

Odonatological Abstract Service

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2004

20546. Suh, A.N. (2004): Dragonfly assemblage dynamics and conservation at small reservoirs in KwaZulu-Natal, South Africa. PhD thesis, School of Botany and Zoology, Faculty of Science and Agriculture, Univ. of KwaZulu-Natal, Pietermaritzburg: XX + 178 pp. (in English) ["A study of the odonate fauna was carried out at the edge of a major escarpment, in eastern South Africa, using the same methodology as has been used in the temperate regions to obtain a sub-tropical perspective. The study used the macroecology approach to compare patterns and responses of these animals (at the developmental stages of larva, teneral and adults) to seasonal, topographical and anthropogenic disturbances. The habitats used were small, but well-established reservoirs located at five elevational gradients: Stainbank Nature Reserve (100 m), Krantzklouf Nature Reserve (450 m), National Botanical Gardens Pietermaritzburg (790 m) Cedara (1050 m) and Mondi Goodhope Estate (1350 m). Although this is essentially a local component of a larger macroecological study, it is shown that even though species and identities differ between temperate, tropical and sub-tropical ecoregions, the general pattern of community response to these variables is similar. Odonate species phenologies in this sub-tropical study showed great similarity to their tropical counterparts by reason of their adults being highly elevation-tolerant, with long flight periods and overlapping generations. Yet they also show temperate characteristics by over-wintering principally as larvae and eggs. The Libellulidae, followed by the Coenagrionidae were the most abundant, elevationtolerant families, with national endemics constituting only 6.5% of the total species sampled. Classification and ordination methods identified and characterised sub-sites to ecologically meaningful biotopes for odonates. This also allowed inferences as to how the various landscape disturbances at the five elevations affect species richness and abundance. Species that responded to these impacts were potential indicator groups that can assist in the planning and management of the landscape for conservation of biodiversity. Some management recommendations for these landscapes are given. Individual odonate species developmental stages and their environmental relations were investigated using both univariate and multivariate analyses. The solutions to these analyses were then used to describe how odonate species are distributed along major environmental gradients. It was shown that regional processes e.g. elevation and insolation alongside local variables e.g. pH, marginal grasses, percentage shade, exposed rock, marginal forest, marsh and flow greatly accounted for adult (aerial stage) assemblage variation and distribution. Turbidity, floating/submerged vegetation and water depth (also influenced by regional factors), highly explained larval (aquatic stage) variation. Elevation has therefore, an indirect effect in that it determines climate, which in turn, determines soil and vegetation types which then determine

species presence and absence. Also, although these artificial water bodies do not increase the 'extent of species occurrence', they are important in increasing their 'area of occupancy'. Dragonflies play a major role in conservation. The Japanese culture has strongly illustrated how dragonflies feature in everyday life more than any other country in the world. While many parks and Botanical Gardens feature dragonfly trails in their nature trails in Britain, this does not necessarily cater for threatened species. Conservation of invertebrates in urban environments in South Africa for example by ecological landscaping designed to encourage dragonflies has been particularly rewarding. A core of regularly occurring odonate species occupied the dragonfly trail at the National Botanical Gardens in Pietermaritzburg, while other species visited the study site at irregular periods. This is likely to be the case for a longer term, say ten years or more. Also, the trail, with updated information on species phenologies, variability and habitat preferences continues to play a valuable role in sensitising an increasingly urbanised population to biodiversity and conservation issues. Odonates remain a major component when assessing ecological components of aquatic biotopes, with the assemblage composition at anyone locality capable of changing over time. This has been extensively illustrated in the northern hemisphere. Medium to longer term changes in odonate population at established reservoirs as demonstrated in this study at the National Botanical Gardens in Pietermaritzburg, South Africa, makes it possible to determine whether a species in a conservation area is being given enough protection from local anthropogenic impacts and effects of unpredictable weather conditions. This in turn enables one to understand how concepts of residency and succession underpin conservation management decisions. In conclusion, this study has addressed some salient aspects of species inventory, monitoring and conservation practice at a local scale that also play a central role in conventional biodiversity conservation practice of a global nature. Information on species phenologies enhances their awareness-raising in addition to providing valuable insights into their population dynamics and conservation, especially for those under threat. In addition, baseline data from this study and similar ones is useful in conserving biodiversity (as subjects) or in multi-taxa studies (as tools) in conserving ecosystems and/or landscapes. Finally, the macroecological approach employed in this study has great potential for teasing apart local effects from regional and/or global ones, and can contribute to the conservation of biodiversity at both small and large scales." (Author)] Address: <https://researchspace.ukzn.ac.za/xmlui/handle/10413/5638>

2005

20547. Chakona, A. (2005): The macroinvertebrate communities of two upland streams in eastern Zimbabwe with reference to the impact of forestry. M.Sc. thesis, Tropical Hydrobiology & Fisheries, Biological Sciences Dept, Univ. of

Zimbabwe, Harare: VIII, 49 pp. (in English) ["Benthic macroinvertebrates and physico-chemical parameters of the water were examined from two fast flowing streams, the Nyahode River which drains a pine monoculture catchment and the Haruni River which drains an undisturbed deciduous forest catchment in the Chimanimani Mountains, Eastern Zimbabwe. Benthic samples and environmental data were collected in October 2004, December 2004 and January 2005. The water quality was similar in many respects but turbidity was significantly higher ($p < 0.05$) in the Nyahode River compared to the Haruni River (mean 17.1 NTU and 6.0 NTU respectively). Conductivity was almost three times higher in the Nyahode ($66 \mu\text{S cm}^{-1}$) than the Haruni ($24 \mu\text{S cm}^{-1}$). The impact of forestry on faunal composition was evident on Ephemeroptera (Euthraulus, Afronurus and Diceromyzon), Plecoptera (Neoperla spio) and Trichoptera (Macrostemum capense) (EPT) richness. Absence of shredders from both streams is a result of the low retention of Course Particulate Organic Matter (CPOM) in the streams due to the rapid flows whilst dominance of filterers suggests that the retention of organic material seems to be limited to Fine Particulate Organic Matter (FPOM). These results indicate that unless reference conditions are established first, results from biotic indices could be completely misleading because absence of some taxa could not be due to human impact but is just a natural phenomenon. Many of the taxa collected from both rivers were sensitive to water quality change (ASPT, 5.6 to 7.8) indicating good water quality which is attributable to the currently underdeveloped nature of the catchment." (Author) <https://ir.uz.ac.zw/jspui/bitstream/10646/833/1/01-Chakona-Msc-Thesis.pdf>] Address: Chakona, A., Univ. of Zimbabwe Lake Kariba Res. Station, PO Box 48, Kariba, Zimbabwe. E-mail: achakona@yahoo.com

20548. Chovanec, A.; Waringer, J. (2005): Dragonflies (Insecta: Odonata) as indicators of the ecological health of wetland ecosystems. *Verh. Internat. Verein. Limnol.* 29: 422-425. (in English) ["Dragonflies play an essential role in the assessment of the ecological integrity of aquatic systems. They are reliable indicators of habitat heterogeneity, connectivity aspects and the ecological quality of the land-water interface. The key factors for understanding this indicator potential are highly specific sets of habitat requirements reflected by distinct patterns of niche differentiation. Bioindication by dragonfly surveys has been broadly discussed (SCHMIDT 1985, 1989, SAMWAYS 1993, CUOVANEC & WARINGER 2001). The aim of this paper is to describe a scheme for assessing the ecological status of river/floodplain systems by analysing dragonfly communities, a method that meets the requirements of the EU Water Framework Directive (WFD). The "Odonata Habitat Index", a key element of this approach, is designed to assess characteristic features of a river/floodplain system, such as connectivity aspects, flow dynamics and terrestrialisation processes. Application examples are presented." (Authors)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, A-1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

20549. Chovanec, A.; Strait, M.; Waidbacher, H.; Schiemer, F.; Cabela, A.; Raab, R. (2005): Rehabilitation of an impounded section of the Danube in Vienna (Austria) - evaluation of inshore structures and habitat diversity. *Large Rivers* 15(1-4), *Arch. Hydrobiol. Suppl.* 155/1-4: 211-224. (in English) ["River regulation, urban development and the construction of a hydroelectric power plant have considerably changed the ecological condition of the Danube section in Vienna. In 1997. The previously straight shoreline of the Danube in this area was reconstructed by creating shallow water areas,

coves, gravel banks and side channels. These inshore structures were created to increase habitat diversity in this area and to establish, together with existing ponds, a system of stepping stone biotopes, which serve as migration linkage through the municipal area of Vienna. A monitoring programme (1998-2001) was established to assess the functional integrity of these structures. A multi-species-approach using odonates, amphibians and fish was developed to cover aquatic, amphibious and terrestrial habitat components. As demonstrated in this study, rehabilitation of heavily altered systems may play an important role in improving ecologically degraded areas and in reconnecting isolated lands-cape patches. A new metric (Floodplain Index) was applied for defining an ecological management objective, for characterizing the newly created structures and for assessing habitat heterogeneity." (Authors)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, 1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

20550. Chovanec, A.; Waringer, J.; Strait, M.; Graf, W.; Reckendorfer, W.; Waringer-Loschenko, A.; Waidbacher, H.; Schultz, H. (2005): The Floodplain Index - a new approach for assessing the ecological status of river/floodplain-systems according to the EU Water Framework Directive. *Large Rivers* 15(1-4), *Arch. Hydrobiol. Suppl.* 155/1-4: 169-185. (in English) ["A new method was developed to assess the ecological status of river/floodplain-systems. The approach is based on the requirements of biological assessment laid down in the EU Water Framework Directive, and, therefore, focuses on water bodies and their environs while neglecting truly terrestrial floodplain sections. The following indicator groups have been integrated: molluscs, caddisflies, dragonflies, amphibians, and fish. These groups were chosen to describe species associations representative of all types of floodplain waters along the gradient of hydrological connectivity. Key element of the procedure is the Floodplain Index, which is calculated for each site investigated on the basis of species-specific habitat values expressing the species' habitat preferences. Since species compositions vary according to the hydrological conditions, the water bodies of an investigation area can be characterized according to the index values. The distribution of the index values shows if and to which extent the degree of lateral connectivity is disturbed in the floodplain area. The assessment of the ecological status is based on a comparison between a river-type-specific reference condition and the status quo. The method is presented with an example from a Danube floodplain area in the north of Vienna (Austria)." (Authors)] Address: Chovanec, A., Umweltbundesamt, Spittelauer Lände 5, 1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

2007

20551. Emiliyamma, K.G.; Radhakrishnan, C. (2007): Fauna Bannerghatta National Park (Karnataka): Insecta: Odonata. *Zoological Survey of India. Conservation Area series* 33: 39-41. (in English) [Only three species are documented: *Agriocnemis pygmaea*, *Trithemis festiva*, *Trithemis aurora*.] Address: Emiliyamma, K.G., Western Ghats Field Res. Station, Zoological Survey of India, Calicut 673 002

20552. Ramos, L.G.; Gapud, V.P. (2007): Survey of dragonflies and damselflies (Odonata) of Mount Makiling, Luzon, Philippines. *Philippine Entomologist* 21: 1-75. (in English) ["The Odonata of Mt. Makiling and vicinities were surveyed. A taxonomic treatment of all examined species is presented, together with a checklist of species of Mt. Makiling. Of the 41 dragonfly species, *Tetracanthagyna bakeri*,

Heliogomphus bakeri, *Ictinogomphus tenax*, *Heteronaias heterodoxa*, *Idionyx philippa*, *Diplacina bolivari*, and *D. braveri* are Philippine endemic, while *Idionyx salva* is Luzon endemic. Only *Agrionoptera bartola* is endemic to Mt. Makiling. Of the 24 damselfly species known from Mt. Makiling, 18 are endemic to the Philippines, with *Amphicnemis bonita*, *A. incallida*, *Risiochemis laguna* and *Drepanosticta makilingia* either confined to Mt. Makiling or shared with Mt. Bana-haw and Quezon. So far, *D. makilingia* is known only from Mt. Makiling. *Rhinocypha colorata*, *Risiochemis serata*, and *Euphaea refulgenes* are common in Mt. Makiling streams, while *Risiochemis atropurpurea* and *Neurobasis luzoniensis* are rare. The status of Odonata of Mt. Makiling is presented in relation to their endemism, importance to rice pest management, problems of the Makiling Forest Reserve and Odonata conservation." (Authors)] Address: Ramos, L.G., Philippines Univ. Los Banos, College, Laguna, Coll. of Agriculture, Philippines.

20553. Song, W.; Ma, L.; Wang, H.; Han, X. (2007): Diversity of insect communities by the lakeside in Zhalong Nature Reserve. *Journal of Northeast Forestry Univ.* 35(7): 80-81. (in Chinese, with English summary) ["A survey was conducted to study the insect fauna by the lakeside in Zhalong Nature Reserve during July-August 2005 and July-September 2006. A total of 104 species of insects belonging to 35 orders and 8 families are recorded. The heterotic groups are Odonata, Coleoptera, Lepidoptera and Hemiptera, accounting for 53.97%, 16.55%, 13.47% and 11.07%, respectively. The number of species and the number of individuals of the insects shows July>August>September. Statistical analysis indicates that the changing trends over time for diversity index(H'), evenness index(J) and richness index (E) are coincident, namely July>August>September, while dominance index (D) exhibits September>August>July." (Authors)] Address: Song, W., School of Forestry, Northeast Forestry Univ., Harbin 150040, P.R.China

2008

20554. Preiß, B. (2008): Die Gestreifte Quelljungfer *Cordulegaster bidentata* und der Feuersalamander *Salamandra salamandra* als Leitarten an ausgewählten Kalksinterquellen und -bächen im Naturpark Eichsfeld-Hainich-Werratal. Bachelorarbeit. Hochschule Anhalt (FH): 83 pp. (in German) [Thüringen, Germany; "For the preparation of this work, eight calcareous sinter springs in the Obereichsfeld (Eichsfeld-Hainich-Werratal Nature Park) were regularly visited between April and August 2007. Here, important structures and parameters of the respective spring run were recorded and described. A targeted search was carried out for exuviae of the striped damselfly *C. bidentata*, which were collected. Furthermore, flying striped damselflies were observed. The larvae of the Fire Salamander *Salamandra salamandra* were observed in the calm areas of the water bodies. The aim of the surveys was to record the ground population and population density of the two flagship species. The evaluation focused on the distribution of the species in the stream system and their seasonal behaviour. Furthermore, the influence of the water structures and parameters on the occurrence of the species was in the foreground." (Author/DeepL)] Address: not stated

20555. Torralba Burrial, A. (2008): Medidas de conservación para los Odonatos. I jornadas sobre la conservación de los artrópodos en Extremadura. Fondos LIFE-Proyecto LIFE 2003/NAT/E/000057 "Conservación de Artrópodos Amenazados de Extremadura", Junta de Extremadura.

Consejería de Industria, Energía y Medio Ambiente: 91-102. (in Spanish) ["Dragonflies, with its conspicuous color, size and habits have left their mark on many fields of human activity, being a fundamental part of the European natural heritage its scientific values, educational, cultural and intrinsic values. However, their role as predators agencies associated aquatic ecosystems affects the conservation problems they present, and that suitable habitats for dragonflies are being lost or degraded at all critically the world. Of the nearly 5600 known species worldwide, 176 have been included in any category of threat in the IUCN Red List 2006. In this paper we review various measures to improve the conservation status of communities of dragonflies. These can be structured according to four courses of action, all necessary and complementary development of lists red, including figures of legal protection measures for the effective protection of the media living and outreach and environmental awareness. Importantly, the synergies given to addressing the problem from the four paths, and that effective protection of the media, that is the way that ensures preservation depend heavily on the existence of a desire or need for society to protect biodiversity in general and dragonflies in particular, need on which attention is drawn to the development of red lists, which increased with the disclosure the magnitude of the problem and knowledge of the species affected and structured by the legal protections. Dragonflies, with its conspicuous color, size and habits have left their mark on many fields of human activity as the mythology, superstition, literature, music, painting, philately and personal adornment (Lucas, 2002). Although the major influences on humans are aesthetic and scientific, interact with them in various ways (Corbet, 1999). Indeed, they are a fundamental part of the European natural heritage for its scientific, educational, cultural, recreational, aesthetic and intrinsic (Council of Europe, 1987). However, the role of organisms associated predators affect aquatic ecosystems to the conservation problems they present, as the habitats Odonata suitable for being lost or degraded worldwide critically, and at an accelerated rate (Corbet, 1999). In addition to increasing knowledge about the biology and habitat of each species, the measures aimed at seeking the conservation of dragonflies can be structured according to four-way of action, all necessary and complementary development of red lists, including figures of legal protection measures for the effective protection of living resources and activities outreach and environmental awareness. The following are examples of conservation measures following each Odonata of these pathways." (Author) (google translator) http://www.telecable.es/personales/antoniobt/2008Medidas_conservacion_odonatos.pdf; 27022011] Address: deceased

2009

20556. Duan, X.-h.; Wang, Z.-y. (2009): Experimental study on the effect of habitat isolation on river ecology. *Advances in Water Science* 20(1): 86-91. (in Chinese, with English summary) ["The field investigations and an experiment were conducted in the Juma river in the suburbs of Beijing to study the effect of habitat fragmentation on river ecology, using benthic macro-invertebrates as indicator species. Three experimental plots were isolated from a relatively undisturbed stream habitat with sheet iron. The benthic assemblages and water parameters were measured by sampling periodically. The results indicate that the abundance, taxa richness and bio-diversity of invertebrates significantly decrease in the experimental plots owing to the habitat isolation. The smaller the experimental habitat plot, the more significantly these biotic indices decrease. The

contents of the dissolved oxygen in the studied plots present the inconsistent variations. The comparison of the benthic communities shows that the relative abundances of Ephemeroptera and Diptera reduces significantly in the isolated plots, and that of the Odonata and Lamellibranchia increase significantly. It is also found that the benthic communities need some time to stabilize after isolation, and then present apparent variation over time. There is a relatively high degree of taxa turnover between isolated plots and the non-isolated reach, which can be attributed to the flight and dispersal of many aquatic insects in their adult stage. However, the benthic communities in isolated plots are not nested subsets in the natural non-isolated stream. This paper also gives some suggestions of the river restoration and the preservation of river ecological integrity based on the study and the present status of the rivers in China." (Authors)] Address: Duan, X.-h., State Key Lab. Hydroscience & Engineering, Tsinghua Univ., Beijing 100084, China

2010

20557. Darblade, S.; Ducout, B. (2010): Compte rendu de présentation de poster: Peuplements odonatologiques de différents types de zones humides du département des Landes (40): synthèse des travaux effectués entre 2001 et 2009 dans le cadre de suivis de sites et d'inventaires en zone Natura 2000. *Martinia* 26(3-4): 188-192. (in French) ["In the Landes Dept, between 2001 and 2009, 283 stations were sampled as part of Natura 2000 inventories and site monitoring in 3 geographical sectors: the coast, the Haute Lande and the Barthes de l'Adour. The lotic and lentic habitats surveyed were diverse and representative of the wetlands of the Landes. In terms of species, of the 56 odonates observed, 3 were new to the Dept: *Trithemis annulata*, *Somatochlora m. metallica* and *Calopteryx s. splendens*; and 5 were protected at national and European level: *Oxygastra curtisii*, *Coenagrion mercuriale*, *Gomphus flavipes*, *Leucorhinia albifrons* and *L. pectoralis*. A comparison of the species richness was then made according to the geographical sectors and habitats sampled. Finally, the analysis of the frequencies of occurrence made it possible to characterise the distribution of species by habitat." (Authors) Translated with www.DeepL.com/Translator (free version)] Address: Darblade, Stéphanie, RNN Étang Noir / Association OS-MUNDA Réserve Naturelle de l'Étang Noir, Avenue du parc des sports, 40510 - Seignosse, France. E-mail: m.etang-noir@libertysurf.fr

20558. Deliry, C. (2010): Expansion de la Libellule purpurine en France *Trithemis annulata* (De Palisot de Beauvois, 1805) - Décembre 2010 (Troisième édition). *Histoires Naturelles* n°1: 5 pp. (in French) [<https://deliry.net/pdf/hn1.pdf>] Address: Deliry, C., 20, rue de la Manine, F-38510 Morestel, France. E-mail: president@sympetrum.org

20559. Wellenreuther, M.; Tynkkyne, K.; Svensson, E.I. (2010): Simulating range expansion: Male species recognition and loss of premating isolation in damselflies. *Evolution* 64(1): 242-252. (in English) ["Prolonged periods of allopatry might result in loss of the ability to discriminate against other formerly sympatric species, and can lead to heterospecific matings and hybridization upon secondary contact. Loss of premating isolation during prolonged allopatry can operate in the opposite direction of reinforcement, but has until now been little explored. We investigated how premating isolation between two closely related damselfly species, *Calopteryx splendens* and *C. virgo*, might be affected by the expected future northward range expansion of *C. splendens*

into the allopatric zone of *G. virgo* in northern Scandinavia. We simulated the expected secondary contact by presenting *C. splendens* females to *C. virgo* males in the northern allopatric populations in Finland. Premating isolation toward *C. splendens* in northern allopatric populations was compared to sympatric populations in southern Finland and southern Sweden. Male courtship responses of *G. virgo* toward conspecific females showed limited geographic variation, however, courtship attempts toward heterospecific *C. splendens* females increased significantly from sympatry to allopatry. Our results suggest that allopatric *C. virgo* males have partly lost their ability to discriminate against heterospecific females. Reduced premating isolation in allopatry might lead to increased heterospecific matings between taxa that are currently expanding and shifting their ranges in response to climate change." (Authors)] Address: Wellenreuther, Maren, Section for Animal Ecology Ecology Building, Lund Univ. SE-223 62 Lund, Sweden. Email: Maren.wellenreuther@zooekol

2011

20560. Alym, M.Z.Y.; Mohamed, I.E.E.; Bakry, S.M. (2011): Study the prey preference of some aquatic insects for different snails under the laboratory conditions. *Egypt. Acad. J. biolog. Sci.* 4(1): 91-101. (in English, with Arabian summary) ["The study of five aquatic insects (predators), adults of two hemipterous species, *Limnogeton fieberii* Mayr, *Sphaerodema urinator* Duf., and nymphs of *Anax imperator*, *Crocothemis erythraea* and *Ischnura pumilio* on four species of snails (preys) exist in its natural habitat at Qena, *Bulinus truncatus* Audouin, *Biomphalaria alexandrina* Ehrenb, *Cleopatra bulimoides* Olivier and *Melanoides tuberculata* Muller. in non choice experiment under laboratory conditions, the result indicated that the first preference for attack to all predators was directed towards *B. truncatus*. And the last preference was *B. alexandrina*. Except, *L. fieberii*, the last preference was *C. bulimoides*." (Authors)] Address: Alym, M.Z.Y., Zoology Department (Entomology), Faculty of Science (Qena), South Valley University, Egypt

20561. Devai, G.; Miskolczi, M. (2011): Adatok a Nyírség szitakötő-faunájához (Odonata) [Data on the dragonfly (Odonata) fauna of the landscape Nyírség (NE-Hungary)]. *Studia odonotol. hung.* 13: 71-80. (in Hungarian, with English summary) ["This is the 22th paper of a series directed at communicating faunistic data of Hungary which had been unpublished until December 31, 1987 (cf. DÉVAI, GY. et al. 1993). The authors present faunistic data on the geographical mesoregion Nyírség in NE-Hungary, from 13 localities in 11 10×10 km UTM grid map cells (EU 40, 41, 50, 51, 61, 71, 82; ET 46, 59, 66, 89), over the administrative area of 6 settlements (Debrecen, Érpatak, Levelek, Nyírbátor, Nyíregyháza, Nyírmada). Collections were made in 6 years between 1968 and 1987 on 26 days, with the participation of 6 specialists. In the report information on 2442 adults (1727 males and 715 females) is given in detail, representing 319 faunistic data. In this study 37 species (15 Zygoptera and 22 Anisoptera) were found to occur in the area, out of which 19 belong to the frequent, 12 to the less frequent, 2 to the rare and 4 to the sporadic class of country-wide occurrence frequency." (Authors)] Address: Devai, G., Dept of Ecology, Kossuth L. Univ., H-4010 Debrecen, P.O. Box 71, Hungary

20562. Nicoli Aldini, R.; Tabarroni, A. (2011): Contributo allo studio della distribuzione degli Odonati nel Piacentino. Abstract de XXIII Congresso Nazionale Italiano di Entomologia,

(Genova, 2011-06-13 -2011-06-16), erredi grafiche editoriali, Genova 2011: 72. (in Italian) ["The territory of Piacenza, the extreme western edge of Emilia bordered to the north by the course of the P river and to the south by the northern Apennine ridge, includes the catchment basins of a number of right-hand Padana tributaries (Tidone, Trebbia, Nure, Chiavenna, Arda). Among the wetlands, the riparian environments of the Po with the mouths of the aforementioned tributaries and, in the Po agricultural area, the network of irrigation canals stand out. In the hills and mountains there are also artificial basins (Lake Trebecco, Lake Mignano) and, higher up, other smaller lakes. In view of this hydrographic variety, which is undoubtedly important for research on amphibiotic entomofauna, it can be stated that current knowledge on the distribution of Odonates in the province of Piacenza is relatively scarce when compared with that available for some other provinces in the region or in neighbouring regions. In view of the importance of Odonates as bio-indicators and in order to obtain a more in-depth knowledge of their distribution in the territory and of any variations in the same over time, we identified the unpublished material from the Piacenza area kept in the collections of the Entomology Institute of the Catholic Univ.. The collection period of the approximately 200 specimens examined covers the last thirty years; there are about sixty localities, located mainly in the lowland and hilly areas of the province. The original geoneimical data concern the following 38 species: *Calopteryx haemorrhoidalis*, *C. splendens*, *C. virgo*, *Sympetma fusca*, *Lestes dryas*, *L. sponsa*, *L. viridis*, *Platycnemis pennipes*, *Pyrrhosoma nymphula*, *Ischnura elegans*, *I. pumilio*, *Enallagma cyathigerum*, *Coenagrion puella*, *Ceragrion tenellum*, *Aeshna affinis*, *A. cyanea*, *A. isosceles*, *A. mixta*, *Anax imperator*, *Hemianax ephippiger*, *Gomphus flavipes*, *G. vulgatissimus*, *Onychogomphus forcipatus*, *Somatochlora metallica*, *Libellula depressa*, *L. fulva*, *L. quadrimaculata*, *Orthetrum albistylum*, *O. brunneum*, *O. cancellatum*, *O. coerulescens*, *Crocothemis erythraea*, *Sympetrum depressiusculum*, *S. fonscolombii*, *S. meridionale*, *S. pedemontanum*, *S. sanguineum*, *S. striolatum*. Some of these species had been reported several times for the area under study, while for others citations in the literature are very scarce or absent. For the Piacenza area, further bibliographic data exist for less than a dozen other species. It is probable that especially the mountainous Apennine environments, which have been less investigated, may provide other findings of some faunistic interest." Translated with www.DeepL.com/Translator (free version).] Address: Nicoli Aldini, R., Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, Via Emilia Parmense 84, 29122 Piacenza, Italy. E-mail: rinaldo.nicoli@unicatt.it

20563. Resende, D.C.; Meira, A.Q.; Campos, L.A.O.; Lino - Neto, J. (2011): Hipóteses evolutivas sobre a morfologia das asas de Libellulidae (Insecta, Odonata). X Congresso de Ecologia do Brasil, 16 a 22 de Setembro de 2011, Sao Lourenço - MG: 2 pp. (in Portuguese) ["The Continuous evaluates the evolution of a characteristic through three parameters, named, δ e and ϵ o. Of these, the parameter δ is responsible for evaluating whether the shared evolutionary history (the δ -logeny) explains the variability observed in the data ($\delta=1$). The result of the comparative analyses showed that the features of interest in this work do not present a δ -logenetic δ -signal ($\delta=0$), suggesting that traditional statistical analyses can be used. The PCA analysis, performed from the pairwise comparison data between the forewings and hindwings of the species, originated a main axis with 48.7% of the explained variance, which separated the species *T. binotata*, *P. avescens* and *M. marcela* from the other species

analyzed. The multiple regression showed that the differences between forewings and hindwings increase with the increase in body size of the species ($R^2=0.88$; $b= - 3.75$; $t(8)= - 4.46$; $p<0.01$). The change in wing shape also correlated with an increase in the anal area of the hind wing ($b= - 3.75$; $t(8)= - 4.46$; $p<0.01$), a characteristic that Corbet (1962) suggested as important for flying species, facilitating the maintenance of a flight with less energy expenditure (gliding). Larger species, in fact, remained longer in flight during reproductive activities ($R^2=0.48$; $b=1.42$; $t(7)=2.45$; $p<0.05$). However, the change in shape between wings ($R^2=0.48$; $b=1.03$; $t(7)=1.96$; $p=0.09$) and the anal area of the hind wing ($R^2=0.48$; $b=1.05$; $t(7)=2.22$; $p=0.06$) did not correlate with the flight time of the species, reinforcing the idea that the dichotomy between fliers and landers seems, in fact, to exist, but would involve other flight activities than those related to reproductive behavior, as already argued by Corbet & May (2008). Conclusion: The morphological and behavioral characteristics of interest showed no δ -logenetic signal, reinforcing the idea that Libellulidae may have undergone rapid adaptive radiation. The differences in wing shape are correlated with the body size of the species, but do not influence the flight time during reproductive activities. (This work was supported by FAPEMIG, through the funding of the project "Phylogeny and evolution of the family Libellulidae Rambur, 1842 (Odonata) based on molecular characters" and a Ph.D. grant to the first author). Translated with www.DeepL.com/Translator (free version)] Address: <http://www.seb-ecologia.org.br/xceb/resumos/1347.pdf>

20564. Sundermann, A.; Stoll, S.; Haase, P. (2011): River restoration success depends on the species pool of the immediate surroundings. *Ecological Applications* 21(6): 1962-1971. (in English) ["Previous studies evaluating the success of river restorations have rarely found any consistent effects on benthic invertebrate assemblages. In this study, we analyzed data from 24 river restoration projects in Germany dating back 1 to 12 years and 1231 data sets from adjacent river reaches that lie within 0-5, 5-10, and 10-15 km rings centered on the restored sites. We calculated restoration success and recolonization potential of adjacent river reaches based on stream-type-specific subsets of taxa indicative for good or bad habitat quality. On average, the restorations did not improve the benthic invertebrate community quality. However, we show that restoration success depends on the presence of source populations of desired taxa in the surrounding of restored sites. Only where source populations of additional desired taxa existed within a 0-5 km ring around the restored sites were benthic invertebrate assemblages improved by the restoration. Beyond the 5-km rings, this recolonization effect was no longer detected. We present here the first field results to support the debated argument that a lack of source populations in the areas surrounding restored sites may play an important role in the failure to establish desired invertebrate communities by the means of river restorations. In contrast, long-range dispersal of invertebrates seems to play a subordinate role in the recolonization of restored sites. However, because the surroundings of the restored sites were far from good ecological quality, the potential for improvement of restored sites was limited." (Authors)] Address: Stoll, S., Res. Inst. Senckenberg, Dept Limnology & Conservation, Clamecystr. 12, 63571 Gelnhausen, Germany. E-mail: stefan.stoll@senckenberg

20565. Wendzonka, J. (2011): Literatura i recenzje [Literature and reviews: - Recenzja. Boudot J.-P., Kalkman V. J., Azpilicueta Amorín M., Bogdanoviæ T., Cordero Rivera A., Degabriele G., Dommanget J.-L., Ferreira S., Garrigós B.,

Jovic, M., Kotarac M., Lopau W., Marinov M., Mihokoviæ N., Riservato E., Samraoui B., Schneider W. 2009. Atlas of the Odonata of the Mediterranean and North Africa. *Libellula*, Suppl. 9: 1–256. *Odonatrix* 7(1): 31-32. (in Polish, with English summary) ["Atlas of the Odonata of the Mediterranean and North Africa" is a distribution atlas of dragonflies in this region. It contains maps (based on 50x50 km UTM grid) for all of 179 recorded species. Additionally, almost all species presented in photographs are shortly described (biology, ecology, remarks on distribution, IUCN Red List Status). For Polish odonatologists it is not a "must have" book, but it is necessary for everyone who wants to get the wider view about the distribution of "our" dragonfly species." (Author)] Address: Wendzonka, J., ul. Graniczna 17, 63-800 Gostyn, Poland. E-mail: wendzonka@wp.pl

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20566. Buczyński, P. (2013): Two forgotten papers about dragonflies (Odonata) of Poland. *Odonatrix* 9(2): 65-71. (in Polish, with English summary) ["The author discusses two Russian papers with data from the vicinity of Pu.awy (eastern Poland) which have been omitted in odonatological literature so far including "A distribution atlas of dragonflies (Odonata) in Poland" (Bernard et al. 2009). Zaitsev (1908) gave on the margins of the paper about interesting insects of the vicinities of Pu.awy the information about the recording of *Caraphractus cinctus* (Hymenoptera: Mymaridae). Then it was wrongly regarded as a specialized parasite of the eggs of *Calopteryx virgo* therefore its presence was treated as an evidence for the occurrence of this dragonfly species (Kolosov 1916; Zaitsev 1908). However, *C. cinctus* parasitizes mainly *Dytiscidae* (Coleoptera), it is also found in the eggs of *Notonecta* spp. (Hemiptera: Heteroptera). Therefore this reasoning is unauthorized and the paper of Zaitsev (1908) should be excluded as a source of data on dragonflies of Poland. Kolosov was known as the author of the paper about the mass migration of *Libellula quadrimaculata* through Pu.awy (Kolosov 1915). His collection was partially preserved in the Museum and Institute of Zoology of the Polish Academy of Sciences (MIZ PAS). This data has been used by Bernard et al. (2009) and discussed in details by Buczynski (2012) who considered it in most as unpublished. However, it was published in *Zapiski Nowo-Aleksandriyskago Instituta Selskago Khozyaistva i Lesovodstva* (Memoires de Institute Agronomique et Forester a Nowo-Alexandriach) (Kolosov 1916) although this work has never been cited, not only in Poland but also in Russia and the Soviet Union. This probably resulted from a chain of unfortunate events. The paper was published during the war when the publishing institute was evacuated from Pu.awy to Kharkov where it stayed. Therefore this paper was absent in Polish libraries. However, for Russian authors the discussed paper was not interesting then for it was local and referred to a different country. Kolosov (1916) gave 41 dragonfly species: 40 from Pu.awy and its vicinity as well as 5 from fragmentary studied sites in other areas of Poland. At the same time *Orthetrum cancellatum* was wrongly recorded: the provided picture of copulatory apparatus of a male indicates *O. albistylum*. The analysis of data and the comparison with the preserved material (Buczyński 2012) show that the specimens in MIZ PAS were re-labelled which resulted in the loss of the detailed data about the sites: new unformed labels provided general site. *Novaya Aleksandriyach* (=Pu.awy). Moreover, the collection of MIZ PAS contains the species which were not given by Kolosov (1916): *Lestes virens*, *Enallagma cyathigerum*, *Anax imperator* and *A. parthenope*. Taking into consideration all of the data, in the

area of Pu.awy ca. 100 years ago 44 dragonfly species were recorded. That number was impressive in the light of contemporary standards of faunistic studies and such a small area. This shows the very high natural values of the valley of the middle River Vistula at that time. This data show the unique, almost complete picture of dragonfly assemblages of the valley of large lowland river in Central Europe during the period when such areas were still transformed in small degree by man." (Author)] Address: Buczynski, P., Dept Zool., Maria Curie-Skłodowska Univ., Akademicka 19, 20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

20567. Deliry, C. (2013): Liste chronologique des Libellules d'Europe. *Histoires Naturelles* n°18: 18 pp. [<https://deliry.net/pdf/hn18.pdf>]

20568. Deliry, C. (2013): Bibliographie d'Odonatologie rhônalpine & Hautes-Alpes, Deuxième édition. Août 2013. *Histoires Naturelles* n°21: 44 pp. (in French) [<http://deliry.net/pdf/hn21.pdf>] Address: Deliry, C., 20, rue de la Manine, 38510 Morestel, France. E-mail: president@sympetrum.org

20569. Elzerman, S. (2013): Zomer 2012: zwervende heidelibel breekt records op braakliggend terrein [Summer 2012: *Sympetrum fonscolombii* breaks records on wasteland]. *Straatgras* 25(1): 8-9. (in Dutch) [<https://natuurtijdschriften.nl/pub/538409/STGR2013025001005.pdf>] Address: ecoloog, Elzerman Ecologisch Advies; info@elzermanecologischadvies.nl

20570. Gliwa, B. (2013): Die Libellen der Moorgebiete "Praviršulio tyrelis" und "Didysis Tyrulis" in Litauen. *Pa-trauklios kaimo aplinkos išsaugojimas ir formavimas Sargeliai: Kruenta* 2013. ISBN 978-609-95323-1-8: 164-198. (in German, with English and Lithuanian summaries) ["Odonata of two nature reserve boglands in Lithuania: *Praviršulis* and *Didysis Tyrulis*. While *Didysis Tyrulis* has been largely destroyed due to peat cutting, *Praviršulis* remained healthy, however, with disorders of natural hydrological conditions in a large part. As a result *Praviršulis* contains still two natural lakes and plenty of raised bog and fen. By contrast, at *Didysis Tyrulis* one finds no natural water bodies at all but lots of secondary „lakes“ in the digged pools together with a dense set of ditches. *Praviršulis* is well researched in terms of dragonflies, 45 species have been recorded. Among them some species strongly specialized in bogland, e.g. *Nehalennia speciosa*, *Somatochlora arctica*. Due to still started research, only 27 species have been recorded at *Didysis Tyrulis*, among them rare species as *Coenagrion armatum* and *Coenagrion lunulatum*. As a surprise, a large of population of *N. speciosa* could be observed as well. This is the first report of this species in a renaturating habitat. Really large populations were recorded for *Leucorrhinia rubicunda* and *L. pectoralis* in 2012.] Address: Gliwa, B., Lithuanian Entomological Society, Akademijos 2, LT-08412 Vilnius, Lithuania. E-mail: gliwa@sargeliai.org

20571. Koch, L.; Schuster, J.D. (2013): Nachweise der beiden Quelljungferarten *Cordulegaster bidentata* und *Cordulegaster boltonii* (Odonata: Cordulegastridae) im südlichen Ennepe-Ruhr-Kreis und Untersuchung ihrer Habitats. *Beiträge zur Heimatkunde der Stadt Schwelm und ihrer Umgebung N.F.* 62: 25-42. (in German) ["*Cordulegastridae* comprises only two species in Germany, both of which are considered "critically endangered" and "endangered" respectively according to the Red List of North Rhine-Westphalia (2010): *C. bidentata* and *C. boltonii*. Both forms in-

habit small and very small flowing waters: tiny clean water-courses and spring rivulets in siep valleys. Due to their low number of individuals even in populated stream sections, flying animals are rarely observed. Since dragonflies are hardly ever expected in their habitats, both species are often overlooked despite their size. In the previous dragonfly surveys, which refer to the surroundings of Schwelm, no clear evidence of damselflies could be found. In the meantime, however, both species have been documented by photos of flying specimens and one species by larvae. The sites are located in Breckerfeld in a tributary stream of the Selbecker Bach and in Ennepetal in the catchment area of the Heilenbecke." (Author)] Address: Koch, L., Heinrich-Heine-Str. 5, 58256 Ennepetal, Germany. E-Mail l-koch@t-online.de

20572. Martin, M. (2013): Eesti kiillide määraja [Estonian dragonflies Identified]. Environment Agency - LIFE08NAT/EE/000257 Dragonlife. Talin: 232 pp. (in Estonian) [The last publication that dealt with Estonian Odonata in depth was published half a century ago in 1963. In the intervening years, there have been many changes in the wedge fauna and new information has accumulated. The "Identification of Estonian dragonflies" covers all 57 species of Odonata found in Estonia so far, plus 2 species that could reach our area in the near future. The book gives an overview of the biology, structure and important characters of wedges, and includes identification tables for both adults and larvae. It is illustrated with 127 photographs and around 300 drawings. (Publisher/DeepL)]

20573. Nijs, G.; D'Haeseleer, J.; Jacobs, I.; Lambrechts, J.; Veraghtert, W. (2013): Inventarisatie van heiderelicten in Vlaams-Brabant. Rapport Natuurpunt Studie 2013/13, Mechelen: 172 pp. (in Dutch) [https://www.researchgate.net/publication/273860912_Inventarisatie_van_heiderelicten_in_Vlaams-Brabant/link/55b5e41808ae9289a08a83d4/download]

20574. Omondi, R.; Yasindi A.W.; Magana A. M. (2013): Food and feeding habits of three main fish species in Lake Baringo, Kenya. *Journal of Ecology and the Natural Environment* 5(9): 224-230. (in English) ["The diets of three fish species of commercial importance in Lake Baringo, *Protopterus aethiopicus*, *Clarias gariepinus* and *Oreochromis niloticus*, were determined using frequency of occurrence and volumetric methods between April 2008 and March 2010. Seine and gill nets were used to catch a total of 430 fish specimens. The diet of *P. aethiopicus* was 94.3% molluscs with a frequency of occurrence of 98.6% of stomachs with food. Adult *C. gariepinus* fed mainly on fish with 75% of the stomachs with food containing fish remains and mean of 49.2% contribution by volume. *C. gariepinus* also fed on zooplankton, especially the cladoceran *Daphnia barbata*. The food items in the stomachs of *O. niloticus* consisted mainly of algae, detritus and zooplankton. Algae was consumed by *O. niloticus* of all length classes in proportions ranging from 26.5 to 88.1%. The importance of zooplankton as food for *O. niloticus* decreased with size of fish. The study reveals the importance of zooplankton as food for *O. niloticus* and *C. gariepinus* in Lake Baringo. There is need to rehabilitate the catchment of Lake Baringo so as to improve the water quality thus improve productivity." (Authors) The diet of *P. aethiopicus* included very few odonate specimens.] Address: Omondi, R., Kenya Marine & Fisheries Res. Inst., P O Box 31 Kisumu, Kenya. ail: reubenomondi@yahoo.com.

20575. Piper, M. (2013): Some Odonata Notes from Samos. *Atropos* 49: 91-93. (in English) ["During June 2010

with the help of Bower's *The Dragonflies of Lesbos* (2008) and *Field Guide to the Dragonflies of Britain and Europe* (Dijkstra & Lewington, 2006) I managed to find and identify a number of interesting dragonflies on Lesbos. The combination of sunshine, good food and abundant wildlife proved a big hit for me and my long suffering wife so we decided to try a different Aegean island in 2011. We settled upon Samos, some 125km to the south of Lesbos. I couldn't find any recent English references on the Odonata of this island (unlike birds, why are there so few trip lists for dragonflies and butterflies?). However, its close proximity to Turkey meant there must be some interesting species to see there and the lack of information was in some ways part of the appeal. What would I find there? The area of the island is 478km² and it is separated from Anatolia by the approximately 1.6km wide Mycale Strait. While largely mountainous, Samos has several relatively large and fertile plains. So during early June 2012, armed with a map (Samos 1: 50.000 Skai Map Hiking Terrain Cartography Group, map 331) I set forth, exploring the relatively few wetlands on the Island. We stayed in Pythagorio on the south-eastern coast, which proved a great base for getting around and had plenty of hotels and restaurants. The most interesting sites and species encountered are described briefly here. Alyki Wetlands (near Psili Ammos in the south-east) is a large shallow lake that dries out in the summer. A single visit here produced approximately 20 *Lestes macrostigma*. These were located on the seaward side of the lake, close to the ruined building. Very few other species were seen, perhaps not surprising given the extreme conditions of the site. Glyfada Wetlands (just west of Pythagorio by the Potokaki turnoff) consisted of two very small pools—one very artificial with concrete banks and one shallow and brackish. Only the brackish pool produced anything of note. Dark Spreadwing were seen on all three visits but only in small numbers of up to 10. A single *Orthetrum sabina* was the only one seen during the holiday. The reservoir near Ormos Marathokambou is a small stone-banked reservoir, approximately 2km north-east of the village on the south-west coast. Surrounded by high fencing, on inspection the padlock on the entrance gates was not locked and so I gained entry. How I love Greece! Good numbers of *Selysiothemis nigra* were seen along tracks around this site. The reservoir itself held very little, although *Trithemis annulata* was here in good numbers. The wonderfully named Valley of the Nightingales (the road to Vourliotes from the north coast main road) hosted a tumbling mountain stream running through woodland. The best species here were several *Cordulegaster insignis*, which were seen from the road along the most shaded sections of the river; they were very skittish and never settled. Quite often they left the stream area and flew along the road and into adjacent woodland. Other species seen here were typical Aegean fast-flowing stream species, such as *Caliaeschna microstigma* and *Epallage fatime*. Walking along the track from Vourliotes to Mandates I chanced across a *Gomphus schneiderii* perched on the ground and then in nearby trees. The River Imvressos in the south of the Island proved productive. The shadier upper stretches of the river between Myli and Agios Georghios again had the typical Aegean fast-flowing water species, *C. microstigma* and *E. fatime*. *Aeshna affinis* were observed feeding over nearby clearings. Where the river slowed near Myli Bridge typical species were *Orthetrum coerulescens* ssp. *anceps*, *Orthetrum brunneum* and *Onychogomphus forcipatus*. And south of here as the river trickled into the sea at Ireon, *Aeshna isosceles* were seen skirmishing with *Anax parthenope*. During the two weeks I found 26 species of dragonfly without trying too hard. So if you fancy the idea of sitting by the beach, cold Mythos in hand, a sparkling Aegean Sea, a content partner,

and a notebook and camera brimming full of dragonfly encounters you could do a lot worse than Samos." (Author)] Address: Piper, M., 83 Logan Street, Market Harborough, LE16 9AW, UK. E-mail: Mark.Piper@mercedes-amg-hpp.com

20576. Sanches, R.D.; Ribeiro, C. (2013): *Variação Lexical para Libélula no Atlas Linguístico do Amapá*. Web-Revista SOCIODIALETO • www.sociodialeto.com.br; Bacharelado e Licenciatura em Letras • UEMS/Campo Grande; Mestrado em Letras • UEMS / Campo Grande. ISSN: 2178-1486 • Volume 4 • Número 11 • Novembro 2013 : 435-449. (in Portuguese, with English summary) ["This article includes a sample of lexical research, leaving the focus on the study of the lexicon which currently has been a topic quite widespread in the variational-based studies. This study was based on data from the Linguistic Atlas of Amapá (ALAP), however, will address only those municipalities that have already been made all collections of data, in this case, we highlight the following municipalities: Amapá, Calçoene, Tartarugalzinho, Laranjal do Jari, Mazagão, Oiapoque Porto Grande, Pedra Branca do Amapari and Santana. The research is based on the theoretical and methodological assumptions adopted by the ALAP project. Therefore, we analyze the semantic field of fauna and flora of the lexical-semantic questionnaire in order to verify the uses made in this region for the lexical item dragonfly. It is noteworthy that the observed variation of this item considering the spatial and social, as recommended by the linguistic geography in a multidimensional perspective. Thus, it was found that the variants found in the state of Amapá were: libélula, jacinta, jacinto, cigarra, cigana, cinza, caba and gafanhoto. However, the most frequent variant is jacinta, since this term dictionaries. Data analysis also reports that the people who use this term are the municipality of Amapá. In relation to gender are the men of the second age group, from all points of inquiry, they have 100% occurrence of the term jacinta instead of dragonfly." (Authors)] Address: Romário Duarte Sanches (UNIFAP/UEPA). Email: duarte.romrio@gmail.com

20577. Shetty, S.; Sreepada, K.S. (2013): *Prey and nutritional analysis of Megaderma lyra Guano from the west coast of Karnataka, India*. *Advances in Bioresearch* 4(3): 1-7. (in English) ["Microchiropteran bats play a vital role in the ecosystem. They consume large volumes of insects many of which are agricultural pests and their droppings (guano) contain large amount of partly digested insect parts that form the resource base for other diverse form of consumers in the food chain including diverse microbes. These together make guano the best organic fertilizers. However, food habits of different species of bats vary depending on the species, locality, season and the ability of the bat to detect certain types of insects using morphological characteristics. Hence, an attempt is made in the present study to analyze the seasonal variations in the food habit of a microchiropteran bat, *Megaderma lyra*, so as to determine the insects on which they feed and also to do a nutritional analysis that include the moisture, carbohydrate, protein, lipid, ash, nitrogen, phosphorus and potassium content of their guano. The study was carried out during November 2009 to October 2010 in a maternity colony in an abandoned house which is mainly surrounded by coconut plantations and paddy fields. It is located at Karkala in D.K. district of Karnataka. To determine their insect prey, insect parts present in the bat guano were identified to ordinal level. The percent volume and percent frequency of food items present were also determined and were classified as basic food (>20%), constant food (5-20%), supplementary food (1-5%) and chance food (<1%). During the sampling period insects belonging

to 15 orders were identified. The scales of fishes, legs of frogs and hair, tooth and legs of rats recorded during pre monsoon, monsoon and post monsoon were all included under Vertebrates. Of the total insect orders identified, Coleopterans formed the major food items in all the three seasons (Premonsoon, monsoon and postmonsoon) and Vertebrates alongwith Coleopterans formed major food items during monsoon and postmonsoon. Whereas Hemipterans formed the constant food in all the three seasons and Lepidopterans formed the constant food along with Hemipterans during monsoon and postmonsoon. Other insect orders quantified included Dictyoptera, Trichoptera, Orthoptera, Diptera, Hymenoptera, Odonata, Ephemeroptera, Isoptera, Neuroptera, Dermaptera, Thysanoptera and spiders. The insect orders represented in the faecal pellets though not all indirectly reflect the occurrence of agricultural pests since their presence coincides with the type of vegetation surrounding the roosting site. Nutritional analysis of the guano revealed that the guano contained maximum carbohydrate (2.8%) during pre monsoon, lipid content (9.3%) during post monsoon and protein during pre monsoon and post monsoon (8.9%) period. N-P-K analysis revealed that guano is rich in phosphorus. Also phosphorus content was recorded highest in all the seasons (6-11%) and potassium during monsoon (1.3%) and post monsoon (1.2%). However, no significant variation in the nitrogen content was recorded. Therefore, the present study indicates that the Indian false vampire bat preys substantially on several insects injurious to crops, gardens and lawns and also on rodents. Further study is needed on the potential impacts of this and other insectivorous bats on these economic pests and also on organic enrichment of bat guano in the study area." (Authors)] Address: Shetty, Shrinidhi, Dept of Biotechnology, Alva's College, Moodbidri, Karnataka- 574 227, India. Email-srimicrotech@yahoo.com

20578. Tichánek, F. (2013): *Společenstva vážek odvodňovacích kanálů Radovesické výsypky*. [Dragonfly communities of drainage ditches in Radovesická spoil heap.]. BcS. thesis, Faculty of Science, Univ. of South Bohemia, České Budejovice, Czech Republic: 58 pp. (in Czech.) [Conclusion: Drainage channels Radovesice dump hosts endangered species of dragonfly, whose presence is within the Most dumps unique. Dragonfly communities that make up the canals, significantly enrich the Most odonatofauna dumps and their conservation value even exceed ponds, wetlands and retention basins the Most dumps. Channels that have for endangered dragonflies the Most dumps a unique position. to increase conservation potential drainage channels should primarily build and maintain channels heterogeneous and rugged. It is advisable to build channels with little inclination banks, prevent excessive water velocity and reduce uniform reed vegetation at the expense of finer and lower macrophyte beds vegetation. Such channels are likely to be attractive to both risk dragonfly species, as well as other valuable communities freshwater organisms, with the original function of drainage channels will not be affected." (Author) *Coenagrion omatum*, *Ischnura pumilio*, *Lestes barbarus*, *Cordulegaster boltonii*, *Orthetrum brunneum*, *O. coerulescens*, *Sympetrum pedemontanum*, *S. striolatum*.] Address: not stated

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20579. Carvalho, A. (2014): *Rock and Roll Dragonfly: A preliminary study on the symbolism of dragonflies (Odonata) in the lyrics of Western contemporary popular songs*. *Entomologia Cultural. Ecos do I Simpósio Brasileiro*

de Entomologia Cultural – 2013. 97-109. (in English) [https://www.researchgate.net/publication/279194728_Rock_Roll_Dragonfly. https://www.researchgate.net/profile/Alcimar_Carvalho/publication/279194728_Rock_Roll_Dragonfly/links/558e016608ae47a3490bdd96.pdf; 09082015] Address: Carvalho, A.L., Depto de Entomologia, Museu Nacional, Univ. Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

20580. Farizawati, S.; Fauzi, M.; Ruslan, M.Y.; Norma-Rashid, Y.; Ng, Y.F.; Idris, A.G. (2014): The diversity of odonates in five islands within the west coast of peninsular Malaysia. *Academic Journal of Entomology* 7(3): 102-108. (in English) ["The odonate fauna of five islands within the west coast of Peninsular Malaysia, namely Besar Island (Melaka), Carey Island (Selangor), Pangkor Island (Perak), Penang Island (Penang) and Langkawi Island (Kedah) were surveyed. A total of 54 species belonging to 12 family groups were identified. The highlights of the collection is an endemic species of Pulau Langkawi (*Megalogomphus icterops*) and one new record for Peninsular Malaysia (Langkawi Island: *Cerriagrion praetermissum*, ident. R. Dow). Although no other endemics were found in Besar Island, it was first record for the island." (Authors) [http://www.idosi.org/aje/7\(3\)14/3.pdf](http://www.idosi.org/aje/7(3)14/3.pdf); 29092014] Address: Idris, A.G., School of Environmental & Natural Resources Sciences, Faculty of Science & Technology, Universiti Kebangsaan Malaysia, 43600 UKM, Bangi Selangor Malaysia

20581. Hefler, C.; Qiu, H.; Shyy, W. (2014): The interaction of wings in different flight modes of a dragonfly. 17th International Symposium on Application of Laser Techniques to Fluid Mechanics, Lisbon, Portugal, July 07 – 10, 2014: 4.5.2. (in English) [Verbatim: considered in the targeted size region for Micro Air Vehicles MAVs. In a low Reynolds number region, where MAVs and natural flyers operate, viscous forces and unsteady aerodynamics must be considered and account for a number of unique phenomena. At such conditions traditional designs are disadvantaged over a flexible flapping wing which can extract additional aerodynamic forces through unsteady flow mechanisms (Shyy et al., 2008; Shyy et al., 2010). Bio inspired designs offer a viable solution to design MAVs. Among natural flyers dragonflies are unique. They possess 2 pairs of wings which they can move separately. The interaction between the fore and hind wing is a particularly interesting topic. Phase difference highly affect the force production of tandem configuration, and while highest force peaks achieved when wings flapping in phase, the efficiency increases if the hind wing leads with a certain phase difference (Lian et al., 2013). Downwash generated by the forewing as well as shed vortexes greatly affect hind wing performance, however this effect is depend on the studied flight mode as well as geometrical and environmental conditions (Maybury & Lehmann, 2004; Sun & Huang, 2007; Rival et al. 2011;). Our aim is to characterize the flow field around the wings of a tethered dragonfly. We have measured the flow field with PIV; expanded with high speed video recording and a novel smoke visualization experiment. All three experiments were executed in still air, so the recorded flow field and vortex shedding wasn't affected by a free stream velocity like in case of wind tunnel studies (Thomas et al., 2004; Tsuyuki et al., 2006). It is in our interest to see whether downwash and vortex shedding is a prominent feature of wing wake interaction of a living dragonfly under near hovering conditions. According to the generated flow stream, we identified three flight modes: vertical take off, emerging flight and forward flight. The dragonfly executed these flight modes with two different flapping modes; in phase flapping and out of phase flapping. The occurrences

of flapping modes for the distinguished flight modes shows that out of phase flapping can be generally used by the dragonfly for takeoff, cruising or emerging flight. The number of occurrences shows that it is not preferred mode for vertical takeoff. In phase flapping wasn't found for forward flight mode. In case of in phase flapping, the wings seemingly functions as one large wing, with no prominent interaction. In case of out of phase flapping hind wing TEV and forewing LEV formation were observed on most of the recorded cases. The position of the shed TEV was above the top side of the hind wing, and in every recorded case only one could be identified. Forewing TEV could not be identified clearly on any of the recorded cases, neither do forewing shed LEV appeared near to the hind wing. It seems that forewing wake and hind wing interaction for these conditions is limited to the downwash effect. The dragonfly is capable of generating two separate flow stream, in an out of phase flapping mode (Fig. 1). This supposedly adds extra stability for the dragonfly when it changes from taking off to forward flight] Address: Hefler, C., Dept Mechanical & Aerospace Engineering, Hong Kong Univ. of Science & Tech., Hong Kong SAR, China. E-mail: meqiu@ust.hk

20582. Horváth, G.; Kriska, G.; Robertson, B. (2014): Polarized light and polarization vision in animal sciences. *Springer Series in Vision Research* Volume 2: 443-513. (in English) ["In the last decade it has been recognized that the artificial polarization of light can have uniquely disruptive effects on animals capable of seeing it and has led to the identification of polarized light pollution (PLP) as a new kind of ecological photopollution. In this chapter we review some typical examples for PLP and the resulting polarized ecological traps. All such polarized-light-polluting artificial surfaces are characterized by strongly and horizontally polarized reflected light attracting positively polarotactic aquatic insects, the larvae of which develop in water or mud, such as aquatic beetles (Coleoptera), water bugs (Heteroptera), dragonflies, mayflies (Ephemeroptera), caddisflies (Trichoptera), stoneflies (Plecoptera) and tabanid flies (Tabanidae), for example. We survey here the PLP of asphalt surfaces, solar panels, agricultural black plastic sheets, glass surfaces, black gravestones and the paintwork of black-, red- and dark-coloured cars. We show how the maladaptive attractiveness (PLP) of certain artificial surfaces to polarotactic insects can be reduced or eliminated. We consider how birds, spiders and bats exploit polarotactic insects trapped by different sources of PLP. We deal with the phenomenon that the vertically polarized mirror image of bridges seen at the river surface can deceive swarming polarotactic mayflies, which is an atypical kind of PLP. We explain why strongly polarizing black burnt-up stubble fields do not attract aquatic insects, which is an example for a horizontal, black polarizing surface that does not induce PLP and thus is an exception proving the rule. Finally, we show that phototaxis and polarotaxis together have a more harmful effect on the dispersal flight of night-active aquatic insects than they would have separately. This provides experimental evidence for the synergistic interaction of phototaxis and polarotaxis in these insects." (Authors)] Address: Horváth, G., Environmental Optics Laboratory, Dept. Biological Physics, Eötvös Univ., Pázmány sétány 1, 1117, Budapest, Hungary. E-mail: gh@arago.elte.hu

20583. Kalniņš, M. (2014): *Resnvedera purvuspares* Leucorrhinia caudalis (Charpentier, 1840) sugas aizsardzības plans. Approved by the Minister for the Environment and Regional Development of the Minister of the Environment and Regional Development of 16 January 2015, Order No

15. Biedriba "Zala upe", Sigulda: 71 pp. (in Latvian, with English summary) ["*Leucorrhinia caudalis* is one of the species of dragonflies occurring in Latvia, which is considered to be endangered and is included in the regulatory enactments of different levels of conservation of the species. In accordance with the report of Article 17 [Article 17 – A report to the European Commission on the status of conservation measures of habitats and species in Latvia (assessment of the period 2007-2012).] the conservation status assessment of *L. caudalis* is adverse; and a negative trend of the conservation status has been found. The assessment of a number of parameters included in the report is based on the grounds of an opinion of an expert or there is no data at all (e.g. as to the hydro-chemical parameters of the micro-habitats and habitats of the species). The natural data management system "OZOLS" of Nature Conservation Agency contains only a few, including inaccurate entries on the fields of the species; therefore it is not possible to plan and carry out appropriate conservation of the fields of the species. When planning the measures of freshwater habitat management, the coastal habitat needs are not assessed in connection of the conservation of *L. caudalis* (and other specially protected species of dragonflies). *L. caudalis* most commonly is found in eutrophic lakes, less often in diseutrophic lakes and old riverbeds in Latvia. The vegetation in the fields of *L. caudalis* in eutrophic lakes and old riverbeds are usually visually moderately abundant to abundant, diverse and rich in species. Typically all zones of aquatic plants – the surface, floating-leaf and submerged – are well-developed. Currently *L. caudalis* is found throughout the territory of Latvia. Comparing the historical and contemporary data of the distribution of the species it can be concluded that the number of observations of the species has decreased, which could indicate the decrease of the population of the species in Latvia. The uneven distribution of the species is more referable to the uneven level of research than to the actual distribution of the species. The influencing factors of the population of *L. caudalis* are the following: their natural enemies and non-native species, collecting, extreme weather conditions, toxic substances in the environment and the minimum size of the population. However, all these factors hold an unknown or low to medium risk. The non-native species and the minimum size of the populations can be a high risk factor too. The loss of a habitat of the species is a medium risk factor, because it has been established only in some specific places. The fragmentation of habitats (isolation of fields), habitat management (cleaning of water bodies) and mismanagement of habitats of coastal zone (overgrowing) are assessed similarly. However, the combination of these factors can have a major impact on the status of the species' population in Latvia. The protection plan of the species contains a description of the conservation measures of *L. caudalis* in the following areas: legislation and conservation planning, conservation of the species and habitats of it, research and monitoring, as well as information and education. A part of the described measures are attributable to the protection of invertebrates or even species and habitats as a whole." (Author)] Address: Kalniņš, M., Nature Protection Board, Eksporta iela 5, Rīga, LV-1010, Latvia. E-mail: martins.kalnins@dap.gov.lv

2015

20584. Sivasankaran, P.N. (2015): Development of an optimal dragonfly-like flapping wing structure for use in biomimetic micro air vehicles. PhD thesis, Faculty of Engineering, Univ. of Malaya: XX, 118 pp. (in English, with Malaysian summary) ["Biomimetic Micro Air Vehicles (BMAV) are unmanned,

micro-scaled aircrafts that are bioinspired from flying organisms to achieve lift and thrust by flapping their wings. Micro Air Vehicles (MAV) are a relatively new and rapidly growing area of aerospace research. They were first defined by the US Defense Advanced Research Projects Agency (DARPA) in 1997 as unmanned aircraft that are less than 15 cm in any dimension. This allows BMAV to potentially be smaller and more lightweight than the other two types. These characteristics make BMAV ideally suited for flight missions in confined areas (e.g. around power lines, narrow streets, indoors, etc.). Therefore, BMAV structural components must be ultra-lightweight, compact, and flexible. Most past MAV research has focused on fixed wings, which are essentially scaled-down versions of wings on conventional fixed wing aircraft. These wings are unsuitable for BMAV due to their lack of flexibility. So a new type of structural wing design is required for BMAV. In this work, a dragonfly wing structure is mimicked to construct a new BMAV wing design. A dragonfly (Odonata) was selected for biomimicry, because they are highly maneuverable flyers, capable of hovering, rapid forward flight, or reverse flight. Therefore, structurally analyzing these wings could yield results that inspire the design of more effective wings for BMAVs. The overall objective of this research is to develop a simplified wing model for a BMAV, bioinspired from actual dragonfly wings. A simplified model was created using spatial network analysis, a topological optimization method. These simplified wing frame models were then fabricated using seven different types of materials. Stainless steel type 321, balsa wood, red pre-impregnated fiberglass, black graphite carbon fiber, polyvinyl acid, acrylic and acrylo-nitrile butadiene styrene. These wing frame structures were fabricated using laser cutting machine and a 3D printer. These wing frames were then immersed in a chitin-chitosan membrane by a casting method. These wing frames were subjected to mechanical testing's such as bending and tensile to study its suitability for use in a BMAV. A flapping mechanism was also created and used to produce flapping motion on these BMAV wings and an actual dragonfly wing (for comparison). The aero elastic properties of both the BMAV and actual dragonfly wings were examined using two high speed frame camera. The bending angle, displaced distance or deflection, wing tip angle, and the wing tip rotational twist speed were analyzed at the flapping frequencies of 10, 20, 30 Hz, 60 Hz and 120 Hz." (Author)] Address: not stated

2016

20585. Arrowsmith, J. (2016): Acidity gradients shape the phylogenetic structure of odonate communities across three biomes. M.Sc. thesis, Faculty of Arts and Science, Biology, Concordia Univ.: 58 pp. (in English) ["Environmental filtering and competitive exclusion can act simultaneously to shape the structure of communities, but disentangling them has proved difficult. Specifically, environmental filtering may restrict establishment at a site to a set of species sharing particular traits permitting local persistence. Mutual exclusion of ecologically similar or phylogenetically related species can also dictate community composition. Patterns of phylogenetic structure allow assessment of the relative influence of these processes. Using phylogenetic patterns of community structure, this study aims to assess the predominant processes structuring odonate communities along a broad-scale environmental gradient in Quebec. Phylogenetic analyses of forty lentic (i.e. lake) odonate communities revealed that co-occurring species in temperate regions were more related than expected by chance, suggesting a predominant role of environmental filtering. Site-to-site variation

in phylogenetic structure was related to pH. That is, the most alkaline lakes, found in temperate regions, were the most phylogenetically clustered, suggesting that pH acts as a main environmental filter of odonate communities. However, environmental filtering may not be the only important process. One alternative explanation is that temperate communities are phylogenetically clustered because damselflies are disproportionately diverse relative to dragonflies in this region. Specifically, the recent radiation of damselflies in temperate regions could have increased the diversity of this group in the temperate species pool, which could then shape local communities in that region. Nevertheless, further analyses suggested that environmental filtering along a pH gradient, rather than the evolutionary history of the species pool, shapes odonate communities in Quebec." (Author)] Address: Arrowsmith, Julie

20586. Arslan, N.; Salur, A.; Kalyoncu, H.; Mercan, D.; Barisik, B.; Odabasi, D.A. (2016): The use of BMWP and ASPT indices for evaluation of water quality according to macroinvertebrates in Küçük Menderes River (Turkey). *Biologia* 71(1): 49-57. (in English) ["This study was carried out in the Küçük Menderes River basin in order to determine the water quality and investigate the environmental quality and the applicability of both the Biological Monitoring Working Party (BMWP) and Average Score Per Taxon (ASPT). Monitoring took place in May, July and September 2014 at 10 stations (7 rivers and 3 lakes) according to the method of Intercalibration Common Metrics. Some metrics (BMWP, ASPT, Family Biotic Index, Simpson Diversity Index, Shannon-Wiener Diversity Index, Margalef Diversity Index, dominance, frequency and existence of sensitive species) were calculated. In total, 69 taxa comprising 5,814 individuals were detected. The taxa having the highest frequency rate were *Limnodrilus hoffmeisteri* (70%), *Chironomus (Camptochironomus) tentans* (70%), *Psammoryctides albicola* (60%), *Physella acuta* (60%), *Nais elinguis* (60%) and *Stylaria lacustris* (50%), which are alpha mesosaprobic and polysaprobic species, respectively. The presence and high dominance and frequency rate of these species have indicated basin pollution. Positive indicator species for water quality are *Gomphus schneideri*, *Trithemis annulata*, *Lindenia tetraphylla*, *Orthetrum cancellatum*, *Hydropsyche angustipennis*, *Cricotopus (Cricotopus) fuscus* and *Cricotopus (Cricotopus) annulator*, while negative indicator species are *Culex pipiens*, *Chironomus (Camptoch.) tentans*, *Chironomus thummi*, *Stylaria lacustris* and *Eristalis tenax*. Habitat quality of the Küçük Menderes River basin was not high (it was found to be heavily polluted/polluted/slightly polluted according to the physicochemical data, BMWP and ASPT) due to physical habitat degradation, urban waste waters, touristic, seasonal dwelling and agricultural activities." (Authors) file:///C:/Users/Martin%20Schorr/Downloads/Biologia.pdf] Address: Arslan, Naima, Dept of Biology, Faculty of Arts and Sciences, Eskişehir Osmangazi Univ., Eskişehir, Turkey. E-mail: oligo2009@gmail.com

20587. Balèiauskas, L.; Baranauskas, K.; Ferenc, R.; Gudžinskas, Z.; Gurskas, A.; Ivinskis, P.; Kesminas, V.; Ložys, L.; Rimšaitė, J.; Sinkeviėienė, Z.; Staponkus, R.; Steponas, A.; Trakimas, G.; Virbickas, T. (2016): [Methodologies for monitoring species of European Community interest. Mammals, fish, amphibians, reptiles, molluscs, insects and plants.] ISBN 978-9986-443-85-8. Published by Nature Research Centre, State Service for Protected Territories under the Environment: 404 pp. (in Lithuanian) [Two odonate species are treated: 5.7. Šarvuotoji skete (*Leucorrhinia pectoralis*) (P. Ivinskis, J. Rimšaitė), pages 263-274 and 5.8.

Pleištine skete (*Ophiogomphus cecilia*) (P. Ivinskis, J. Rimšaitė) pages 275-283] Address: https://www.researchgate.net/publication/301361893_Europos_Bendrijos_svarbos_rusiu_monitoringo_metodik_os_Zinduoliai_zuvys_varliagyviai_ropliai_moliuskai_vabzdziai_ir_augalai

20588. Calvao, L.B.; Nogueira, D.S.; Montag, L.F.; Lopes, M.A.; Juen, L. (2016): Are Odonata communities impacted by conventional or reduced impact logging? *Forest Ecology and Management* 382: 143-150. (in English) ["Timber harvest is a prevailing economic activity in Amazonia, which contributes to forest degradation and biodiversity loss. However, Reduced-impact logging has been used to mitigate the loss of environmental integrity and biodiversity, since it has been assumed to be less detrimental than conventional logging practices. The objective of this study was to evaluate if environmental conditions, streams and Odonata communities in reduced-impact logging areas (RIL) are similar to those of unlogged areas (CONTROL), whilst all are modified in conventional logging areas (CL), as a consequence of vegetation removal from the margins of water bodies. Forty-nine streams in areas that differ in timber harvest practices were sampled in eastern Amazonia. As expected, aquatic systems in RIL areas showed environmental conditions and Odonata species composition similar to CONTROL areas while CL streams differed both from CONTROL and RIL. Odonata richness and abundance were not different between CONTROL, RIL and CL treatments, however. Despite the fact that species richness and abundance changes may be masked by the presence of remaining riparian vegetation in CL areas, the use of reduced-impact logging minimizes changes in Odonata species composition and environmental conditions, that remain similar to that of unlogged areas. This is possible due to the planning to reduce environmental impacts in RIL. Unlike RIL, most canopy cover in the proximity of the water bodies (<10 m distance) is lost in CL areas due to logging activities." (Authors)] Address: Calvao, L.B., Programa de Pós-Graduação em Zoologia, Museu Paraense Emílio Goeldi/Universidade Federal do Pará, Instituto de Ciências Biológicas, Laboratório de Ecologia e Conservação-LABECO, Rua Augusto Correa, N 1 Bairro Guama, CEP 66.075-110, Belém, Pará, Brazil. E-mail: lenizecalvao@gmail.com

20589. Garrouste, R.; Wedmann, S.; Pouillon, J.-M.; Nel, A. (2016): The oldest 'amphipterygid' damselfly of tropical affinities in the Paleocene of Menat (Zygoptera: Eucaloptera). *Historical Biology* 29(6): 818-821. (in English) ["The new damselfly genus and species *Valerea multicellulata* is described from the Paleocene of Menat (France), a Lagerstätte with many fossil insects, plants and vertebrates with high paleontological value. Aquatic insects are very scarce in this outcrop, this damselfly being the fourth described Odonata. Its closest modern relatives belong to the Amphipterygidae or the Devadattidae, families with very narrow tropical extant distributions. This new fossil allows us to confirm the tropical affinities of the odonatan fauna of the Menat paleolake communities. It also shows that the amphipterygids were clearly more widespread during the Paleogene than today, probably in relation to the worldwide warm and equable climate in the Paleocene." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@cimrns1.mnhn.fr

20590. Ghani, W.M. H. W. A.; Rawi, C.S.M.; Hamid, S.A.; Al-Shami, S.A. (2016): Efficiency of different sampling tools for aquatic macroinvertebrate collections in Malaysian streams. *Tropical Life Sciences Research* 27(1): 115-133.

(in English, with Malaysian summary) ["This study analyses the sampling performance of three benthic sampling tools commonly used to collect freshwater macroinvertebrates. Efficiency of qualitative D-frame and square aquatic nets were compared to a quantitative Surber sampler in tropical Malaysian streams. The abundance and diversity of macroinvertebrates collected using each tool evaluated along with their relative variations (RVs). Each tool was used to sample macroinvertebrates from three streams draining different areas: a vegetable farm, a tea plantation and a forest reserve. High macroinvertebrate diversities were recorded using the square net and Surber sampler at the forested stream site; however, very low species abundance was recorded by the Surber sampler. Relatively large variations in the Surber sampler collections (RVs of 36% and 28%) were observed for the vegetable farm and tea plantation streams, respectively. Of the three sampling methods, the square net was the most efficient, collecting a greater diversity of macroinvertebrate taxa and a greater number of specimens (i.e., abundance) overall, particularly from the vegetable farm and the tea plantation streams (RV<25%). Fewer square net sample passes (<8 samples) were sufficient to perform a biological assessment of water quality, but each sample required a slightly longer processing time (± 20 min) compared with those gathered via the other samplers. In conclusion, all three apparatuses were suitable for macroinvertebrate collection in Malaysian streams and gathered assemblages that resulted in the determination of similar biological water quality classes using the Family Biotic Index (FBI) and the Biological Monitoring Working Party (BMWP). However, despite a slightly longer processing time, the square net was more efficient (lowest RV) at collecting samples and more suitable for the collection of macroinvertebrates from deep, fast flowing, wadeable streams with coarse substrates." (Authors) Tholymis sp.] Address: Wan Mohd Hafezul Wan Abdul Ghani, School of Biological Sciences, Univ. Sains Malaysia, 11800 USM, Pulau Pinang, Malaysia

20591. Gros, P. (2016): *Coenagrion scitulum* (Rambur, 1842), eine für die Fauna Salzburgs neue Libellenart (Odonata: Coenagrionidae). Mitt. Haus der Natur 23: 32-34. (in German, with English summary) [Austria; *C. scitulum* is newly reported for the odonate fauna of the province of Salzburg, Austria. Details of this discovery are given]. 4-VI-2015, Adneter Moor, Guttrathberg (Gemeindegebiet Hallein), 575 m. a.s.l., 47,720°N / 13,050° E and 24-VI-2015, Adneter Moor (Gemeindegebiet Adnet), 475 m. a.s.l., 47,690°N / 13,133° E.] Address: Gros, P., Haus der Natur / Biodiversitätszentrum, Museumsplatz 5, 5020 Salzburg, Austria. EMail: patrick.gros@hausdernatur.at

20592. Grup d'Estudis dels Odonats de Catalunya (2016): *Les Libèl·lules de Catalunya*. Brau Edicions S L: 208 pp- ["The result of ten years field work - a compilation of current information on the dragonflies and damselflies of Catalonia. Introduction to the biology of the group, followed by 70 species accounts, each including a distribution map for Catalonia, detailed morphological description to aid identification, information on habitat, ecology, behaviour and conservation status. A chart for habitat type and phenology is also included for each species." (Publisher) "OXYGASTRA, Grup d'Estudi dels Odonats de Catalunya was born in 2003 and joined the Catalan Institute of Natural History, as a working group, in January 2005. From the moment of its constitution, the group propose two priority lines of work: to expand the knowledge of the odonatofauna of Catalonia and to bring the world of dragonflies closer to all those interested in the knowledge and observation of nature. With these objectives

in mind, the Oxygastra group set out to create the first monograph on odonates in Catalonia. Fieldwork began in 2003 and ended in 2012. To carry out this work, 348 grids of 10x10Km in the Catalan territory have been surveyed and almost 30,500 records of observations have been obtained. This, added to the bibliographic records, has made it possible to obtain more than 34,400 useful records. The book is structured in four sections. The first sets out the historical antecedents in the study of odonates in Catalonia, contains an introduction to the biology of the group and details the methodology used in the preparation of this work. The second part contains the files of the seventy cataloged species, which include distribution maps, morphological details to facilitate their identification and graphics illustrating the habitats, ecology and phenology of each species. The third part presents the distribution patterns of odontoids in Catalonia, the main areas of odontological interest and the state of conservation of the species. The last section contains a glossary with the terminology used in the book, a basic bibliography and a systematic list of taxa. It should be noted that this work has been possible thanks to the selfless work of the members of the Oxygastra group, who for more than ten years have spared no effort to finally see the publication *Les libèl·lules de Catalunya* see the light of day. We must also thank the support received throughout this long process by the Institut d'Estudis Catalans and by the Dept of Territory and Sustainability, the Mascort Foundation and other private sponsors when it comes to publishing the results of the work done. The book *les libèl·lules de Catalunya* has been published by Brau edicions." (<http://www.oxygastra.org/2017/03/les-libellules-de-catalunya.html>)

20593. Harabis, F. (2016): The value of terrestrial ecotones as refuges for winter damselflies (Odonata: Lestidae). *Journal of Insect Conservation* 20: 971-977. (in English) ["Habitat requirements of many species may vary significantly throughout the lifecycle. Species are often forced to exchange their habitats to meet requirements of different life stages. Due to the effect of human activities, however, there is a loss of habitat complexity and a consequent disappearance of species associated with multiple habitat types. This also applies to freshwater invertebrates occurring in temporary habitats. However, it appears that many species are able to meet their habitat requirements even in a human-altered landscape. The aim of this study was to analyze the habitat preferences of the damselfly *Sympecma fusca* in an area significantly influenced by human interventions. According to the results of a capture-mark-recapture study and generalized additive models, I found that, during a pre-reproductive period (in the autumn), imagoes utilize predominantly insolated ecotones, which constitute only a small fraction of the available terrestrial habitat. During the reproductive period (in spring), however, imagoes completely change their priorities in favour of reproductive success. At this time, males use ecotones only in adverse weather conditions. Ecotones allow the species to survive a long pre-reproductive period. However, suitable habitat conditions may be lost because of inappropriate interventions (e.g., mowing). These small-scale interventions often resemble natural disturbances and may not necessarily lead to the extinction of an entire population. Imagoes are able to move on to different habitat patches, but only if they have alternative habitats. This outcome indicates that maintaining a high heterogeneity of keystone structures is crucial for maintaining high levels of biodiversity." (Author)] Address: Harabiš, F., Dept of Ecology, Faculty of Environmental Sciences, Czech Univ. of Life Sciences Prague, 165 21 Prague 6, Czech Republic. E-mail: harabis.f@gmail.com

20594. Hefler, C.; Qiu, H.; Shyy, W. (2016): Dragonflies utilize flapping wings phasing and spanwise characteristics to achieve aerodynamic performance. arXiv:1612.05353v1 [physics.flu-dyn: 15 pp. (in English)] ["While dragonflies are highly agile flyers, some key aerodynamic mechanisms responsible for their flight performance remain inadequately understood. Based on forward flight conditions, we investigate dragonflies spanwise aerodynamic behaviors associated with flapping wings phasing relationship. Overall, the leading edge vortex (LEV) on the forewing forms without the influence of the hindwing. For hindwing, the wing root region prominently displays a trailing edge vortex (TEV). In the inner span region, the vortical flow structures around the hindwing is influenced by the forewings LEV when both wings are in close proximity and move in opposite directions. In the mid-span region, downwash following the forewing suppresses LEV formation on the hindwing. Finally the outer span region of the hindwing develops its LEV by wake capture at the end of a stroke cycle. In the inner region, the timing of shedding on both fore- and hind-wings is synchronized, which is not the case elsewhere. These varied flow structures suggest that the fore- and hind-wings, along their spanwise directions, play different roles in force generation." (Authors)] Address: Hefler, Csaba., Dept of Mechanical & Aerospace Engineering, Hong Kong Univ. of Science & Tech., Hong Kong SAR, China. E-mail: meqiu@ust.hk

20595. Herlambang, A.E.N.; Hadi, M.; Tarwotjo, U. (2016): Struktur Komunitas Capung di Kawasan Wisata Curug Lawe Benowo Ungaran Barat. Bioma 18(1): 70-78. (in Indonesian, with English summary) ["Dragonflies have an important role for the stability of the ecosystem that is as predator and prey at the same time. The availability of food resources and optimal environmental conditions affect the species richness of dragonflies in the habitats. Research on dragonfly community structure aims to find out the differences of community structure in each habitat type in the region of Curug Lawe Benowo. The research was conducted in 4 different stations which focus on species of dragonfly, amount of an individual species, habitats, environmental conditions, and the correlation between the variables. The method used is point count. The results showed that there are 19 dragonfly species which came from 7 different families. The total number of individuals encountered from 4 stations is 205. The common species that can be found in all of the stations is *Euphaea variegata*. The level of diversity are medium, the level of evenness is fairly even. Similarity of species in any habitat types indicate that the habitats has a three kind of similarity levels that is fairly equal, less equal and not equal. Data analysis shows that there is a correlations between environmental conditions, and dragonfly species, affecting abundance and distributions of a dragonfly in the habitats, and can be used to describe dragonflies community structure in the region." (Authors)] Address: Herlambang, A., Laboratorium Ekologi dan Biosistemik, Fakultas Sains dan Matematika, Universitas Diponegoro, Semarang, Jl Prof. Soedarto, SH, Semarang, 50275, Indonesia. Email: elangalamsyah@gmail.com

20596. Khelifa, R.; Zebba, R.; Amari, H.; Mellal, M.K.; Mahdjoub, H.; Kahalerras, A. (2016): A hotspot for threatened Mediterranean odonates in the Seybouse River (Northeast Algeria): are IUCN population sizes drastically underestimated? International Journal of Odonatology 19(1-2): 1-11. (in English) ["Several odonate species are threatened in the Mediterranean basin and some of them show alarming decreasing trends. The distribution and population estimations provided by the IUCN are based on occasional field sampling

or non-rigorous methodologies and could be erroneous and misleading. To obtain reliable estimations of the population size and distribution of three threatened species, *Calopteryx exul*, *Coenagrion mercuriale*, and *Gomphus lucasii*, we first conducted capture-mark-recapture in a natural population during one flight season, and second we carried out intensive sampling of adults, larvae and exuviae in the Seybouse watershed, Northeast Algeria. In addition, a revision of odonate occurrence and distribution in the watershed was done by pooling information collected over six years (2010–2015). Our results show that population estimations of the three species are much higher than what the IUCN presents; that is, 2208 individuals of *C. exul* (22.08% of the estimated global population), 1765 individuals of *C. mercuriale*, and 11,204 individuals of *Gomphus lucasii* (about 4.5 times as large as the estimated global population). Moreover, a total of 42 species were recorded in the study site, of which seven are new. The mean number of localities per species increased by a factor of 2.47, e.g. from six to 12 in *C. exul*, two to 12 in *Coenagrion mercuriale* and five to 14 in *Gomphus lucasii*. Our results suggest that the Seybouse watershed is one of the most important areas in North Africa and the Mediterranean basin for these three threatened species and requires particular attention and an urgent conservation plan to reduce anthropogenic effects and maintain populations." (Authors)] Address: Khelifa, R., Biodivers. Res. Center, Univ. British Columbia, 2212 Main Mall, Vancouver, B.C. V6T1Z4, Canada. Email: rassimkhelifa@gmail.com

20597. Nava-Bolaños, A.; Sánchez-Guillén, R.A.; Munguía-Steyer, R.; Córdoba-Aguilar, A. (2016): Isolation barriers and genetic divergence in non-territorial *Argia* damselflies. Biological Journal of the Linnean Society 120(4): 804-817. (in English) ["Isolation barriers work at different instances during the mating process in odonate insects. In territorial damselflies, heterospecific interactions are mainly precluded by sexual (visual) isolation, while in non-territorial damselflies, heterospecific interactions are mostly precluded by mechanical isolation and sexual (tactile) isolation. In this study we investigated the strength of three premating barriers (visual, mechanical and tactile), genetic divergence and degree of sympatry (on their entire distribution) between four non-territorial *Argia* damselflies (*A. anceps*, *A. extranea*, *A. oenea* and *A. tezpi*). Our results are explained in the light of learned mating preferences and Kaneshiro's hypothesis. We detected a strong reproductive isolation between all pairs of species by the joint action of the three studied barriers [visual (90.6%), mechanical (8.7%) and tactile (0.7%)]. Sexual (visual) isolation was the most important barrier, perhaps driven by learning mating preferences. One of the studied species, *A. extranea*, which is the most derived of the studied species, showed a highly asymmetric isolation in reciprocal crosses, which is consistent with Kaneshiro's hypothesis. Moreover, we detected a negligible ecological niche differentiation between the studied species (70% of shared distribution). Our results suggest that sexual (visual) selection may be an important force driving speciation in non-territorial species." (Authors)] Address: Nava-Bolaños, Angela, Departamento de Ecología Evolutiva, Instituto de Ecología, Universidad Nacional Autónoma de México, Apdo. Postal 70-275, Ciudad Universitaria, 04510, México, D.F., México

20598. Outomuro, D.; Söderquist, L.; Nilsson-Örtman, V.; Cortázar-Chinarro, M.; Lundgren, C.; Johansson, F. (2016): Antagonistic natural and sexual selection on wing shape in a scrambling damselfly. Evolution 70(7): 1582-1595. (in English) ["Wings are a key trait underlying the evolutionary

success of birds, bats and insects. For over a century, researchers have studied the form and function of wings to understand the determinants of flight performance. However, to understand the evolution of flight, we must comprehend not only how morphology affects performance, but how morphology and performance affects fitness. Natural and sexual selection can either reinforce or oppose each other, but their role in flight evolution remains poorly understood. Here we show that wing shape is under antagonistic selection with regard to sexual and natural selection in a scrambling damselfly. In a field setting, natural selection (survival) favored individuals with long and slender forewings and short and broad hindwings. In contrast, sexual selection (mating success) favored individuals with short and broad forewings and narrow-based hindwings. Both types of selection favored individuals of intermediate size. These results suggest that individuals face a trade-off between flight energetics and maneuverability and demonstrate how natural and sexual selection can operate in similar directions for some wing traits, i.e. wing size, but antagonistically for others, i.e. wing shape. Furthermore, they highlight the need to study flight evolution within the context of species' mating systems and mating behaviors." (Authors)] Address: Johansson, F., Dept of Ecology & Environmental Science, Animal Ecology Group, Umea Univ., 90187 Umea, Sweden. E-mail: frank.johansson@eg.umu.se

20599. Romero, G.Q.; Piccoli, G.C.O.; de Omena, P.M.; Gonçalves-Souza, T. (2016): Food web structure shaped by habitat size and climate across a latitudinal gradient. *Ecology* 97(10): 2705-2715. (in English) ["Habitat size and climate are known to affect the trophic structure and dynamics of communities, but their interactive effects are poorly understood. Organisms from different trophic levels vary in terms of metabolic requirements and heat dissipation. Indeed, larger species, such as keystone predators, require more stable climatic conditions than their prey. Likewise, habitat size disproportionately affects large-sized predators, which require larger home ranges, thus being restricted to larger habitats. Therefore, food web structure in patchy ecosystems is expected to be shaped by habitat size and climate variations. Here we investigate this prediction using natural aquatic microcosm (bromeliad phytotelmata) food webs comprised of litter resources (mainly detritus), detritivores, mesopredators, and top predators (damselflies). We surveyed 240 bromeliads of varying sizes (water retention capacity) across 12 open restingas in SE Brazil spread across a wide range of tropical latitudes (-12.6° to -27.6°, ca. 2.000 km) and climates (Δ mean annual temperature = 5.3°C). We found a strong increase in predator-to-detritivore mass ratio with habitat size, representative of a typical inverted trophic pyramid in larger ecosystems. However, this relationship was contingent among the restingas; slopes of linear models were steeper in more stable and favorable climates, leading to inverted trophic pyramids (and top-down control) being more pronounced in environments with more favorable climatic conditions. By contrast, detritivore-resource and mesopredator-detritivore mass ratios were not affected by habitat size or climate variations across latitudes. Our results highlight that the combined effects of habitat size, climate and predator composition are pivotal to understanding the impacts of multiple environmental factors on food web structure and dynamics." (Authors)] Address: Romero, G.Q., Laboratory of Multitrophic Interactions and Biodiversity (LIMBIO), Dept of Animal Biology, Institute of Biology, Univ. of Campinas (UNICAMP), CP 6109, Campinas, SP 13083-970 Brazil. E-mail: gqromero@unicamp.br

20600. Roulin, A. (2016): Strong decline in the consumption of invertebrates by Barn Owls from 1860 to 2012 in Europe. *Bird Study* 63: 146-147. (in English) ["Capsule The analysis of 616 papers about the diet of the European Barn Owl *Tyto alba* showed that 9678 invertebrates were captured out of 3.13 million prey items (0.31%). The consumption of invertebrates strongly decreased between 1860 and 2012. This further demonstrates that the Barn Owl diet changed to a large extent during the last 150 years. ... Other families were less often consumed with 101 Dermaptera, 43 Mantodea, 43 Hemiptera, 32 Hymenoptera, 25 Diptera, 22 Lepidoptera, 8 Neuroptera, 4 Odonata and 4 Blattodea. The most frequently captured genera are *Gryllotalpa* (967 individuals), 829 *Gryllus*, 488 *Copris*, 380 *Melolontha* and 162 *Geotrupes*. Of note is the absence of any cicadas (Cicadidae) suggesting that Barn Owls capture most often insects that sing loudly at night and species that are abundant and easily detectable (Table S2)." (Author)] Address: Roulin, A., Dept of Ecology & Evolution, Univ. of Lausanne, Biopôle, Lausanne 1015, Switzerland

20601. Stigge, H.A.; Bolek, M.G. (2016): Evaluating the biological and ecological factors influencing transmission of larval digenetic trematodes: A test of second intermediate host specificity of two North American *Haliipegus* species. *Journal of Parasitology* 102(6): 613-621. (in English) ["Host specificity of parasites is a basic principle in parasitology; however, it is not easily measured. Previously, host specificity was calculated as the number of species that a parasite infected, but this is not an accurate description of host usage because some species are capable of being infected but do not contribute to the completion of the life cycle. Instead, measures of host specificity should take into consideration interactions between a parasite and a potential host species as well as interactions between current and subsequent hosts in the life cycle. The objectives of this study were to track the development of 2 trematode species, *Haliipegus eccentricus* and *Haliipegus occidualis*, in 3 phylogenetically and ecologically distinct microcrustacean second intermediate hosts, and then, evaluate the extent to which each of these hosts contributed to transmission of each *Haliipegus* species to the next odonate host in the life cycle. All 3 microcrustacean species exposed became infected with both species of *Haliipegus*. The patterns of growth of *H. eccentricus* and *H. occidualis* were similar, but there were consistent differences in the rates of growth among the microcrustacean species in both *Haliipegus* species. Regardless of host species infected, all individuals of both species were considered to be developmentally infective to the next host in the life cycle by 19 days post exposure (DPE) when they lost their excretory bladder. Worms of varying sizes were capable of surviving without this structure suggesting that there is not a strong relationship between the rate of growth of the metacercariae and the development of their osmoregulatory system. Although *Haliipegus* species were capable of living without an excretory bladder at 19 DPE, there were differences in their size and rates in which the 3 microcrustaceans contributed to transmission of the parasites to subsequent odonate hosts. Collectively, under controlled laboratory conditions, there was an approximately 2-fold difference in the average percent of worms that established in odonates from the ostracod, *Cypridopsis* sp., than from the harpacticoid copepod, *Phyllognathopus* sp., and the difference was nearly 3-fold between *Cypridopsis* sp. and the cyclopoid copepod, *Thermocyclops* sp. Therefore, Powered by Editorial Manager® and ProduXion Manager® from Aries Systems Corporation despite all 3 microcrustacean species becoming infected, not all species were equally suited for

transmission and completion of the life cycle. Differences among the 3 microcrustacean species in cercaria ingestion, metacercarial growth and development, and odonate predation rates on infected microcrustacean species were important factors in determining transmission of the 2 *Halipegus* species to odonate hosts.] Address: Stigge, Heather, Dept of Integrative Biology, Oklahoma State Univ., Stillwater, Oklahoma 74078, USA

20602. Viyapuri, R. (2016): Development of chitosan based nanocomposite film for the wing membrane of biomimetic micro air vehicles (BMAV). PhD thesis, Faculty of Engineering, Univ. of Malaya: XXII, 135 pp. (in English) ["Biomimetic Micro Air Vehicles (BMAV) are unmanned, micro-scaled aircraft that are bioinspired from flying organisms to achieve lift and thrust by flapping their wings. There are still many technological challenges involved with the designing BMAV. One of these is designing ultra-lightweight materials and structures for the wings that have the mechanical strength to withstand continuous flapping at high frequencies (e.g. 30 Hz for a dragonfly). Insects achieve this by using chitin-based, wing frame structures that encompass a thin, film membrane. The overall objective of this research is to develop an innovative wing membrane for a BMAV, bioinspired from actual dragonfly wings. Chitosan was used as a polymer matrix. Chitin nanowhiskers (CNW) and nanocrystalline cellulose (NCC) were prepared in laboratory and used as reinforcement fillers in the design of two types of nanocomposite membranes. In each type, tannic acid was used as crosslinker for the chitosan matrix. Film samples with different ratios of nanomaterials and crosslinking agent were prepared. The chemical changes, structural properties, and mechanical performance of each sample was measured, analyzed, and compared. Following these initial studies, heat treatment was also investigated to assess its potential for improving the chitosan nanocomposite film. Transmission electron microscopy (TEM) and scanning electron microscope (SEM) confirms the nano-scaled size of nanomaterial produced and reveals the dispersion level of the nanomaterials in the chitosan matrix. Fourier-transform-infrared spectroscopy (FTIR) was used to investigate the molecular interaction of film. X-ray diffraction (XRD) results indicated that the nanocomposite films have a rigid structure. Performance analysis using a universal testing machine (UTM) and nanoindentation machine indicates that, the tensile strength and modulus increase significantly for the crosslinker nanocomposite films. Wettability, moisture content and solubility tests show that the film exhibits elevated water resistant when the additives and heat treatment are introduced. A dragonfly wing frame structure iv was also bio-mimicked and fabricated using a 3D printer. The membrane was applied to these BMAV wing frames by a casting method. A flapping generator was used to produce static, flapping motion on these BMAV wings and an actual dragonfly wing (for comparison). The aeroelastic properties of both the BMAV and actual dragonfly wings were examined using two high speed frame camera. Bending angle, wing tip deflection and wing tip twist angle were analyzed at the flapping frequencies of 30 Hz, 60 Hz and 120 Hz." (Author)] Address: not stated

20603. Wesner, J.S. (2016): Contrasting effects of fish predation on benthic versus emerging prey: a meta-analysis. *Oecologia* 180(4): 1205-1211. (in English) ["Predator-prey interactions are often studied entirely within the ecosystem of the predator. However, many prey transition between ecosystems during development, expanding the effects of predators across ecosystems. Prey are often vulnerable to

predation during this transition, facing a predator gauntlet as they leave their source ecosystem. As a result of predation during this transition, predators may have stronger effects on prey fluxes to the neighboring ecosystem than on prey densities in the predator's own ecosystem. I used meta-analysis of predator (fish) and prey (invertebrate) interactions in freshwater ecosystems to test the hypothesis that fish have stronger effects on prey flux to the terrestrial ecosystem, by reducing insect emergence biomass, than on prey densities in the aquatic ecosystem, by reducing benthic insect/invertebrate biomass. Fish reduced insect emergence by 39 % on average, more than twice as strong as their reductions of benthic prey (16 % reduction; averages are variance-weighted). In fact, fish effects on benthic prey were not significantly different from zero, but were significant for emergence. These results indicate that predator effects can not only cascade from one ecosystem to another but also that effects can be stronger outside than within the ecosystem of the predator. Failure to account for this may underestimate the effects of predators on prey." (Author)] Address: Wesner, J.S., Dept of Biology, Univ. of South Dakota, Vermillion, SD, USA. E-mail: jeff.wesner@usd.edu

20604. Zada, N.; Farid, A.; Zia, A.; Saeed, M.; Khan, S.M.; Khan, A.; Khan, I.A.; Fazlullah; Badshah, T. (2016): Damselflies (Odonata: Zygoptera) fauna of District Buner, Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* 4(1): 491-495. (in English) ["Damselfly fauna of district Buner (Khyber Pakhtunkhwa, Pakistan) was surveyed during 2013 and 2014. A total of 230 adult damselflies were collected from fifteen localities of the district during two successive summer seasons. Twelve species of damselflies under 8 genera of 5 families were found, harbouring in district Buner, including Calopterygidae: *Neurobasis chinensis chinensis*; Chlorocyphidae: *Libellago lineata lineata*, *Rhinocypha quadrimaculata*; Coenagrionidae: *Ceragrion coromandelianum*, *Pseudagrion ceylanicum*, *P. rubriceps*, *Ischnura aurora rubilio*, *I. elegans*, *I. forcipata*, *I. fontainei*; Protoneuridae: *Elatoneura campioni*; and Chlorolestidae: *Megalestes major*." (Authors)] Address: Zada, Naeem, Entomology section, Dept, of Agricultural Sciences, Univ., of Haripur, Haripur, Pakistan

2017

20605. Groupe Odonat'Auvergne (2017): Liste rouge des odonates d'Auvergne. Groupe Odonat'Auvergne / DREAL Auvergne Rhône-Alpes: 23 pp. (in French) [73 taxa were assessed. 11 species are considered as threatened with extinction (CR, EN and VU), i.e. 15% of the Auvergne odonotofauna] Address: https://www.auvergne-rhone-alpes.developpement-durable.gouv.fr/IMG/pdf/lrrodonatesauvergne_goa_2017_vf-2.pdf

20606. Hefler, C.; Noda, R.; Shyy, W.; Qiu, H. (2017): Unsteady vortex interactions for performance enhancement of a free flying dragonfly. ASME 2017 Fluids Engineering Division Summer Meeting Volume 1C, Symposia: Gas-Liquid Two-Phase Flows; Gas and Liquid-Solid Two-Phase Flows; Numerical Methods for Multiphase Flow; Turbulent Flows: Issues and Perspectives; Flow Applications in Aerospace; Fluid Power; Bio-Inspired Fluid Mechanics; Flow Manipulation and Active Control; Fundamental Issues and Perspectives in Fluid Mechanics; Transport Phenomena in Energy Conversion From Clean and Sustainable Resources; Transport Phenomena in Materials Processing and Manufacturing Processes. Waikoloa, Hawaii, USA, July 30–August 3, 2017, Conference Sponsors: Fluids Engineering Division.

ISBN: 978-0-7918-5806-6: 10 pp. (in English) ["Bioinspired designs offer a viable solution to the design challenges of micro air vehicles (MAVs) desired to operate in the same size region under similar conditions as flying vertebrates and insects. Inspired by our previous studies of tethered live dragonflies, here, a quantitative characterization of the unsteady aerodynamic features of a live, freely flying dragonfly under well-established level flight condition will be presented. In particular with regard of the span-wise features of vortex interactions between the fore- and hind-pairs of wings, that highly contributes to the flight agility and efficiency of dragonflies. Flow fields of free flying dragonflies in still air have been measured by time-resolved stereo particle image velocimetry (TRS_PIV). A specifically designed dark flight chamber has been built, where hand hold dragonflies (*Pantala flavescens*) were released and made to fly nearly parallel to the measurement plane toward a guiding light. Realistic kinematics of the dragonfly wings in free flight were measured by filming with 2 synchronized high-speed video cameras. Using the recorded images, several dozens of landmarks on the fore- and hind-wing surfaces and several landmarks on the body were traced with high precision and the three-dimensional coordinates were then reconstructed with a direct linear transformation (DLT) method. Using the reconstructed wing-body model, Navier-Stokes-based computational fluid dynamics (CFD) analyses, with wing shapes prescribed based on the experimental measurement, dynamically moving multi blocked, and an over-set-grid system were conducted. The numerical results are in overall agreement with the PIV data, and the combined numerical and experimental approach offers valuable insight into aerodynamic analyses. The results show that the interaction with the forewing leading edge vortex (LEV) strongly influences the flow structures around the inner spanwise region of the hindwing, while aerodynamic enhancement via vortex capture in the outer span is observed. The interaction depends not solely on wing phasing, geometrical arrangement, but also the flight mission." (Authors)] Address: Hefler, Csaba, Dept of Mechanical and Aerospace Engineering, Hong Kong Univ. of Science and Technology, Hong Kong SAR, China. E-mail: meqiu@ust.hk

20607. McAlpine, D.F.; Makepeace, H.S.; Sabine, D.L.; Brunelle, P.M.; Bell, J.; Taylor, G. (2017): First occurrence of *Enallagma pictum* (Scarlet Bluet) (Odonata: Coenagrionidae) in Canada and additional records of *Celithemis martha* (Martha's Pennant) (Odonata: Libellulidae) in New Brunswick: possible climate-change induced range extensions of Atlantic Coastal Plain Odonata. *J. Acad. Entomol. Soc.* 13: 49-53. (in English) [Expansion in the geographic range of two Canadian Atlantic Coastal Plain Odonata is documented; *E. pictum* and *C. martha*. Comment on the significance of these records in the light of climate warming is provided. https://academic.oup.com/journal/papers/mcalpine_17-5.pdf] Address: McAlpine, D.F., NB Museum, 277 Douglas Avenue, Saint John, NB, Canada, E2K 1E5. E-mail: Donald.McAlpine@nbm-mnb.ca

20608. Njoroge, L.; Underhill, L.G.; Navarro, R.A. (2017): Kenyan dragonflies: Past, present and future. *Biodiversity Observations* 8.29: 1-17. (in English) ["As of May 2017, the database of the OdonataMAP project (including records from Odonata Database of Africa) had a total of 3376 dragonfly records from Kenya. Of these, 129 had been posted by citizen scientists while the remaining 3247 are mainly museum records. These records comprise of a total of 172 dragonfly species. These species belong to four families of what can be referred to as true dragonflies and five families

belonging to damselflies (Table 1). A detailed species list with number of records for each species is given in Appendix 1 to this publication."] Address: Njoroge, L., Section of Invertebrates Zoology, National Museums of Kenya, Nairobi, Kenya. Email: Lnjoroge@museums.or.ke

20609. Sasamoto, A.; Futahashi, R.; Kosterin, O.E.; Malikova, E.I. (2017): Note on *Orthetrum melania* (Anisoptera: Libellulidae) from Kunashir Island with a reference to its subspecific status. *Tombo* 59: 74-76. (in English, with Japanese summary) ["The markings of wing of male in Kunashir population clearly indicate the characters of nominotypical *melania* subspecies, i.e. the range of basal black marking on hindwing comparatively developed, extending to between third and fourth antenodal veins, almost wholly covered the median space, and blue tints on veins narrower (Figs. 2b & 3) (Sasamoto & Futahashi, 2013). The female (Fig. 4) implies also well the characteristics of nominotypical *melania*, i.e. the thorax occupied with broadly black markings and the basal marking of hindwing blackish brown. Therefore, we can identify the Kunashir population as *Orthetrum melania melania*. Moreover, here we point out that the record of "*Pseudothemis zonata* (Burmeister, 1839)" from Kunashir Island by Paulson et al. (1998) was misidentified with *Orthetrum melania* (Paulson & Ubukata, pers. comm.)." (Authors)] Address: Sasamoto, A., 531-3 Oh, Tawaramoto-cho, Shiki-gun, Nara pref. 636-0345 Japan. Email: aksmt@sea.plala.or.jp

20610. Volz, D. (2017): Biodiversity of larval and adult dragonflies and damselflies (Odonata) of interdunal wetlands at Saugatuck Harbor Natural Area. Honors Theses. 2924, Western Michigan Univ.: 34 pp. (in English) ["The effects of climate change on insects in the United States have yet to be fully understood. Research on the insect populations of Lake Michigan's interdunal wetlands has been particularly limited. As these vibrant habitats are already at risk of destruction due to increased development, it is vital to have a working knowledge of the species that are living in the habitat. However, to date, there have been no studies on assemblages of interdunal wetlands in Michigan. Examining community compositions is critical to understanding the ecological problems that could occur in the future. This study is the first to look at Odonata diversity in an interdunal wetland in Michigan. The research, done at Saugatuck Harbor Natural Area on populations of Odonate species, provides a base-level of awareness about which species are living and breeding in this wetland habitat. The written record of the specific species observed in the area as adult odonates contributes to the Michigan Odonata Survey. This survey helps scientists better understand what odonates are living in and migrating to Michigan. Species with complex life cycles, such as Odonata, are important to both aquatic and terrestrial habitats. As these populations experience changes in the future, this research will provide crucial data on which species change their habitats. Examining the richness, diversity, and evenness of adult and larval Odonata provides a better view of the species living in wetland habitats. Odonates are an important food source for many other species living in these wetlands. Alterations to the complex food web within a wetland can have cascading effects on many species that live in the habitat. Incorporating the information gained from this study into future studies of the same wetland area will increase awareness about the effects of climate change on interdunal wetlands in the Great Lakes region." (Author)] Address: Volz, D., Western Michigan Univ., devonvolz@gmail.com

20611. Zeyghami, S.; Bode-Oke, A.; Dong, H. (2017): Quantification of wing and body kinematics in connection to torque generation during damselfly yaw turn. *Science China Physics, Mechanics & Astronomy* volume 60, Article number: 014711: 13 pp. (in English) ["This study provides accurate measurements of the wing and body kinematics of three different species of damselflies in free yaw turn flights. The yaw turn is characterized by a short acceleration phase which is immediately followed by an elongated deceleration phase. Most of the heading change takes place during the latter stage of the flight. Our observations showed that yaw turns are executed via drastic rather than subtle changes in the kinematics of all four wings. The motion of the inner and the outer wings were found to be strongly linked through their orientation as well as their velocities with the inner wings moving faster than the outer wings. By controlling the pitch angle and wing velocity, a damselfly adjusts the angle of attack. The wing angle of attack exerted the strongest influence on the yaw torque, followed by the flapping and deviation velocities of the wings. Moreover, no evidence of active generation of counter torque was found in the flight data implying that deceleration and stopping of the maneuver is dominated by passive damping. The systematic analysis carried out on the free flight data advances our understanding of the mechanisms by which these insects achieve their observed maneuverability. In addition, the inspiration drawn from this study can be employed in the design of low frequency flapping wing Micro Air Vehicles (MAV's)." (Authors)] Address: Dong, H.B., Dept of Mechanical & Aerospace Engineering, Univ. Virginia, Charlottesville, 22903, USA

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20612. Al Basheer, A.; Parshad, R.D.; Quansah, E.; Yu, S.; Upadhyay, R.K. (2018): Exploring the dynamics of a Holling–Tanner model with cannibalism in both predator and prey population. *Int. J. Biomath.* 11, 1850010 (2018): 29 pp. (in English) ["Cannibalism is an intriguing life history trait, that has been considered primarily in the predator, in predator–prey population models. Recent experimental evidence shows that prey cannibalism can have a significant impact on predator–prey population dynamics in natural communities. Motivated by these experimental results, we investigate a ratio-dependent Holling–Tanner model, where cannibalism occurs simultaneously in both the predator and prey species. We show that depending on parameters, whilst prey or predator cannibalism acting alone leads to instability, their joint effect can actually stabilize the unstable interior equilibrium. Furthermore, in the spatially explicit model, we find that depending on parameters, prey and predator cannibalism acting jointly can cause spatial patterns to form, while not so acting individually. We discuss ecological consequences of these findings in light of food chain dynamics, invasive species control and climate change. [...] A dragonfly-larvae system consisting of *Anax junius* and *Plathemis lydia* (which are the prey for other predators such as tadpoles in a pond setting) is used to understand the effects of prey cannibalism on predator–prey interactions" (Authors)] Address: Al Basheer, A., Mathematics Dept, The Univ. of Georgia, 240A Riverbend Rd, Athens GA 30602, USA

20613. Beolens, R. (2018): *The Eponym Dictionary of Odonata*. Whittles Publishing: 352 pp. (in English) ["The Eponym Dictionary of Odonata is a comprehensive listing of all people after whom damselflies and dragonflies have been named in scientific or common names. Each entry provides details of the species and a brief biography of the person. It

is also cross-referenced so that the relationships between scientific authors, entomologists and others can be followed. Many entries have been contributed by the people so honoured who are not necessarily odonatologists, entomologists, zoologists or even great men of science. Many damselflies and dragonflies are named for the author's family members, friends and those who collected the species holotypes, while others are figures from myth or history. In fact, it could be anything from the author's mother to a favourite musician. Because entries may include details of dates, places, educational and work institutions, it is possible to discover information about each person and for a picture to be built of how the science sometimes follows groupings of colleagues or those significantly influenced by charismatic teachers. The Dictionary includes other names which might, at a glance, be thought to be eponyms yet are not in the truest sense. These may be species named after characteristics embodied in characters from literature, whole peoples, acronyms or toponyms, etc. To some extent it can read like a canon of the great women and men of science over the last several centuries. Interestingly there are species named after as many as three generations of the same family, veiled references to old lovers, sycophantic homage, financial patronage, etc., as well as all the more 'legitimate' reasons for naming species. Not surprisingly, odonatologists exhibit a range of opinion on the practice, from naming all species after people, to wanting all eponyms banned; they can be totally humourless and pedantic or full of fun and irreverence. Like all of us they have as many reasons for their namings as ordinary folk have for naming their children or pets. Underlying all this, however, is the value of Eponym Dictionary of Odonata in cataloguing this fascinating aspect of science for all users, whether scientists or interested lay readers." (Author)] Address: Whittles Publishing, Dunbeath, Caithness, Scotland KW6 6EG, UK

Guillemot, A.; Krieg-Jacquier, R.; Bal, B.; Lamouille-Hébert, M. (2018): A la recherche d'*Aeshna caerulea* sur la réserve naturelle nationale de Passy (Odonata: Aeschnidae). Document non publié (<http://files.biolovision.net/haute-savoie.-lpo.fr/userfiles/larecherchedAeshnacaeruleasurlarservenaturellenationaledPassy.pdf>): 13 pp. (in French) ["Within the framework of survey weekends and in association with the manager of the Passy national nature reserve (Asters), the Sympetrum group carried out a survey weekend on 6 and 7 August 2016 to search for *Aeshna caerulea* (Ström, 1783), a rare and threatened species discovered in 1994 in the vicinity of France. Thus, after having identified several wetlands favourable to the presence of the species in 2015, twelve people were gathered to search for this emblematic taxon of boreo-alpine ecosystems. Following these surveys, *A. caerulea* was not observed, despite the presence of the range of species generally associated with it. It is necessary to continue the surveys to refine the distribution of the species in the Dept and to identify possible connections between the different populations in Haute-Savoie." (AuthorsDeepL)] Address: Guillemot, A., Groupe de recherches et de protection des libellules Sympetrum, 150, route de Chez Diannay 74570 Groisy, France. E-mail: alexandre.guillemot@asters.asso.fr

20614. Gumpinger, C.; Höfler, S.; Pichler-Scheder, C.; Chovanec, A. (2018): *Ökologische Aufwertungsmaßnahmen in oberösterreichischen Gewässern. Planung, Umsetzung, Erfolge, Probleme.* Im Auftrag des Amtes der Oberösterreichischen Landesregierung Direktion Umwelt und Wasserwirtschaft, Abteilung Wasserwirtschaft, Wels: 109 pp. (in German) ["The identified success factors on the way

from technically completely over-formed water bodies to ecologically upgraded - in the best case renatured - water bodies are summarised again in Fig. 82. In summary, it can be stated that these conclusions do not contain any fundamentally new findings, but that the authors are in line with international literature. The measures implemented in Upper Austria show the same deficits and problems that occur again and again - at least throughout Europe - and are accordingly more or less of high ecological quality - in the majority of cases, however, they can only be assessed to a limited extent on the basis of analogies with other measures or other water bodies, because no monitoring was carried out. In the future, in order to implement measures as successfully as possible, it will be important to learn to understand watercourses as overall systems, and accordingly to align planning and implementation as closely as possible to the guiding principles, and in this way ultimately to actually renaturalise watercourses. Where this is not possible due to limited framework conditions, the focus should be on habitat diversity, the best possible connection to the surrounding area and a design that enables or even initiates dynamic processes. Special attention must be paid to the water ecological functionality of created or initiated structures. Sufficiently generous dimensioning plays a major role here, as these initial measures create the preconditions for the long-term self-development of the streams and rivers. A particular challenge in the future will be to bring the sediment balance of the water bodies closer to its natural state. With regard to the monitoring of success, a standardised integrative medium- to long-term monitoring approach of hydromorphology (incl. sediment) and aquatic and terrestrial ecology is desirable with regard to the overall system of water bodies including the surrounding area. If the monitoring results do not document the hoped-for effects, remedial work - if at all possible even several adaptation loops consisting of remedial work and monitoring - is urgently recommended. This is particularly important because even small mistakes can lead to bottleneck effects that can prevent or at least delay the achievement of the set goals in the long term. If watercourse restoration projects are planned and carried out in the future with these crucial points in mind, technicians and ecologists - provided they have the necessary will and vision - will be able to learn together how flowing waters function and what really matters in restoration projects. Ultimately, there is also justified hope that more intact watercourse habitats will develop again and thus not only will the objectives of the Water Framework Directive be achieved in the long term and permanently, but also that the population will be able to benefit from the added value of intact watercourse habitats." (Authors/DeepL)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, A-1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

20615. Janssen, A.; Hunger, H.; Konold, W.; Pufal, G.; Staab, M. (2018): Simple pond restoration measures increase dragonfly (Insecta: Odonata) diversity. *Biodiversity and Conservation* 27: 2311-2328. (in English) ["Ponds are home to a diverse community of specialized plants and animals and are hence of great conservation concern. Through land-use changes, ponds have been disappearing rapidly and remaining ponds are often threatened by contamination and eutrophication, with negative consequences for pond-dependent taxa like amphibians or dragonflies (Odonata: Anisoptera and Zygoptera). Increasingly, restoration measures such as removal of shading terrestrial vegetation or submerged organic matter are implemented to counteract current threats, but how these measures affect the target taxa is rarely assessed. We tested if and how simple pond

restoration measures affect diversity. We propose that pond restoration influences the light regime, which promotes aquatic and riparian vegetation important for different dragonfly life stages, thus increasing their diversity. Additionally, we assume that this changes dragonfly species composition between restored and unrestored ponds. We surveyed exuviae in the riparian and aquatic vegetation along the shore of 29 (12 restored, 17 unrestored) man-made ponds in southwest Germany and assessed environmental variables known to affect dragonfly diversity. We identified the cover of tall sedges and submerged macrophytes as the driving biotic variables for dragonfly diversity and species composition, with restoration measures affecting submerged macrophyte cover directly but tall sedges indirectly via available sunlight. This study demonstrates that simple restoration measures not only have a positive effect on overall dragonfly diversity, but also increase habitat suitability for several species that would otherwise be absent. We therefore propose dragonflies as a suitable flagship group for pond conservation." (Authors)] Address: Janssen, Alina, Nature Conservation & Landscape Ecology, Faculty of Environment and Natural Resources, Univ. of Freiburg, Freiburg, Germany

20616. Mamat-Noorhidayah; Yazawa, K.; Numata, K.; Norma-Rashid, Y. (2018): Morphological and mechanical properties of flexible resilin joints on damselfly wings (*Rhincocypha* spp.). *PLoS One*. 2018 Mar 7;13(3):e0193147. doi: 10.1371/journal.pone.0193147. eCollection 2018: 17 pp. (in English) ["Resilin functions as an elastic spring that demonstrates extraordinary extensibility and elasticity. Here we use combined techniques, laser scanning confocal microscopy (LSCM) and scanning electron microscopy (SEM) to illuminate the structure and study the function of wing flexibility in damselflies, focusing on the genus *Rhincocypha*. Morphological studies using LSCM and SEM revealed that resilin patches and cuticular spikes were widespread along the longitudinal veins on both dorsal and ventral wing surfaces. Nanoindentation was performed by using atomic force microscopy (AFM), where the wing samples were divided into three sections (membrane of the wing, mobile and immobile joints). The resulting topographic images revealed the presence of various sizes of nanostructures for all sample sections. The elasticity range values were: membrane (0.04 to 0.16 GPa), mobile joint (1.1 to 2.0 GPa) and immobile joint (1.8 to 6.0 GPa). The elastomeric and glycine-rich biopolymer, resilin was shown to be an important protein responsible for the elasticity and wing flexibility." (Authors) <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0193147>] Address: Mamat-Noorhidayah, Institute of Biological Science, Fac. Science, Univ. of Malaya, Kuala Lumpur, Malaysia

20617. Mazzaglia, M.K.; Goldschalt, T. (2018): Eine Königslibelle in Neles Garten. *neunmalklug verlag GbR - Charlotte Stiefel & Sarah Roller*: 36 pp. (in German) ["Picture book, from 3 years. On a warm summer day, Nele discovers a strange little animal in the garden. "It is the larva of a damselfly," her father explains. Together they watch as the dragonfly first hatches from the larval skin, then dries its wings in the sun and finally takes its first flight. A story with interesting factual information about a fascinating animal species." (Publisher)] Address: neunmalklug verlag GbR, Charlotte Stiefel & Sarah Roller, Ölgasse 13, 77933 Lahr, Germany

20618. Medina, M.N.D.; Cabras, A.A.; Villanueva, R.J.T.; Colong, R. (2018): Odonata recorded in the buffer zone of Mt. Hamiguitan Range Wildlife Sanctuary with remarks on

the distribution of endangered *Risicnemis antoniae* in Davao Oriental Philippines. *Notulae Scientia Biologicae* 10(1): 14-20. (in English) ["Mt. Hamiguitan Range Wildlife Sanctuary is both a UNESCO and ASEAN recognised heritage site. There is a current move to expand the site by expanding the buffer zone. This area unfortunately is poorly studied in terms of its biodiversity. This paper explores the Odonata species found in the proposed buffer zone. Transect line along fluvial ecosystem was established in the two bordering municipalities. A total of 32 species from 22 genera and nine families were recorded in which eighteen species (18) belong to the suborder Zygoptera while 14 species are Anisoptera. High level of endemism was recorded for Zygoptera (94.44%) endemism while low endemism for Anisoptera (21.43%). Distribution of *Risicnemis antoniae* (Gassmann & Hämäläinen, 2002), an IUCN endangered damselfly was recorded in the creeks of Barangay Tandang Sora, Governor Generoso at relatively lower elevation between 100-300 meters above sea level. Due to its habitat's close proximity to human habitation and the encroaching anthropogenic disturbances, it should be declared as Local Conservation Area." (Authors)] Address: Medina, M.N.D., Univ. of Mindanao, Institute for Biodiversity & Environment, Research & Publication Center, Matina, Davao City, Philippines. E-mail: mnd_medina@umindanao.edu.ph

20619. Moore, M.P.; Lis, C.; Martin, R.A. (2018): Larval body condition regulates predator-induced life-history variation in a dragonfly. *Ecology* 99(1): 224-230. (in English) ["Organisms with complex life cycles commonly exhibit adaptive plasticity in the timing of transitions between life stages. While the threat of predation is predicted to induce earlier transitions, empirical support has been equivocal. When predation risk affects both the propensity to transition to the next life stage and the ability to reach the energetic thresholds necessary to complete the transition, only those individuals in the best physiological condition may be able to accelerate development and emerge earlier. To test this hypothesis, we followed uniquely marked dragonfly larvae (*Pachydiplax longipennis*) through emergence in pools where we factorially manipulated the presence of a large heterospecific predator (*Anax junius*) and cannibalism risk via conspecific size variation. Consistent with our hypothesis, high-condition larvae were more likely to emerge in the presence of the heterospecific predator than in its absence, and low-condition larvae were more likely to emerge in its absence than in its presence. Moreover, high-condition larvae emerged earlier when cannibalism risk was high than when it was low. Predation risk therefore has condition-dependent effects on emergence. As predation risk frequently affects resource accumulation, similar mechanisms across taxa could commonly underlie the incongruence between empirical results and theoretical expectations for predator-induced life-history variation." (Authors)] Address: Moore, M.P., Dept of Biology, Case Western Reserve Univ., Cleveland, Ohio 44106 USA. Email: mpm116@case.edu

20620. Moreno-Benítez, J.M.; Ripoll, J. (2018): Dragonflies along the Málaga Great Path and in the Province. IDENTIFICATION GUIDE. Diputación de Málaga, 29004 Málaga, Spain: 188 pp. (in English) [The Identification Guide to the Dragonflies along the Great Málaga Path and in the Province' forms part of the above actions, and brings us nearer to these metallic coloured beautiful creatures, which make our river and lakes more colourful. This publication follows the one about 'The Birds along the Great Path' and 'The Identification Guide to the Diurnal Butterflies along the Great Málaga Path', which has recently been published. However,

their identification was not the only purpose of this edition. We also aim to present this fascinating world and participate in research into them and its protection. Dragonflies are real survivors as they existed in the same time as dinosaurs, but contrary to them, they survived the massive extinction of the great part of life on Earth from that period. Here they are, hundreds of millions of years later, with slight changes in their basic physical form and biological features. These winged insects achieved to adapt to all kinds of water, even with certain level of salinity and contamination. Dragonflies are rather necessary in the ecosystems where they live and of great importance for humans. What would happened to us if dragonflies did not exist? Well, no doubt, we would not be fine. While larvae in water and as adult insects, they feed on many insects which, among other negative aspects, can be harmful for humans. For instance, these are mosquitoes. Moreover, they are part of food chains in water ecosystems, together with other animals which live there like fish, amphibians, and birds. In the province of Málaga, 54 different species of the Odonata have been spotted. This is 69% of all the Odonata in the Iberian Peninsula (79 species) or 7 out of 10." (Authors)] Address: Diputación de Málaga (Málaga county council), great Málaga path team, Pacífico 54, Edificio A (Building A), 29004 Málaga, Spain. <https://www.grandesdemalaga.es/en/7346/dragonflies-along-great-malaga-path-province-identification-guide>

20621. Moyo, S.; Richoux, N.B. (2018): Fatty acids reveal the importance of autochthonous non-vascular plant inputs to an austral river food web. *Hydrobiologia* 806: 139-156. (in English) ["We hypothesised that the dominant organic source supporting macroinvertebrate consumers in a South African river is autochthonously produced non-vascular algae (regardless of season), and that the prevalence of autochthony increases with increasing distance from the headwaters. Fatty acid profiles of macroinvertebrates from six sites and four sample times were assessed to characterise the consumer diets and estimate the relative assimilation of autochthonous versus allochthonous-based sources in the food web. Fatty acid markers, ordination analyses and mixing models confirmed that the ultimate nutritional source for the invertebrate assemblages was autochthonous-produced carbon, with some contributions occurring from vascular plants (potentially of allochthonous and autochthonous origin, as some vascular plants were aquatic macrophytes). However, contrary to our second hypothesis, the prevalence of autochthony did not change predictably along the river. Such an autochthonous-based food web is consistent with many large rivers in well-researched regions of the world, although the complexity and variability that we observed in the fatty acid profiles of macroinvertebrate consumers in a small South African river should help stimulate renewed interest in investigations of carbon flow within small rivers from less-studied regions (particularly in arid climates)." (Authors)] Address: Moyo, S., Dept of Zoology & Entomology, Rhodes Univ., Grahamstown, South Africa

20622. Phan, Q.T.; Kompier, T.; Karube, H.; Hayashi, F. (2018): A synopsis of the Euphaeidae (Odonata: Zygoptera) of Vietnam, with descriptions of two new species of Euphaea. *Zootaxa* 4375(2): 151-190. (in English) ["23 species of Euphaeidae (Odonata: Zygoptera) are reported from Vietnam including two new species of Euphaea, *E. saola* Phan & Hayashi, sp. nov. and *E. sanguinea* Kompier & Hayashi, sp. nov., and four species not recorded previously, *Bayadera continentalis* Asahina, 1973, *B. hyalina* Selys, 1879, *B. nephelopennis* Davies & Yang, 1996 and *Euphaea pahyapi* Hämäläinen, 1985. The females of *Anisopleura bipugio*

Hämäläinen & Karube, 2013, *Bayadera serrata* Davies & Yang, 1996 and *Euphaea hirta* Hämäläinen & Karube, 2001 are described for the first time. The mutual taxonomic status of *Bayadera hyalina* and *B. strigata* Davies & Yang, 1996 is discussed. Distribution maps of all known Vietnamese species, with detailed distribution records, are provided." (Authors)] Address: Phan, Q.T., Entomology & Parasitology Laboratory, Center for Molecular Biology, Institute of Research and Development, Duy Tan Univ., 3 Quang Trung, Da Nang, Vietnam. E-mail: pqtoan84@gmail.com

20623. Start, D. (2018): Ontogeny and consistent individual differences mediate trophic interactions. *The American Naturalist* 192(3): 301-310. (in English) ["Ecologists use species traits to predict responses to environmental change and, ultimately, to understand the composition of biological communities. However, this ignores known and substantial intraspecific variation that can have important consequences for species interactions and community composition. This within-species variation results from two distinct sources: ontogeny and consistent individual differences. Ontogeny and consistent differences interact to produce phenotypes, but the community-level consequences of this interaction have not been studied. Using larval dragonfly communities, I investigate patterns of intraguild predation by manipulating (1) consistent individual differences in activity rate and (2) the ontogeny of the focal and interacting species. I show that activity rate is a consistent individual trait but that the effect of activity rate on intraguild predation depends on the functional role of an organism in the community (predator or prey). An organism's functional role itself varies across ontogeny of both the focal and interacting individuals. I suggest that ontogeny and consistent individual differences interact to produce intraspecific variation, with consequences for species interactions, communities, and eco-evolutionary dynamics." (Authors)] Address: Start, D., Dept of Ecology and Evolutionary Biology, Univ. of Toronto, Toronto, Canada. E-mail: denon.start@mail.utoronto.ca

20624. Tschol, M. (2018): Role of natural and sexual selection in the evolution of a sexual trait in an old insect order. M.Sc. thesis, Dept of Biology, Lund: (in English) ["Wing pigmentation in dragonflies and damselflies (odonates) functions as a secondary sexual trait with a role in courtship and antagonistic male-male interactions. Recently, a thermoregulatory function of wing pigmentation has also been suggested. This study aimed to elucidate how both sexual and natural selection have influenced the evolution and global distribution of wing pigmentation in odonates. I examined the role of wing patch colour in intra- and inter-sexual selection in the banded demoiselle (*Calopteryx splendens*) utilizing manipulation experiments. While no clear effect of wing patch colour on female preference was found, male *C. splendens* showed reduced aggression towards males with red manipulated wing patches, suggesting that colour mediates information that is used in territorial male conflicts. Additionally, I reconstructed the evolutionary history of this sexual trait and tested for a macroevolutionary association between latitude zone and wing pigmentation, with the expectation that thermoregulatory benefits promote wing pigmentation in temperate regions. I found wing pigmentation evolved several times in multiple lineages of dragonflies and damselflies and a high number of secondary trait loss is in agreement with the view that this sexual trait is costly. Pigmented species were found to be more prevalent in the tropics and evolutionary rates of wing pigment loss were higher in the temperate region. Together, my results do not support the view that a thermoregulatory benefit at temperate

regions has promoted the emergence and maintenance of this trait. Instead, other unknown selective pressures in the tropical regions may have shaped the evolutionary trajectory of wing pigmentation. There may be a more important role of this visually appealing sexual signal in intra- and inter-specific interactions in the tropics compared to the temperate regions. Popular Abstract: Evolution of a Sexual Signal in Dragonflies and Damselflies. Animals often use visual signals to choose mates or communicate fighting ability between rivals. Some dragonfly and damselfly species exhibit colourful pigmentation patterns on their wings which females use as a cue while selecting a mate and males to determine if they want to get into a fight with another competing male. I conducted field experiments to learn more about the role of wing pigmentation in one species of damselfly (*Calopteryx splendens*) and additionally used phylogenetic comparative methods to look at the evolution of this sexual signal across many dragonfly and damselfly species. To better understand how abiotic and biotic factors contribute to the diversity of life, we often select specific traits that we study more closely. One prominent biotic factor is the interaction between the sexes. Some traits that are important in this interaction function as sexual signals, like in the case of wing pigmentation in dragonflies and damselflies. I conducted two field experiments where I manipulated the wing patch colour of male *C. splendens* and recorded the reactions of either free ranging females or resident territorial males. It turns out, while females did not prefer or discriminate more between different colours, resident males showed less aggression towards individuals with red coloured wings. This suggests a possible role of the wing patch in signalling information towards other competing males. In an evolutionary perspective, this signalling role might get lost over time because of other forces acting against it. So could potentially increased predation on individuals with wing pigmentation lead to the loss of the trait in the whole species and its ancestors. In my between species phylogenetic comparative study I found a pattern that fits this prediction. Wing pigmentation evolved several times in different lineages of Odonata, and was subsequently lost three times more often. Interestingly, my analyses also indicate a difference in the evolutionary history of wing pigmentation between tropical and temperate species, possibly indicating different selective pressures acting on this trait in both regions. This will have to be investigated more closely in the future!" (Author)] Address: not stated

20625. Ul Islam, S.; Lin, W.; Wu, R.; Lin, C.; Islan, W.; Arif, M. (2018): Complete genome sequences of three novel cycloviruses identified in a dragonfly (Odonata: Anisoptera) from China. *Archives of Virology* 163: 2569-2573. ["Three cycloviruses (genus *Cyclovirus*, family *Circoviridae*) were recovered from a dragonfly (Odonata: Anisoptera) captured in Fuzhou, China. The three cycloviruses, named dragonfly associated cyclovirus 9, 10 and 11 (DfCyV-9, -10, -11), respectively, show 56.1-79.6% genome-wide identity to known cycloviruses and 61.6-65.1% among themselves. Thus, according to the current species demarcation criteria, they represent three novel cycloviruses. Notably, DfCyV-10 has a predicted replication-associated protein (Rep) that is most similar to that of bat associated cyclovirus 2 (BatACyV-2), a cyclovirus discovered in China, with 79.4% amino acid sequence identity, but a putative capsid protein (Cp) most similar to that of BatACyV-10, a cyclovirus discovered in Brazil, with 71.7% amino acid sequence identity. These data are useful for understanding the diversity and evolution of cycloviruses, especially those found in insects." (Authors)] Address: Du, Z., State Key Laboratory of Ecological Pest

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20626. Vinko, D.; Tratnik, A.; Bahor, M.; Erbida, N.; Pirnat, A.; Šalamun, A. (2018): [An inventory of dragonflies (Odonata) in the area of the Ribniki Nature Reserve in the Draga Valley near Ig. Report. Client: Public Institution Landscape Park Ljubljansko barje, Inner Gorice. Slovenian Odonatological Society, Ljubljana, October 2018: 29 pp., 3 appendices- (in Slovenian) [Google translator: With 49 species of dragonflies recorded, the area of Ribniki Nature Reserve in the Draga valley near Ig is one of the richest areas in Slovenia. And yet, 15 species of dragonflies are rare here. The 17 species present here are rare in the rest of the Ljubljana Marshes, for 7 the nature reserve is the only known habitat on the Marshes. 17 species are endangered, 5 protected, two listed in the Annex to the Habitats Directive and one in the Annex to the Berne Convention. New localities of the *Cordulegaster heros* have been found in the area. This European protected species, listed in Annexes II and IV of the Habitats Directive, is relatively common in the nature reserve and rare in the rest of the Ljubljana Marshes due to the lack of suitable habitat for it. In 2017, the *Leucorrhinia pectoralis* was first recorded here and re-certified in 2018. The medium-sized pond where this internationally strictly protected species was listed in Annexes II and IV of the Habitats Directive and Appendix II of the Berne Convention, thus, it represents the only confirmed habitat of the species in central Slovenia today. Active conservation measures are urgently needed to improve the conservation status of the species, and are based on a thorough inventory of the current state of the field, and we therefore suggest that the species be investigated as soon as possible in the nature reserve area. Given that the species has been regularly present in the last two years, although in smaller numbers, and aquatic biotopes are subject to succession and management, it is important to identify sites of development as soon as possible. The requirements of the species and the findings of the research required must therefore be incorporated into further management plans for the site. Further monitoring of the state of the ecological situation and the population also needs to be made. We reaffirmed the presence of the *Lestes dryas*, which is only the second species of the reserve area, the first being from the 1950s. Similar is the case with the rare bush beast (*Lestes barbarus*) and the beast beast (*Lestes virens vestalis*), which were not recorded in the area between 1954 and 2017. Some of the area's most important natural resources include the *Coenagrion scitulum*, *Erythromma lindenii*, *Epiheca bimaiculata* and *Sympetrum meridionale*. In the nature reserve Ribniki in the Draga valley near Ig we find the richest water in Slovenia from the point of view of the fauna of dragonflies. Many species diversity is also achieved, for example. Mura river with 56 species (Šalamun et al., 2015), Vipava valley with 53 (Vinko, 2016), Bela krajina with 50 (Šalamun et al., 2012), Mirna valley with 47 (Bahor, 2017), all of which on the surface much larger than in this project task of the area under consideration. Since there are not many large standing waters in central Slovenia, the ponds in the Draga valley near Ig are all the more important in order to preserve the diversity of dragonflies, including the wider area. The entire Ljubljana Marshes, together with the finds over the past two years, boasts the appearance of 51 species of dragonflies. For comparison, 45 species of dragonflies are known for the nearby Ljubljana, Rožnik and Šišenski hrib Nature Parks (Šalamun, 2018); for the entire City of Ljubljana there are 52 species (Kiauta, 2014a, 2014b; Vrhovnik et al., 2015, 2016; Šalamun, 2018), but only 42 species have been listed

in the City of Ljubljana in recent years (Vrhovnik et al., 2016; Šalamun, 2018).] Address: Vinko, D., Slovenska 14, 1234 Mengeš, Slovenia; E-mail: damjan.vinko@gmail.com

2019

20627. Alfarisiy, A. (2019): Odonata survey on some of the outer islands of Belitung Regency, Belitung island, Indonesia. *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 29: 1-34. (in English) ["Another survey of Odonata on the Indonesian island of Belitung is reported. This survey was the second survey conducted in the Belitung area with International Dragonfly Fund support and was focused to Belitung Regency's outer islands. 72 species were recorded during the survey. Significant records from the surveyed islands include *Amphicnemis kuiperi*, *Mortonagrion arthuri*, *Mortonagrion appendiculatum*, *Teinobasis ruficollis*, *Platylestes heterostylus*, *Pornothemis serrata*, *Pornothemis starrei* and *Tramea phaeoneura*. Almost all the records are new to the small islands surveyed, except for *Mendanau Island* for which there were already records of four species. A checklist of the odonate fauna of the outer islands is given in an appendix." (Author)] Address: Alfarisiy, A., Zoology Division, Belitung Biodiversity Observer Foundation, Belitung, Indonesia. E-mail: akbaral mulk@gmail.com

20628. Bahuguna, P.; Joshi, H.K.; Kumar, K. (2019): A report on drifting behaviour of odonata (aquatic insects), *Kyunja Gad*, a spring fed tributary of River Mandakani, Chamoli, Garhwal, Uttarakhand. *J. Mountain Res.* 14(2): 63-67. (in English) ["Odonata is an important group of macroinvertebrates which are highly sensitive to environmental changes and pollution. This is the reason why they are mostly studied as change in water quality pattern. The dial study of drifting behavior in such species also indicates towards the feeding behavior of fishes available in that habitat. In the present communication an attempt has been made to view the drifting patterns in a sensitive macro zoobenthic group Odonata in the *Kyunja Gad* which is a tributary of the snow-fed River Mandakani." (Authors)] Address: Bahuguna, P., Bio-diversity Lab, Dept of Zoology, A.P.B.Govt.P.G.College Agustyamuni, District Rudraprayag, Uttarakhand-246421, India. E-mail: pankajpaurii@gmail.com

20629. Borisova, N.V.; Karolinsky, E.A. (2019): First record of the white-tailed skimmer (*Orthetrum albistylum* (Selys, 1848) from the Chuvash Republic. *Natural Science Research in Chuvashia* 5: 55-56. (in Russian, with English summary) ["1 male, 17.VIII.2018, Yalchik district, okr. Eshmikeevo village, the Prisursky gas processing plant, Yalchiksky block (55°01'50"N, 47°55'10"E)." (Authors)] Address: Borisova N.V. Russia, Cheboksary, FSBI "Prisursky State Reserve", Chuvash Branch of the Russian Entomological Society. Email: natborisova18@yandex.ru

20630. Bose C., N.; Kakkassery, F.K. (2019): Study on the diversity and abundance of odonates in three different geographic divisions in Kerala. *Biodiversity of Kerala after Deluge-Concerns, Implications and Conservation Strategies* 22-23 February 2019: 74-78. (in English) ["Like all living organisms, odonate diversity is also susceptible to environmental factors. The objective of the present study was to analyse how different geographical features affect the distribution and diversity of odonates. For the present survey, 12 different locations of Thrissur and Ernakulam districts were selected and they were categorised under three geographical divisions- the eastern highlands, the central midlands and the western coastal plains. The observation was

carried out for 1 year from August 2017 to July 2018. A total of 61 species were encountered during the survey. Maximum species richness was observed in the eastern highlands, followed by central midlands and western coastal plains. Similarly, maximum values of diversity indices were recorded from eastern highlands, followed by central midlands and western coastal plains. Our observations indicate that Marotichal, Athirampilly, Vazhani and Malayatoor in the eastern highlands has a diverse odonate fauna." (Authors)] Address: Bose, Nitha, Research and Postgraduate Dept of Zoology, St. Thomas' College (Autonomous), Thrissur-680001, Kerala, India. Email.: nithabose123@gmail.com

20631. Csar, D.; Gumpinger, C.; Pichler-Scheder, C.; Höfler, S.; Chovanec, A. (2019): Sanierung der Morphologie kleiner und mittlerer Fließgewässer in Österreich Resultate und Erkenntnisse aus Best-Practice Projekten inkl. Empfehlungen für die Erfolgskontrolle. Im Auftrag des Bundesministeriums für Nachhaltigkeit und Tourismus. Forschungsprojekt Nr. 101291: 81 pp. (in German) ["As part of the implementation of the European Water Framework Directive (WFD), watercourses throughout Austria are being upgraded and renatured in order to achieve "good ecological status" or "good ecological potential". However, the effectiveness of the measures is often below the improvement that can be shown with the currently available assessment systems, the jump to a better ecological status class. If this jump in class does not occur after the implementation of a measure, the measure was not necessarily unsuccessful. In the present project, measures already completed throughout Austria to improve the ecological situation of water bodies were collected with accompanying monitoring studies and the data analysed in order to derive general recommendations for success monitoring. Since no such recommendations for the recording and evaluation of measure effects have been available so far, a methodological framework for effect documentation was developed, with which one can already present and evaluate small changes in the water ecological situation at measure level. The results of surveys of the quality elements in accordance with the guidelines of the EU Water Framework Directive, which can be supplemented as needed by various criteria that offer a higher resolution by considering additional aspects and thus enable improved interpretation of the results and the presentation of even small successes, essentially serve as the basis for monitoring the success of the measures. For data entry, calculation and presentation, the template of a calculation table was developed in the generally available software Microsoft Excel. The results are transferred to a summary data sheet, supplemented with characteristic data on the water body and the measure, and concluded with an expert assessment. This data sheet finally functions as a short report for the general documentation of the effect of the measure and guarantees the comparability of projects. In the coming years, this methodological framework will be tested, evaluated and further developed in practice." (Authors/DeepL)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, A-1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

20632. Ferreira do Amaral, D.; Montalvão, M.F.; Mendes, B.; Araújo, A.P.; Rodrigues, A.S.; Malafaia, G. (2019): Sublethal effects induced by a mixture of different pharmaceutical drugs in predicted environmentally relevant concentrations on *Lithobates catesbeianus* (Shaw, 1802) (Anura, ranidae) tadpoles. *Environmental Science and Pollution Research* 26(1): 600-616. (in English) ["The increasing consumption of medications by humans has negative effects such as the increased disposal of these compounds in the

environment. Little is known about how the disposal of a "drug mix" (DM) in aquatic ecosystems can affect their biota. Thus, we evaluated whether the exposure of *Lithobates catesbeianus* tadpoles to a DM composed of different medication classes (antibiotic, anti-inflammatory, antidepressant, anxiolytic, analgesic, and antacid drugs)—at environmentally relevant concentrations—may change their oral morphology, trigger behavioral disorders, and have mutagenic effects on erythrocyte cells. Based on our data, animals exposed to the DM showed changes in mandibular sheath pigmentation, dentition, and swimming activity, as well as atypical behavior in the social aggregation test [with co-specific and interspecific (*Physalaemus cuvieri*) individuals] and antipredatory defensive response deficit (chemical stimulus from Odonata larvae), after 15 exposure days. The mutagenic analysis revealed higher frequency of nuclear abnormalities in the erythrocytes of tadpoles exposed to the DM (e.g., multilobulated, blebbed, kidney-shaped, notched nucleus, binuclear, and micronucleated erythrocytes). Given the chemical complexity of the DM, we assumed that several organic functions may have been affected, either by the isolated, synergistic, antagonistic, or additive action of DM compounds. Finally, our study confirms the toxicological potential of DM in *L. catesbeianus* tadpoles, with emphasis to impacts that can affect the fitness of individuals and their natural populations. Thus, we suggest that more attention should be given to the disposal of medications in the environment and reinforce the need of improving water and sewage treatment systems." (Authors)] Address: Ferreira do Amaral, D., Post-Graduation Program in Conservation of Cerrado Natural Resources – Biological Research Lab., Goiano Federal Institute—Urutaí Campus, Urutaí, Brazil

20633. Fraixedas, S.; Galewski, T.; Ribeiro-Lopes, S.; Loh, J.; Blondel, J.; Fontès, H.; Grillas, P.; Lambret, P.; Nicolas, D.; Olivier, A.; Geijzendorffer, I.R. (2019): Estimating biodiversity changes in the Camargue wetlands: An expert knowledge approach: An expert knowledge approach. *PLoS ONE* 14(10): e0224235. <https://doi.org/10.1371/journal.pone.0224235>: 18 pp. (in English) ["Mediterranean wetlands are critical strongholds for biodiversity and the provision of ecosystem functions and services; yet, they are being severely degraded by a number of socio-economic drivers and pressures, including climate change. Moreover, we still lack comprehensive understanding of the extent to which biodiversity loss in Mediterranean wetlands will accelerate change in ecosystem processes. Here, we evaluate how changes in biodiversity can alter the ecosystem of the Camargue (southern France). We collected data on species presence/absence, trends and abundance over a 40-year period by combining observations from the scholarly literature with insights derived from expert knowledge. In total, we gathered more than 1500 estimates of presence/absence, over 1400 estimates of species abundance, and about 1400 estimates of species trends for eight taxonomic groups, i.e. amphibians, reptiles, breeding birds, fish, mammals, dragonflies (odonates), orthopterans and vascular plants. Furthermore, we used information on recently arrived species and invasive species to identify compositional changes across multiple taxa. Complementing targeted literature searches with expert knowledge allowed filling important gaps regarding the status and trends of biodiversity in the Camargue. Species trend data revealed sharp population declines in amphibians, odonates and orthopterans, while birds and plants experienced an average increase in abundance between the 1970s and the 2010s. The general increasing trends of novel and invasive species is suggested as an explanation for the changing abundance of birds and

plants. While the observed declines in certain taxa reflect the relative failure of the protection measures established in the Camargue, the increasing exposure to novel and invasive species reveal major changes in the community structure of the different taxonomic groups. This study is the first attempt to assess changes in biodiversity in the Camargue using an expert knowledge approach, and can help manage the uncertainties and complexities associated with rapid social-ecological change in other Mediterranean wetlands. ... To compile the species lists for odonates and orthopterans, we consulted the management plan of the Tour du Valat Regional Nature Reserve written by Cohez et al. [15] and the MSc thesis about odonates and orthopterans by Merlet [16]. This gave us information on species presence/absence and their status (e.g. abundance, distribution, nativeness). For odonates, we also looked for quantitative data (number of individuals) from the National Odonata data collection programme (Complément à l'inventaire des libellules de France) known as «CILLIF» (French Odonatological Society, Société française d'odonatologie – SfO) for the period 2014-2016 to help complementing the species list, as well as the doctoral thesis from Aguesse [17] and the revision of the species red list for the Provence-Alpes-Côte d'Azur region by Lambret et al. [18]. As for orthopterans, the list was further elaborated with the doctoral thesis of Bigot [19], one of Bigot's works [20], and the red list for the Mediterranean region from Sardet and Defaut [21]. Both lists were checked and supplemented by an expert from the Tour du Valat. Lack of literature for the 1970s made difficult to obtain qualitative information for both groups (also for many orthopteran species we could not find information for their present status). However, for some species qualitative information on the species abundance and distribution could be added to the surveys." (Authors)] Address: Fraixedas, Sara, Tour du Valat, Research Institute for the conservation of Mediterranean Wetlands, Le Sambuc, Arles, France. E-mail: sara.fraixedas@helsinki.fi

20634. Jusys, V.; Eigirdas, V.; Gliwa, B. (2019): First records of *Pantala flavescens* and *Anax ephippiger* (Odonata, Libellulidae) in Lithuania. *Lietuvos Entomologų Draugijos Darbai* 3(31): 5-7. ["The bird traps of Ventes Ragas ornithological station along with birds and bats catch a large number of dragonflies and few damselflies as well. In September 2016 the author (V.J.) started to mark Odonata with a permanent marker and identify them. Marked dragonflies have always been released. Dragonflies of rare species or such with atypical colouring or markings have also been documented using an SLR digital camera. Birds are observed and ringed at other spots in Lithuania too. Whilst doing so, the author (V.E.) took a picture and video of a teneral dragonfly. List of localities: Ventes ragas, bird traps at the ornithological station, Šilute distr. Lat 55.341388, Long 21.-191666. Paupys, fish farm Raseiniai distr. Lat 55.339444, Long 22.950555. Results: A single male of *Pantala flavescens* (22-V-2019, Vytautas Jusys, Fig. 1) was captured in the bird traps in Ventes ragas, a teneral male of *Anax ephippiger* (23-VIII-2019, Vytautas Eigirdas) was observed in the fish farm in Paupys, a female of *A. ephippiger* (16-X-2019, Vytautas Jusys, Fig. 2) was captured in the bird traps of Ventes Ragas.] Address: Jusys, V., Ornithological Station Ventes Ragas, Mariu g. 24, LT-99361 Vente, Lithuania. E-mail: vrventragis@gmail.com

20635. Kamaruzaman K.; Rasdi, I. (2019): The role of mosquito predators in the ecosystem in reducing the incidence of Dengue. *Asian J Agric & Biol.* 2019; Special Issue:

131-137. ["The aim of this study was to show that the presence of mosquito predators in the ecosystem decreased the incidence of dengue cases. Data was obtained by daily inspection of 85 *Aedes* mosquito potential breeding point at 15 dengue outbreak hotspot localities with at least one mosquito predator present at the locality and the VEKPRO programme used in the monitoring of dengue cases in Malaysia. The mosquito predators identified were dragonfly, dragonfly nymph, gambusia fish, tadpole and frog. The study was done at the district of Petaling from 4th January, 2015 to 4th July 2015. The results show that the presence of mosquito predators hinder the breeding of *Aedes* mosquito in the ecosystem which is related to a decrease in dengue cases." (Authors)] Address: Kamaruzaman K, Dept of Environmental & Occupational Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

20636. Kathan, B. (2019): Die Libellenfauna (Insecta: Odonata) des Spitzbergs bei Tübingen unter besonderer Berücksichtigung der Arten *Sympecma fusca* (Lestidae) und *Cordulegaster bidentata* (Cordulegasteridae). Bachelorarbeit der Mathematisch-Naturwissenschaftlichen Fakultät der Eberhard Karls Universität Tübingen: 106 pp. (in German) ["Holistic mapping of the order Odonata is in itself an exceptional case. In this work, this intensive type of recording was additionally provided with a three-part focus. The study was carried out over the course of a whole year on the Spitzberg near Tübingen, a study area with little water, but nevertheless promising in terms of dragonflies. In addition to all ground-dwelling species, species that are often neglected in routine mapping and occur purely temporarily for hunting and maturing purposes were also recorded with the same intensity in the entire area. At the same time, comprehensive surveys of the species *Sympecma fusca* and *Cordulegaster bidentata* flying on the Spitzberg were carried out between March 2018 and February 2019. Both species are highly specialised and particularly complex to record, which is why their complex biology has still not been fully deciphered in detail. With regard to *S. fusca*, we investigated which areas of the Spitzberg the imagines use during the maturation period in spring and autumn, whether they overwinter in the study area and to what extent the habitat structures used during this part of the life cycle overlap. Concerning *C. bidentata*, an intensive sampling of the larval habitats, i.e. all spring rivulets in the blades of the Spitzberg, was carried out. In addition to the distribution of the larvae, their degree of association within all microhabitats of a spring rivulet was investigated. In addition, the different size classes into which all recorded individuals were divided were checked for any significant differences in their distances to the main sources of the respective streams. 19 of the total of 33 dragonfly species recorded at Spitzberg in 2018 as part of this work subjected the study area to purely temporary use, 14 species were classified as native. *S. fusca* was recorded in high abundance, numerous habitats used in autumn, winter and spring overlapped. Reproduction of the species took place both on the Spitzberg itself and in the nearby surrounding area. *C. bidentata* was recorded in high abundance in the larval stage in several sections of spring rivulets, partly syntopically with *Cordulegaster boltonii* and *Aeshna cyanea*. The majority of individuals were found living solitarily in a microhabitat, but many larvae were also associated in small groups within a microhabitat at the time of discovery. The 4 different size classes did not differ significantly in their distances from the main source." (Author/DeepL)] <https://www.researchgate.net/publication/33853->

1877_Die_Libellenfauna_Insecta_Odonata_des_Spitzbergs_unter_besonderer_Berucksichtigung_der_Arten_-Sympecma_fusca_Lestidae_und_Cordulegaster_bidentata_Cordulegasteridae] Address: Kathan, B., Loyst. 9/1, 88299 Leutkirch im Allgäu, Germany. Email: bastiankathan@web.de

20637. Kim, Y.j.; Kong, D.S. (2019): Benthic macroinvertebrates fauna of Mt. Chilbo. Korean J. Nat. Conserv. 18(1): 1-13. (in Korean, with English summary) ["Benthic macroinvertebrates fauna was investigated at the Mt. Chilbo, Gyeonggi-do, Korea, from June to October, 2019. 4 sites located around the Mt. Chilbo were selected for quantitative (surber net: 30×30cm, mesh size: 1mm) of benthic macroinvertebrates. Including qualitative sampling, total 39 species, 31 families, 12 orders, 6 classes in 4 phyla occurred. Insecta was composed of 6 species in Ephemeroptera, 4 species in Odonata [*Ischnura asiatica*, *Calopteryx atrata*, *Davidius lunatus*, *Sympetrum flaveolum*], 1 species in Hemiptera, 2 species in Coleoptera, 9 species in Diptera and 5 species in Trichoptera. Non-insecta was 12 species composed of 1 species in Platyhelminthes, 4 species in Mollusca and 2 species in Annelida 5 species in Crustacea. The dominant species and the subdominant species based on individual abundance were Chironomidae sp. and *Physa acuta* with 20.4% and 18.7% of dominance respectively. McNaughton's dominance indices, Shannon-Weaver's diversity indices, Margalef's species richness indices and Pileou's evenness indices, Kong's Benthic Macroinvertebrate indices of benthic macroinvertebrates (BMI) showed the range of 0.53~0.82, 1.27~2.76, 1.09~2.84, 0.68~0.81, and 26.6~57.9 respectively." (Authors)] Address: Kim, Ye Ji., Dept of Life Science, Kyonggi Univ., Korea

20638. Koszalka, J.; Jablonska-Bama, I. (2019): Aquatic macroinvertebrate biodiversity in freshwaters in northeastern Poland. In: The Handbook of Environmental Chemistry book series (HEC, volume 87): Polish River Basins and Lakes – Part II: 103-125. (in English) ["Biodiversity is a significant element that describes the ecological state of waterbodies. Eutrophication is a widespread problem that has an impact on water habitats and leads to the succession of sensitive species. Habitat degradation results in significant, predictable decreases in taxonomic diversity. We assessed benthic macroinvertebrate community structure (mainly families) in 9 rivers, 9 ponds, and 23 lakes in northeastern Poland. Mollusca, Annelida, Arthropoda, and Nematelminthes were the 4 phyla represented, and 76 Insecta families, 5 taxa of Crustacea, and 12 Mollusca families were identified. A total of 91 taxa (mainly families) were recorded in all of the waterbodies studied. Diptera, Trichoptera, Ephemeroptera, and Gastropoda were the major components of the benthic macroinvertebrate communities in the aquatic habitats studied. The biodiversity values of the macroinvertebrate assemblages in the rivers and lakes studied were similar. This likely resulted from the similar number of habitats in both types of waters. Differences in biodiversity among the various waterbodies could be evidence of the moderate, diversified anthropogenic pressure to which they are subjected. The analysis of similarities indicated that in terms of the benthic macroinvertebrate communities, the waterbodies studied formed three groups, which, with just one exception, consisted separately of rivers, ponds, and lakes." (Authors)] Address: Koszalka, J., Dept of Tourism, Recreation & Ecology, Faculty of Environmental Sciences Univ. of Warmia and Mazury in Olsztyn, Olsztyn, Poland

20639. Liu, Y.; Wang, Y.; Zhang, Z.; Bu, Y.; Niu, H. (2019):

Roost selection and ecology of *Stoliczka's* trident bat, *Aselliscus stoliczkanus* (Hipposideridae, Chiroptera) in China. Mammalian Biology 95: 143-149. (in English) ["Bats choose their habitats based on microclimate, structure, environment, human disturbance and availability. Selection of suitable roosts by bats can have fitness benefits by providing shelter and a place to rear young. To clarify the mechanism of habitat selection by *Stoliczka's* trident bat (*Aselliscus stoliczkanus*), roost selection, ecology and diet of this species were studied from December 2013 to September 2017 in mainland China. Ninety-six potential roosts were investigated. Of these, 73 roosts were occupied by bats, and 20 of these roosts were used by *A. stoliczkanus*. Eighteen variables related to habitat characteristics were measured, and *A. stoliczkanus* habitat preferences were evaluated using independent-samples t-tests and Chi-square tests. The major environmental factors affecting selection of roosts were determined by principal component analysis (PCA). Roosts used by *A. stoliczkanus* were significantly smaller in size than those used by other bat species, with more and narrower entrances. Hibernation roosts of *A. stoliczkanus* had relatively longer roost length, as well as lower entrances. Breeding roosts of *A. stoliczkanus* were close to the nearest water source and had more entrances, with more area covered by water. Disturbance levels were significantly higher in non-breeding roosts than that in breeding roosts, and disturbance levels were lower in hibernation roosts than non-hibernation roosts. Entrances of breeding roosts were more commonly located on sunny slopes, while entrances of hibernation roosts were more commonly located on shady slopes. Our results are the first to describe roost characteristics and habitat selection of *A. stoliczkanus*, and increase our understanding of the ecology and habitat of this species. The diet of *A. stoliczkanus* mainly includes five orders of insects, namely, Lepidoptera, Coleoptera, Hemiptera, Odonata, and Diptera, and showed clear seasonal variation from summer to autumn." (Authors)] Address: Liu, Yingying, College Life Science, Henan Normal Univ., Xinxiang, 453007, China

20640. Lounis, K. (2019): Inventaire et écologie des macroinvertébrés dans les mares temporaires de la région d'Oum El-Bouaghi (Nord-Est algérien). Thèse Présentée en vue de l'obtention du doctorat LMD, Université Larbi Ben M'hidi Oum El Bouaghi, Faculté Des Sciences Exactes et des Sciences de la Nature et de la Vie, Département des Sciences de la Nature et de la Vie: 117 pp. (in French, with English summary) ["This work aims to conduct a systematic study of the macroinvertebrate species of seventeen temporary pools south of Oum El Bouaghi, in order to bring a contribution to the knowledge of the entomofauna of these ephemeral ecosystems which is not well known and analyze their waters for better characterize their environment where 18 physicochemical parameters were analyzed. Faunal samples were harvested using a surgeon net. Identification of organisms was done using the determination keys (Dejoux et al., 1981; Tachet et al., 2002) and digital keys. The results of the physicochemical analyzes carried out on the 17 stations revealed that the temperature of the water varies between 12.6 °C and 20.3 °C, with an average of 17.36 ± 2.13 °C, the pH of the waters varies between 6.45 and 8.48, with an average of 7.34 ± 0.54. The dissolved oxygen showed an average of 5.81 ± 0.66mg / l and the electrical conductivity of the waters of the region is large and varies between 966 and 1055 µS.cm⁻¹, with an average value of 1012.1 ± 20.17 µS.cm⁻¹. For pollution elements, only nitrates can present a serious contamination. Faunistic analysis has identified 11 orders, 31 families and 47 species

of which 39 are constant, 7 ubiquitous and only one accessory. The number of benthic population showed that Beetles are the largest numerically important ecological group (41.94%), followed by odonates with 9.68%, followed by orders from Amphipods and Basommatophores with 6.45%, while other orders represent only 3.22% each." (Author)] <http://bib.univ-oeb.dz:8080/jspui/handle/123456789/9115>

20641. Mohamed, M.; Noor-Izwan, A.; Kemalok, J.; Zakaria, M.Z.; Aziz, M.A.A.A.; Hamdin, M.S.; Ismail, N.; Subadi, N.M. (2019): Insects of Taman Negara Johor Tanjung Piai: A Ramsar site. *Journal of Wildlife and Parks* 34: 53-62. (in English) ["Tanjung Piai, located in Pontian district, forms the southernmost point of mainland Asia. This wetland area has been classified as one of six RAMSAR sites in Malaysia. This study was performed to record the number of insect fauna that can be found in the area. The focus was on three main insect groups: ants, butterflies, and odonates. The collection was conducted using general collection methods, namely baited traps and sweep netting. Overall, 36 species of insects from the three main groups were recorded. Formicidae recorded the highest number of species (21), followed by Odonata with nine species and butterflies with six. The low number of insects collected was due to the comparatively low diversity of vegetation and poor accessibility. The conditions of the waterlogged area limited the sampling collection process. Nevertheless, this is the first attempt to record insect species at Taman Negara Johor Tanjung Piai.... The present assemblage of odonate species sampled from Tanjung Piai shows common flowing stream species; they could be using freshwater bodies around the park as their breeding and foraging ground, as no species are known to live in salty or brackish water. As Tanjung Piai is open to the sea, with relatively few freshwater bodies, the diversity among odonates was also poor. The most common species found in this area were *Orthetrum sabina* and *Orthetrum chrysis*, while there were no signs of damselflies in the area during the survey." (Authors)] Address: Mohamed, M., Centre of Research on Sustainable Uses of Natural Resources (CoR-SUNR), Faculty of Applied Science and Technology Universiti Tun Hussein Onn Malaysia, Pahang Campus, KM 1, Jalan Panchor, 84000 Muar, Johor. E-mail: maryati@uthm.edu.my

20642. Moratin, R.; Dabry, J.; Teroi, V. (Coord.) (2019): Atlas préliminaire des Odonates du Grand Est. Faune Grand Est documents n°1: 93 pp. (in French) [The odonate fauna of northeastern France in the Lorraine and Alsace regions is mapped.] Address: https://www.odonat-grandest.fr/telechargements/FauneGrandEst/FauneGrandEst_documents/FGEdoc1_atlas_odonata_GrandEst.pdf

20643. Müller, Z.; Szabó, T.; Gáspár, A.; Juhász, P.; Ludányi, M.; Málnás, K.; Mihaliczku, E.; Olajos, P.; Polyák, L.; Kiss. (2019): Contribution to the Hungarian dragonfly fauna, based on the nationwide surveys (Odonata: Anisoptera). *Folia Historico-Naturalia Musei Matraensis* 43: 33-80. (in English) ["Between 1996 and 2017 dragonfly larvae, exuviae and imagoes were collected from 1846 different sampling locations in Hungary. The published 38 species of Anisoptera belong to 5 families (10 Aeshnidae, 2 Cordulegasteridae, 4 Gomphidae, 4 Corduliidae and 18 Libellulidae). Larval data for the following species are the most important faunistic results: *Aeshna viridis*, *Anax ephippiger*, *Cordulegaster bidentata*, *C. heros*, *Leucorrhinia caudalis* and *L. pectoralis*." (Authors)] Address: Müller, Z., BioAqua Pro Ltd., 4032 Debrecen, Hungary, Soó Rezső u. 21. Email: mullerz@bioaquapro.hu

20644. Ramamonjisoa, N.; Nakanishi, K.; Natuhara, Y. (2019): The efficacy of a generalized antipredator defense against a novel predator depends on the source of induction in prey. *Hydrobiologia* 836: 197-205. (in English) ["Ecological naiveté or the failure to recognize a novel enemy is often put forward as a cause of extirpation of biodiversity in newly invaded systems. We tested the efficacy of a generalized antipredator defense, namely reduced activity level, in the tadpoles of *Rhacophorus arboreus* to the threat of the invasive predator red swamp crayfish *Procambarus clarkii* in simplified laboratory environments. We first investigated the behavioral responses of the tadpoles in the presence of caged fed predators (native: dragonfly larvae and newts, and novel *P. clarkii*), and subsequently tested the vulnerability of predator-induced tadpoles to free-ranging predators. The tadpoles reduced activity level in the presence of the native predators but did not recognize the crayfish. Reducing activity level increased survival in the presence of native predators. This behavior was still effective in the presence of crayfish, but survivorship varied with the identity of the native predator from which the tadpoles received induction cues: tadpoles that were previously exposed to dragonfly larvae noticeably survived better than those previously induced by newts. Our findings suggest that naive prey may exploit information from native predators to better resist the threat of novel predators, but not all sources of induction confer the same benefit." (Authors)] Address: Ramamonjisoa, N., Graduate School of Science, Kyoto Univ., Kyoto, 606-8501, Japan

20645. Rhainds, M. (2019): Ecology of female mating failure/lifelong virginity: a review of causal mechanisms in insects and arachnids. *Entomologia Experimentalis et Applicata* 167: 73-84. (in hermaphroditism, Lampyridae, mating cost, neoteny syndrome, population density effects, precopulatory cannibalism, scaling inversion, sex role reversal, Strepsiptera, wallflowers) ["Sexual reproduction implies binary outcomes of competitive interactions for access to male gametes: lifelong virgin females with null fitness vs. mated females with variable (generally nonzero) fitness. Female mating failure has long remained a dormant concept in sexual selection theory in part because it is acutely maladaptive (lifelong virgins that do not reproduce are strongly selected against) and also due to widespread acceptance of the Bateman–Trivers paradigm (anisogamy and correlated sex roles). Based on recent scientific output on lifelong virginity across multiple taxonomic groups in insects (Coleoptera, Diptera, Hemiptera, Lepidoptera, Odonata, Orthoptera, Strepsiptera), female mating failure has become a mainstay of sexual selection over the last decade. Lifelong virginity and senescence (death) are intertwined processes; old virgin females compensate for increased risk of lifelong virginity by becoming less choosy and increasing investment in mating-related activities. Low rates of female lifelong virginity (<5%) in most natural populations of insects indicate that sex generally 'works' due to selective pressures acting on both males and females to enhance lifetime fitness. Mating failures are most common in insects with female flightlessness; these pressures may lead in evolutionary time to transitional pathways from sexual reproduction to parthenogenesis. Female mating probability is affected by nonlinear density-dependent processes dependent upon the scale of observation (mate-encounter Allee effect at large spatial scales, mating interferences between females at small scales). Mate choice and sex role reversal (females being the active sexual partner) are ubiquitous in insects and arachnids with significant paternal investment, but consequences

in terms of female lifelong virginity remain unknown. Logistically, conceptual development of female mating failure in insects is most limited by the lack of broadly applicable methods to assess rates of lifetime virginity among flighted females." (Authors)] Address: Rhainds, M., Natural Resources Canada, Canadian Forest Service – Atlantic Forestry Centre, 1350 Regent St, PO Box 4000, Fredericton, New Brunswick, E3B 5PT, Canada. E-mail: marc.rhainds@canada.ca

20646. Rodrigues, M.E.; Moura, E.B.; Roque, F.O. (2019): Dragonflies as indicators of the environmental conditions of veredas in a region of Central-Western Brazil. *Oecologia Australis* 23(4): 969-978. (in English) ["Veredas (palm swamps) play a critical role in maintaining the hydrological system and they are considered the cradle of the waters of the Brazilian Cerrado. Currently, veredas are suffering intense human pressure due to the conversion of native landscapes for other land uses as agriculture, pasture and urban environments. Few studies have evaluated the biodiversity of veredas and the current effects of human impact, especially on aquatic communities. Odonata have excelled as bioindicators of environmental quality and they are increasingly used in environmental monitoring programs. In this study, we evaluate whether loss of riparian vegetation around the vereda areas alters the communities of Odonata and whether the species can be considered bioindicators of these environmental conditions. Our hypothesis is that eco-physiological and behavioral characteristics, such as thermoregulation capacity and oviposition behavior, influence the persistence of species in communities in natural or altered environments. We sampled 25 veredas and classified them into two groups, namely "preserved riparian vegetation" (VRP), when the riparian vegetation surrounding the sampled stretch was 30 meters or more, and "altered riparian vegetation" (VRA), when the vegetation extended for less than 30 meters from at least one of the banks. Our results showed that the composition of the communities in areas classified as VRP was more similar to each other and different from the communities found in the areas classified as VRA. Of the 52 species observed, 11 species responded as indicators for preserved or altered riparian vegetation. Of these species, four were indicative of areas with preserved riparian vegetation and seven were indicative of veredas with altered riparian vegetation. Our results show that the composition of dragonflies and damselflies, and some taxa in particular may be potential indicators of the condition of veredas, and may, therefore, be included in vereda monitoring programs in Central-Western Brazil." (Authors)] Address: Rodrigues, M.E., Univ. Estadual de Santa Cruz, Depto de Ciências Biológicas, Programa de Pós-graduação em Sistemas, Aquáticos Tropicais, Lab. de Organismos Aquáticos, Rod. Jorge Amado, Km 16, CEP 45662-900, Ilhéus, BA, Brazil. E-mail: rodrigues.mbio@gmail.com

20647. Sinaei, M.; Loghmani, M. (2019): Plankton and aquatic insect biodiversity in the Sarbaz River, Southeastern Iran. *Indian Journal of Geo Marine Sciences* 48(12): 1907-1915. (in English) ["Studying plankton community and determining the trends in river pollution are of great value and importance. In the present work, plankton and aquatic insect community were evaluated in 10 sites along the Sarbaz River in southeastern Iran. Among the species identified, *Navicula* has the highest incidence with five species. The highest frequency and density belongs to the ciliates group. Results indicate that the studied environment has a poor planktonic diversity and density. Results suggested that a decrease in plankton communities could be one of

the factors influencing reductions in mugger crocodile (*C. palustris*) hatchling survival. Moreover, it was found that dominant populations of aquatic insects are susceptible to organic pollutants with tolerating levels of 0 to 4 from Diptera, Ephemeroptera, Trichoptera, Ephemerehidae, Hemiptera, Odonata ["Aeshnidae, Calopterygidae"] orders. Moreover, an increase is noted in the Family Biotic Index (FBI) in downstream sites, suggesting a decrease in water quality compared with other sites." (Authors)] Address: Sinaei, M., Dept of fisheries, Chabahar branch, Islamic Azad Univ., Chabahar, Iran. E-mail: oceanography.sina@gmail.com

20648. Su, X.; Zhang, K.; Zheng, J.; Zhang, J.; Zhao, Y. (2019): Numerical investigations on high lift force generation of 3D dragonfly wing during hovering motions. *IOP Conf. Series: Materials Science and Engineering* 616 (2019) 012005. doi:10.1088/1757-899X/616/1/012005: (in English) ["In the paper, a novel numerical method is present to numerically investigate life force generation mechanisms of 3D dragonfly wing during hovering motions. The dynamic mesh which describes the motion of 3D wing and gird change in inner computational domain is generated by an ALE model we developed. Then the mesh is transferred at each time step into ANSYS CFX using Junction Box Routine. The simulation results show that a high lift force generated by implementing one specified advanced flapping action during hovering motion in which the translation time period of downstroke is shortened." (Authors)] Address: Su, X., School of Hydraulic Engineering, Dalian Univ. of Technology, Dalian 116024, China. Email: zcx@mail.dlut.edu.cn

20649. Svensson, E.I. (2019): Eco-evolutionary dynamics of sexual selection and sexual conflict. *Functional Ecology* 33: 60-72. (in English) ["1. The research framework of eco-evolutionary dynamics is increasing in popularity, as revealed by a steady stream of review articles and a recent and influential book, but primary empirical research is lagging behind. Moreover, the few empirical case studies demonstrating eco-evolutionary dynamics might not be entirely representative. 2. Much current research on eco-evolutionary dynamics is focused on how ecological interactions lead to natural selection on phenotypic traits "eco-evo", and in turn how the evolutionary change in such traits feed back on ecological dynamics ("evo-eco"). A key feature of eco-evolutionary dynamics is thus a feedback loop between ecology (e.g., population dynamics) and evolution (i.e., genetic change). 3. In contrast to previous research on eco-evolutionary dynamics driven by natural selection, the role of eco-evolutionary feedbacks in sexual selection and sexual conflict is largely unknown. Here, I review theory and the limited empirical evidence in this area and identify some promising future lines of research. 4. I update a past review on contemporary evolution of secondary sexual traits in natural populations and formulate six explicit and rigorous criteria for contemporary evolution of secondary sexual traits by natural or sexual selection or sexual conflict. I then discuss the other key prediction of eco-evolutionary dynamics (i.e., evolution by sexual selection or sexual conflict shapes ecological dynamics). My overview reveals that our current knowledge in this area is limited and mainly come from theoretical models and laboratory experiments. 5. A major challenge in eco-evolutionary dynamics is therefore to link ecological and population dynamics with sexual selection and sexual conflict. This is not an easy task but might be possible with carefully chosen study systems and methods." (Authors)] Address: Svensson, E.I., Evolutionary Ecology Unit, Dept of Biol., Lund Univ., Lund, Sweden. Email: erik.svensson@biol.lu.se

20650. Torralba Burrial, A. (2019): In Memoriam Francisco Javier Ocharan Larrondo (1946-2019). Boln. Asoc. esp. Ent. 43(3-4): V-XX. (in Spanish) [Obituary. https://www.researchgate.net/publication/338854682_In_Memoriam_Francisco_Javier_Ocharan_Larrondo_19_46-2019] Address: Torralba Burrial, A., Dpto. Ciencias de la Educación - Universidad de Oviedo - Oviedo, Spain. E-mail: torralbaantonio@uniovi.es

20651. Weathered, J.; Hammill, E. (2019): Adaptation to agricultural pesticides may allow mosquitoes to avoid predators and colonize novel ecosystems. *Oecologia* 190(1): 219-227. (in English) ["Human activities such as the application of agrochemicals may detrimentally disturb natural ecosystems, generating novel selection pressures. Here we examine how pesticides may influence community composition using the aquatic communities within bromeliad phytotelmata, and how adaptive responses to pesticides may influence community-level patterns. We first quantified the composition of macroinvertebrate communities from pesticide-free and pesticide-exposed locations. Complementary manipulative experiments where bromeliads were transplanted between pesticide-free and pesticide-exposed sites were then performed. Finally, pesticide bioassays on the most common predators (*Mecistogaster modesta* damselflies) and prey (*Wyeomyia abebela* mosquitoes) assessed a potential evolutionary mechanism that may influence community compositional differences. Our field survey revealed differences in *W. abebela* and *M. modesta* abundances between pesticide-free and pesticide-exposed areas. Our transplant experiment suggested compositional differences were not due to physical differences between bromeliads from different locations. Pesticide bioassays revealed that *M. modesta* from pesticide-free locations had higher innate pesticide tolerances than *W. abebela* from pesticide-free areas, but *M. modesta* larvae showed no evidence of adapted resistance as none were found where pesticides were used. Conversely, *W. abebela* larvae from pesticide-exposed locations had higher pesticide tolerances than individuals from pesticide-free sites, suggesting an adaptive response. This evolved resistance to pesticides may, therefore, allow *W. abebela* to colonize habitats free of the dominant predator in the system, explaining the higher *W. abebela* abundances in pesticide-exposed areas than in pesticide-free locations. We suggest that the total effect of novel stressors is driven by interactions between ecological and evolutionary processes." (Authors)] Address: Hammill, E., Dept Watershed Scienc. & Ecol. Center, Utah State Univ., Logan, Utah, 84341, USA. E-mail: edd.hammill@usu.edu

20652. Zou, P.-Y.; Lai, Y.-H.; Yang, J.-T. (2019): Effect of phase lag on hovering flight of damselflies and dragonflies. *Physical Review E* 100, 063102: 14 pp. (in English) ["In this work we studied the differences in flight kinematics and aerodynamics that could relate to differences in wing morphologies of a dragonfly and a damselfly. The damselflies and dragonflies normally fly with the fore wing or hind wing in the lead, respectively. The wing of the damselfly is petiolate, which means that the wing root is narrower than that of the dragonfly. The influence of the biological morphology between the damselfly and the dragonfly on their hovering strategies is worthy of clarification. The flight motions of damselflies and dragonflies in hovering were recorded with two high-speed cameras; we analyzed the differences between their hovering motions using computational fluid dynamics. The distinct mechanisms of the hovering flight of damselflies (*Matrona cyanoptera*) and dragonflies (*Neurothemis ramburii*) with different phase lags between fore and hind wings

were deduced. The results of a comparison of the differences of wing phases in hovering showed that the rotational effect has an important role in the aerodynamics; the interactions between fore and hind wings greatly affect their vortex structure and flight performance. The wake of a damselfly sheds smoothly because of slender petiolation; a vertical force is generated steadily during the stage of wing translation. Damselflies hover with a longer translational phase and a larger flapping amplitude. In contrast, the root vortex of a dragonfly impedes the shedding of wake vortices in the upstroke, which results in the loss of a vertical force; the dragonfly hence hovers with a large amplitude of wing rotation. These species of Odonata insects developed varied hovering strategies to fit their distinct biological morphologies." (Authors)] Address: Yang, J.-T., Dept of Engineering Science & Ocean Engineering, National Taiwan Univ., 10617 Taipei, Taiwan. Email: jtyang@ntu.edu.tw

2020

20653. Aksenova, O.V.; Potapov, G.S.; Bepalaya, Y.V.; Kolosova, Y.S.; Vikhrev, I.V.; Kondakov, A.V.; Gofarov, M. Yu.; Bolotov, I.N. (2020): Dragonflies from hot springs in Russia with a country-level checklist of species known to occur in geothermal environments. *Ecologica Montenegrina* 34: 49-63. (in English) ["Geothermal springs are known to harbor unusual assemblages of Odonata worldwide. A review of original records and the body of available literature revealed that 27 Odonata species were recorded from hot springs in Russia so far and that the successful larval development in geothermal environments was discovered for 17 species. Among them, four species exclusively inhabit hot springs, i.e. *Mnais costalis*, *Anotogaster sieboldii*, *Orthetrum melania* (Kunashir Island), and *O. albistylum* (Eastern Siberia). In Russia, these southern species are unable to develop beyond geothermally heated water bodies due to cold climate, and they exist as local geothermal populations there. Here, we report on several novel records of Odonata species from geothermal springs in eastern Russia. Four species were recorded on the Kunashir Island (Kurile Archipelago): *Mnais costalis* (adults), *Anotogaster sieboldii* (adults and larvae), *Orthetrum melania* (adults), and *Symphetrum pedemontanum elatum* (adults and larvae). Two species were found in the Kamchatka Peninsula, i.e. *Libellula quadrimaculata* (freshly emerged imago and exuvia) and *Aeshna juncea* (larvae). To explain the origin of isolated geothermal populations of Odonata, three alternative hypotheses can be proposed as follows: (1) pre-glacial relicts; (2) mid-Holocene relicts (since the Holocene Climate Optimum); and (3) recent (late Holocene) populations founded by long-distance dispersal events. These scenarios are yet to be tested by means of a molecular approach." (Authors)] Address: Potapov, G.S., N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences, Northern Dvina Emb. 23, 163000, Arkhangelsk, Russia. E-mail: grigorij-potapov@yandex.ru

20654. Allamuratovich, M.M.; Danabaevich, S.A.; Faizievich, I.K.; Azadovna, B.S.; Nurlibay, M. (2020): Macrozoobenthos of lakes of Uzbekistan. *National Association of Scientists (NAU)* 58: 9-13. (in English, with Russian summary) ["Species composition of macrozoobenthos of 6 lakes from different regions (north, center, south) of the republic have been studied. Total 111 species of bottom animals have been recorded. List of dominant species is presented. Using coefficient of Sørensen-Czekanowski similarity of species composition of macrozoobenthos of the lakes studied have been determined." (Authors)] The list of taxa includes *Anax*

imperator.] Address: Allamuratovich, M.M., Karakalpak State Univ., Nukus, Uzbekistan

20655. Baeta, R.; (ANEPE CAUDALIS) (2020): Suivi diachronique des populations ligériennes de *Stylurus flavipes* et d'*Ophiogomphus cecilia* en région Centre Val-de-Loire (Saison 2019 – Cinquième année de suivi à l'échelle régionale). Association Naturaliste d'Étude et de Protection des Écosystèmes CAUDALIS / DREAL Centre Val de Loire: 17 pp. (in French) ["In 2019, the 43 grids surveyed are spread over more than 300 km of the Loire and correspond to a cumulative surveyed length, all sessions combined, of 35 km of banks. The regional database for the 2019 season thus contains information on 6,501 exuviae collected and identified, of which 6,496 concern three species (Fig. 2). On the scale of the grids *Onychogomphus forcipatus* was contacted on 42 of the 43 grids surveyed, *Ophiogomphus cecilia* on 36 and *Stylurus flavipes* on 6. The very sharp decline observed in this species in 2018 (Baeta, 2018) has therefore continued in 2019. At this stage, it is becoming relatively worrying. The differences between species are even more marked if we look at the transects. Thus, only 8 out of 521 transects (1.5%) were validated for *Stylurus flavipes*, whereas 126 were validated for *Ophiogomphus cecilia* (24%) and 340 for *Onychogomphus forcipatus* (65%). However, these relative abundances vary between Depts (Fig. 3) and depend on the upstream-downstream position of the surveyed grids (see maps in the appendix). A summary of the raw data collected by ANEPE Caudalis on the 8 grids monitored in Indre-et-Loire in 2019 is presented in the appendix in the form of 2 tables (Tab. SI & SII). All the data have been transferred in SINP format to the DREAL Centre Val de Loire." (Author/DeepL)] Address: Baeta, R., Animateur du Plan régional d'actions en faveur des Odonates en Centre-Val de Loire, association naturaliste d'étude et de protection des écosystèmes "Caudalis", 1 rue de la Mairie 37520 La Riche - Courriel, France. Email: renaud.baeta@anepe-caudalis.fr

20656. Bogan, M.T.; Eppehimer, D.; Hamdhani, H.; Hollien, K. (2020): If you build it, they will come: rapid colonization by dragonflies in a new effluent-dependent river reach. *PeerJ* 8:e9856 <https://doi.org/10.7717/peerj.9856>: 19 pp. (in English) ["Background: Aquatic ecosystems are greatly altered by urban development, including the complete loss of natural habitat due to water diversions or channel burial. However, novel freshwater habitats also are created in cities, such as effluent-dependent streams that rely on treated wastewater for flow. It is unclear how diverse these novel ecosystems are, or how quickly aquatic species are able to colonize them. In this study, we (1) quantify odonate (Insecta, Odonata) colonization of a novel effluent-dependent river reach, (2) examine how drying events affect odonates in these novel habitats, and (3) explore whether effluent-dependent streams can support diverse odonate assemblages. Methods: We conducted monthly odonate surveys at three sites along the Santa Cruz River (Tucson, AZ, USA) between June 2019 and May 2020. One site was in a long-established effluent-dependent reach (flowing since the 1970s) that served as a reference site and two sites were in a newly-established reach that began flowing on June 24, 2019 (it was previously dry). We compared odonate species richness, assemblage composition, and colonization patterns across these reaches, and examined how these factors responded to flow cessation events in the new reach. Results: Seven odonate species were observed at the study sites in the new reach within hours of flow initiation, and species rapidly continued to arrive thereafter. Within 3

months, species richness and assemblage composition of adult odonates were indistinguishable in the new and reference reaches. However, drying events resulted in short-term and chronic reductions in species richness at one of the sites. Across all three sites, we found over 50 odonate species, which represent nearly 40% of species known from the state of Arizona. Discussion: Odonates were surprisingly diverse in the effluent-dependent Santa Cruz River and rapidly colonized a newly established reach. Richness levels remained high at study sites that did not experience drying events. These results suggest that consistent discharge of high-quality effluent into dry streambeds can be an important tool for promoting urban biodiversity. However, it remains to be seen how quickly and effectively less vagile taxa (e.g., mayflies, caddisflies) can colonize novel reaches. Effluent-dependent urban streams will always be highly managed systems, but collaboration between ecologists and urban planners could help to maximize aquatic biodiversity while still achieving goals of public safety and urban development." (Authors)] Address: Bogan, M.T., School of Natural Resources and the Environment, Univ. of Arizona, Tucson, AZ, USA. Email: mbogan@email.arizona.edu

20657. Bora, A.; Meitei, L.R.; Bhowmik, S. (2020): Odonate diversity of Nongkhyllem wildlife sanctuary, Ri-bhoi district, Meghalaya, India. *Journal of Entomological Research* 44(1): 125-130. (in English) ["During studies on Odonate diversity of Nongkhyllem Wildlife Sanctuary from 2016 to 2017 a total of 58 species belonging to two sub-orders, 10 families, and 37 genera were recorded. This included 35 species of Anisoptera and 23 species of Zygoptera. Three species (*Disparoneura apicalis*, *Agriocnemis kalinga* and *Calicnemia erythromelas*) are new additions to the odonate fauna of Meghalaya. The genus *Orthetrum* was found to be the most dominant genera contributing five species. Being legally protected under state legislation, the sanctuary faces low levels of human interference and anthropogenic activities." (Authors)] Address: Bora Atanu, 2 No. Sorupather, Bishnupur, Moranhat, P.O.: Moranhat, Charaideo-785 670, Assam, India, Email: atanubora47@vahoo.com

20658. Figueiró, R.; Silva dos Santos, S.; Docile, T.N.; Rodrigues da Costa, T.; Ferreira, C.; Gil-Azevedo, L.H. (2020): Preliminary observations on the patterns of co-occurrence of Black fly (Diptera: Simuliidae) larvae and some of their potential macroinvertebrate predators. *Revista Brasileira de Entomologia* 64(3) São Paulo 2020 Epub Sep 04, 2020: 6 pp. (in English) ["Biotic factors such as predation, although important drivers of the black fly community, are rarely investigated in the literature. This study aimed to test the hypothesis that the patterns of co-occurrence of black fly larvae and its potential predators is not random and that there is a correlation between its frequencies and Simuliidae larvae abundances. Larvae were sampled from two localities in the Pedra Branca State Park, Rio de Janeiro, Brazil, during the dry season in June 2018. We collected *Simulium pertinax* Kollar, 1832, *Simulium subpallidum* Lutz, 1910, *Simulium* (*Inaequalium*) sp., *Simulium* (*Psaroniocompsa*) sp. and *Simulium* (*Trichodagmia*) sp. The predators families present were Perlidae, Hydropsychidae, Leptoceridae, Libellulidae and Chironomidae. The null models showed that species co-occurred significantly more than expected by chance. The canonical correlation analyses for the Vargem Grande and Pau da Fome areas area showed a significant relationship between black fly abundances and predator abundances. In Vargem Grande the abundance of Chironomidae showed a highly significant positive correlation to *S.* (*Psaroniocompsa*) sp., while Hydropsychidae was significantly correlated to

Simulium sp. On the other hand, in Pau da Fome Libellulidae was significantly correlated to *S. (Psaroniocompsa)* sp. and Simulium sp. and Chironomidae correlated significantly to Simulium sp. The result is consistent with what would be expected of organisms that exercise mutual population regulation, although other factors than biotic interactions may be causing these patterns. However the lack of mechanistic evidences on the effect of biotic interactions on black fly populations pose a challenge on the understanding of these patterns." (Authors)] Address: Figueiró, R., Fundação Centro Univ. Estadual da Zona Oeste (UEZO), Rio de Janeiro, RJ, Brasil. E-mail: ronaldofigueiro@gmail.com

20659. Haring, E.; Fischer, I.; Sittenthaler, M.; Chovanec, A.; Szucsich, N.; Sattmann, H.; Wolf, P. (2020): Die Libellenfauna Wiens: Erhebungen und Erfassung mittels DNA-Barcoding unter besonderer Berücksichtigung der FFH-Arten Cordulegaster heros und Leucorrhinia pectoralis. Endbericht zum LE-Projekt: 63 pp. (in German) ["The subject of the project was the survey and recording of the dragonfly fauna in the rural areas of Vienna. Both traditional survey methods and molecular genetic methods (DNA barcoding, environmental DNA barcoding) were used. In the course of the surveys, a total of 95 sites at 42 water bodies were investigated. In the process, 48 dragonfly species were detected, which corresponds to 77% of the Viennese and 62% of the Austrian dragonfly fauna. Particularly noteworthy is the first record of *Leucorrhinia albifrons* for Vienna. The species is "threatened with extinction" in Austria and was detected in the Lobau. Of the 48 species, 26 are listed in endangerment categories according to the Austrian Red List. Five of the detected species are listed in the Annexes of the Habitats Directive. Special attention was paid to the two Habitats Directive species, *Cordulegaster heros* and *Leucorrhinia pectoralis*. *C. heros* was found at 15 of a total of 17 watercourses surveyed in the Lainzer Tiergarten and Wienerwald, *L. pectoralis* at three of 14 watercourses surveyed in the Lobau. In the course of the surveys, 198 individuals from 45 species were collected. Tissue samples of these animals were used to record species-specific gene segments, so-called DNA barcodes, for the creation of a DNA reference database. Based on this reference database, a molecular genetic identification method for dragonfly exuviae of all Central European dragonfly families was established within the framework of the project and tested with 85 exuviae. For 83 of them it was possible to determine them by means of species-specific DNA barcodes. For the eDNA pilot study, filtrates from 103 water samples served as DNA source. The method was established for the detection of a total of five dragonfly species (*C. heros*, *L. pectoralis*, *Calopteryx virgo*, *Erythromma viridulum* and *Sympetrum sanguineum*). At least one of the five species was detected via eDNA barcoding in 25 of 43 field samples processed in the project." (Authors)] Address: Chovanec, A., c/o Umweltbundesamt, Spittelauer Lände 5, A-1090 Wien, Austria. E-mail: chovanec@ubavie.gv.at

20660. Hastings, B.; Jackson, B. (2020): Analyzing the flight patterns and behavior of dragonflies engaged in aerial territory battles. <https://digitalcommons.longwood.edu/cgi/viewcontent.cgi?article=1175&context=springshowcase>: (in English) ["It has previously been determined that male dragonflies occupying the most suitable territory within a habitat have a higher flight-muscle ratio (FMR) than those occupying poor territories, but it is unknown how this increased FMR relates to their flight patterns. This study examined the flight patterns of dragonflies engaged in aerial territory battles to investigate differences in maneuverability between

winners and losers. 3D video data of dragonflies interacting in a natural habitat was analyzed for territorial flights. Winners showed a lower maximum angular velocity compared to losers." (Authors)] Address: Hastings, B., Longwood Univ., USA. Email: Brandon.hastings@live.longwood.edu

20661. Huda, K.A. & Dhia, K.K. (2020): Effect of some environmental factors on the density of Odonata naiads in the temporary ponds of Basrah Province, South of Iraq. *Journal of Basrah Researches (Sciences)* 46(1): 110-121. (in English, with Arabian summary) ["The environmental effects of some factors (temperature, salinity, pH and dissolve oxygen) were studied to determine the monthly changes on the density of Odonata naiads in three temporary ponds: St.1- Abu Gosra, St.2- Al-Masehab and St.3-Al-Jilal, in Basrah Province, South of Iraq, during the period from December 2017 to November 2018. The results show that the total density of naiads was significantly positive correlation ($p < 0.01$) with temperature and salinity, whereas it significantly negative correlation ($p < 0.01$) with pH and dissolve oxygen. The highest density 124 ind./ m³ was recorded for Anisoptera in February at St.2 and 70 ind./ m³ for Zygoptera in April at St.1, while the lowest density was 3 and 2 ind./m³ were recorded for Anisoptera and Zygoptera in June at St.1 respectively. Temperature recorded a significant ($P < 0.05$) variation, the air temperature ranged between 14- 46 ° C and the water temperature ranged between 12-38° C. The highest value of salinity reached 14 g / L in October at St.2, while the lowest values reached 1.2 g / l during November at St.3, pH values were ranged between 4.5 -8.2 in July at St.1 and in October at St.3 respectively, and the values of dissolved oxygen were ranged between 0.8- 10 mg / l in July at St.1 and January at St.3 respectively." (Authors)] Address: Huda, K.A., Dept of Marine Biology / Marine Science Center / Univ. Basrah, Iraq. Email: hudamcs@yahoo.com

20662. Janssens, L.; Stoks, R. (2020): Oxidative stress mediates rapid compensatory growth and its costs. *Functional Ecology* 34(10): 2087-2097. (in English) ["1. While oxidative stress has been hypothesized to function both as a constraint on and a cost of growth, its mediatory role in shaping life history is still highly debated. Empirical studies about the role of oxidative stress in shaping growth responses and the associated costs are scarce and the two hypotheses have never been combined in one study. 2. By directly manipulating oxidative stress we tested its role in determining compensatory growth responses and the associated costs in *Lestes viridis*. We reduced oxidative stress levels using the mitochondrial uncoupler 2,4-dinitrophenol (DNP). To induce a compensatory growth response, half of the larvae in each oxidant treatment was exposed to a transient starvation period, after which food was present ad libitum. 3. As expected, the transient starvation period induced a compensatory growth response, which was associated with increased oxidative damage and costs in terms of performance (reduced escape swimming speed) and physiology (reduced fat content). As expected, DNP exposure reduced oxidative stress and this resulted in the strongest compensatory growth response without any apparent costs and no increase in oxidative damage. 4. By directly downregulating oxidative stress, our results are consistent with the hypothesis that the level of oxidative stress predictably determines the degree of the compensatory growth response and its associated costs. Our data therefore suggest a mediatory role of oxidative stress in shaping life history." (Authors)] Address: Janssens, Lizanne, Debérotstraat 32, 3000 Leuven, Belgium. E-mail: lizanne.janssens@kuleuven.be

20663. Lamouille-Hébert, M. (coord.), (2020): Atlas des Odonates de Haute-Savoie. 53 pp. (in French) [https://www-researchgate.net/publication/351483183_Atlas_of_the_Haute-Savoie_Dragonflies_and_Damselflies] Address: Lamouille-Hébert, Marie, EPHE - École pratique des hautes études, 4-14 Rue Ferrus, 75014 Paris, France. Email: marie.hebert@frapna.org

20664. Lamouille-Hébert, M. (2020): Impact du changement climatique sur la future distribution des espèces d'Odonates boréo-alpins: exemple dans la région de Chamonix (Haute-Savoie). Ministère de l'enseignement supérieur et de la recherche École Pratique des Hautes Études, Sciences de la Vie et de la Terre, Mémoire: 113 pp. (in French) ["In the context of the current biodiversity crisis, many species are threatened with extinction or have disappeared due to the degradation or disappearance of their habitats as a result of direct or indirect anthropogenic pressures (developments, discharges). The most vulnerable species are specialists whose habitats are rare and threatened. This is the case for stenothermic species in high altitude wetlands. Climate change is a threat to these isolated species, which, with the displacement of competing eurothermic species, see their habitats colonised by other species and do not always have the capacity to move or the possibility of finding habitats that are favourable to them at higher altitudes. To better understand, anticipate and mitigate the impacts of climate change on specialised mountain species, we studied between 2017 and 2019 in the Chamonix region, the current and future potential distributions of six boreo-alpine Odonata species: *Aeshna caerulea*, *Aeshna juncea*, *Somatochlora alpestris*, *Somatochlora arctica*, *Leucorrhinia dubia* and *Coenagrion hastulatum* in 125 wetlands above 1900 meters. Before studying these distributions, using this sample of wetlands representative of the study area, we demonstrated that only 79% of the high altitude wetlands are known in the area: small wetlands are often missing. Secondly, in order to maximise the probability of detection of species in this sample, we set up and compared different detection methods: three based on morphological identification of species (larva, adult, exuviae) and metabarcoding (environmental DNA analysis method). Combinations of methods have allowed for some species to reach detection probabilities higher than 0.9 or even equal to 1. Based on the detection probabilities and the distribution of known wetlands, we have built models to predict the current and future distributions of the species and to identify areas of conservation concern: the species have the upper limit of their distribution range which potentially rises by an average of 288 metres in altitude between 2020 and 2100 (3.6m/year). The results obtained demonstrate the need for better knowledge and protection of the habitats of rare and threatened specialist species, in order to propose courses of action and monitoring programmes adapted to the species and to high altitude wetlands. Deploying this research by taking into account this group, but also different groups of species that respond differently to environmental constraints, on a larger scale than the Chamonix region, would be necessary for the effective preservation of wetlands and biodiversity at altitude." Translated with www.DeepL.com/Translator (free version) <https://hal-ephe.archives-ouvertes.fr/hal-03080122>] Address: Lamouille-Hébert, Marie, EPHE - École pratique des hautes études, 4-14 Rue Ferrus, 75014 Paris, France. Email: marie.hebert@frapna.org

20665. Min, J.-K.; Kong, D.-S. (2020): Distribution patterns of benthic macroinvertebrate communities based on multispatial-scale environmental variables in the river systems

of Republic of Korea. *Journal of Freshwater Ecology* 35(1): 323-347. (in English) ["Understanding the relationship between benthic macroinvertebrates and environmental variables is the first step toward establishing sustainable freshwater ecosystems in terms of biodiversity, and this knowledge can be applied in river management. We analyzed major environmental variables that affect biotic communities on the national scale in the Republic of Korea. To achieve this goal, 2647 sampling stream sites were surveyed from 2016 to 2018 to collect benthic macroinvertebrates and measure 14 environmental variables. We identified a total of 359 taxa, belonging to 32 orders in 9 classes of 5 phyla, most of which were aquatic insects including Ephemeroptera, Odonata, Plecoptera, Coleoptera, Diptera and Trichoptera. Two-way indicator species analysis (TWINSPAN) based on biotic communities divided the sampling sites into six groups. Discriminant analysis identified gradient, streambed substrates, velocity, biological oxygen demand (BOD) and altitude as the major environmental variables that distinguished each TWINSPAN group. In addition, stream order and stream width also influenced aquatic macroinvertebrate communities, but the influence was low. The indicator taxa in each group were gradually changed from sensitive organisms preferring high altitudes, fast velocities and coarse substrates to tolerant organisms preferring low altitudes, slow velocities and fine substrates in each group from one to six. Canonical correspondence analysis confirmed that the composition of benthic macroinvertebrate communities in the Republic of Korea was dependent on stream gradient, microhabitat, organic pollution and geographical feature rather than on stream size or other water quality variables. Our study identified variables affecting the overall distribution patterns of biotic communities on a national scale and provides useful information for conservation and management of stream ecosystems in the Asian monsoon region." (Authors)] Address: Min, J.-K., Dept of Life Science, Kyonggi Univ., Suwon, Gyeonggi-do Province, Republic of Korea

20666. Nel, A.; Huang, D. (2020): A new genus and species of damsel-dragonfly from the Middle Jurassic of Inner Mongolia (Odonata: Campteroptelebiidae). *Palaeoentomology* 3(4): 357-360. (in English) ["The Campteroptelebiidae is the largest family of fossil damsel-dragonflies, containing more than 60 species described from Lower Jurassic–Lower Cretaceous strata of Europe and Asia. This group is especially diverse in the Middle–Late Jurassic strata in Inner Mongolia, northeastern China, with some very large species (Zhang et al., 2006, 2008, 2013; Nel et al., 2007, 2008, 2009; Petrulevicius et al., 2011; Li et al., 2013; Zhang et al., 2013; Zheng et al., 2016, 2017). Thus it is surprising that we found a new representative of these damsel-dragonflies, belonging to a group of genera characterized by a very particular shape of the forewing cubito-anal area. This fossil has a unique shape of the forewing median vein, allowing its attribution to a new genus and species. It increases our knowledge about the palaeobiodiversity of this impressive group of Odonata." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@mnhn.fr

20667. Pastorino, P.; Zaccaroni, A.; Doretto, A.; Falasco, E.; Silvi, M.; Dondo, A.; Elia, A.C.; Prearo, M.; Bona, F. (2020): Functional feeding groups of aquatic insects influence trace element accumulation: Findings for filterers, scrapers and predators from the Po basin. *Biology* 9(9), 288: 15 pp. (in English) ["For this study, we measured the concentrations of 23 trace elements (Al, As, Ba, Bi, Cd, Cr, Co, Cu, Fe, Ga, Hg, In, Li, Mn, Mo, Ni, Pb, Se, Sr, Ti, Tl, V, and Zn) in the

whole bodies of three functional feeding groups (FFG) (filterers—Hydropsychidae, scrapers—Heptageniidae, and predators—Odonata) of aquatic insects collected from two sites in the Po basin (Po Settimo and Malone Front, Northwest Italy) to determine: (a) how FFG influence trace element accumulations, (b) if scrapers accumulate higher elements compared to the other FFG, since they graze on periphyton, which represents one of the major sinks of metals, and (c) the potential use of macroinvertebrates to assess the bioavailability of trace elements in freshwater. The hierarchical clustering analysis generated three main groups based on trace element concentrations: the most abundant elements were Fe and Al, followed by Sr, In, Zn, V, Mo, and Cu. Ti was below the limit of detection (LOD) in all FFG. Ga was detected only in scrapers from both sites and Hg only in predators from Po Settimo. The principal component analysis showed that concentrations of Al, As, Bi, Cd, Co, Cr, Ga, Fe, In, Mn, Pb, Ni, and Sr were highest in scrapers, suggesting that trace elements accumulate from the ingestion of epilithic periphyton (biofilm). Odonata (predators) accumulate certain elements (Ba, Hg, Li, Se, V, Ti, and Zn) in higher concentrations by food ingestion composed of different aquatic organisms. Differently, Cu and Mo concentrations were the highest in filterers due to their bioavailability in the water column. Non-metric multidimensional scaling clearly differentiated the FFG based on their ability to accumulate trace elements. The findings from this study represent an important step toward the definition of an innovative approach based on trace element accumulation by macroinvertebrates." (Authors)] Address: Pastorino, P., Veterinary Medical Research Institute for Piemonte, Liguria & Valle d'Aosta, Via Bologna 148, 10154 Torino, Italy. E-mail: paolo.pastorino@izsto.it

20668. Pena-Firme, P.; Guillermo-Ferreira, R. (2020): Females of the red damselfly *Mnesarete pudica* are attracted to more ornamented males and attract rival males. *Scientific Reports* 10(14320): 7 pp. (in English) ["Male calopterygid damselflies often exhibit colourful wings used during aggressive contests and courtship displays. Evidence suggests that male wing coloration is a secondary sexual character assessed by males and females to identify male quality. In some species, males adopt a lekking strategy, where females visit exhibition arenas and choose the best mate. Here, we addressed whether the behaviour of *Mnesarete pudica* males is influenced by female visitation when gathering in leks. We hypothesized that female visitation would increase male investment in courtship and fighting, while reducing patrolling flights and harassment attempts. Moreover, we tested the hypothesis that more ornamented males attract more females to the territory, following the hotshot model of lek evolution. Our results suggest that, indeed, males with more pigmented wings attract more visiting females, independently of male size. Our results also show that the number of females in a territory attracts more males and elicits male contest behaviour, reducing male harassment. We conclude that male ornament and male clustering is a good predictor of female visitation rates, suggesting that females may exert mate choice." (Authors)] Address: Guillermo-Ferreira, R., Dept Hydrobiology, Federal Univ. of São Carlos – UFSCar, São Carlos, São Paulo, Brazil. Email: rhainerguillermo@gmail.com

20669. Ptatscheck, C.; Gansfort, B.; Majdi, N.; Traunspurger, W. (2020): The influence of environmental and spatial factors on benthic invertebrate metacommunities differing in size and dispersal mode. *Aquatic Ecology* 54: 447-461. (in English) ["Understanding the drivers of species distribution

is an important topic in conservation biology and ecology, pertaining to species traits like dispersal strategies and species–environment interactions. Here we examined the drivers of benthic species distribution at 20 sections of a second-order stream network. Environmental and spatial factors and the dispersal modes of the organisms were considered. We expected that species with aerial dispersal capabilities like insects would be less restrained by distance between sites and thus mostly affected by environmental factors. In contrast, we hypothesized that completely benthic species would mainly be affected by spatial factors due to limited dispersal. However, microscopic species like nematodes characterized by a high passive dispersal potential may be less limited by spatial factors. When using redundancy analyses and subsequent variance partitioning, the included variables explained 24% (insects), 24% (non-flying macrobenthos), and 32% (nematodes) of the variance in the respective community composition. Spatial factors mainly explained the species composition of all tested groups. In contrast with other larger species, nematodes were characterized by fine-scale patterns that might have been induced by random processes (e.g., random distribution and priority effects). Our study showed that dispersal processes are crucial in shaping benthic communities along streams albeit the relatively small sampling area (max. distance between sampling sites: 2 km). The demonstration of spatial factors as important drivers of the species distribution of passively dispersing benthic organismal groups highlights the role played by connectivity in determining species distribution patterns in river systems." (Authors)] Address: Ptatscheck, C., Dept of Animal Ecology, Bielefeld Univ., Konsequenz 45, 33615 Bielefeld, Germany. Email: christoph.ptatscheck@uni-bielefeld.de

20670. Potts, K.M. (2020): Survival and development of larval odonates (Anisoptera) and female oviposition site choice in response to predatory fish. MSc. thesis, Dept of Biology, Univ. of Mississippi: VII + 43pp. (in English) ["The reproductive success of many aquatic insects is highly dependent on where they deposit their eggs. Not all habitats are created equal. Some are more favorable than others for larval development. Therefore it would be evolutionarily advantageous for an ovipositing female to differentiate between them and choose the most suitable for her offspring's survival. Numerous studies have shown that many species with complex life-cycles representing a diverse array of taxonomic groups sort themselves non-randomly among habitat patches on the basis of perceived habitat quality. In the case of dragonflies, insufficient evidence exists to support the hypothesis that this group can assess relevant indicators of patch quality and use those cues to select habitat. I conducted a series of experiments to investigate what effects a predatory fish, the green sunfish (*Lepomis cyanellus*), had on larval dragonfly [*Erythemis simplicicollis*, *Pachydiplax longipennis*] performance and development and adult female habitat selection behavior. Developmental studies were performed to determine the degree of consumptive and non-consumptive effects of *L. cyanellus* and how they affect survival and other fitness correlates of larval dragonflies. I found that larval survival is significantly affected by the presence of uncaged *L. cyanellus*, but not affected by caged *L. cyanellus*. Caged *L. cyanellus* did not have an effect on fitness correlates, suggesting larvae are not capable of detecting fish. I examined whether female dragonflies actively avoid ovipositing in sites containing predatory fish which potentially inflict significant fitness costs via offspring predation. Results indicated that female adults of three common species of dragonflies did not discern between

habitat patches based on the presence or absence of fish predators. This suggests that members of this group either rely on a bet-hedging or risk-spreading strategy, utilize a form of philopatry, or the presence of fish predators may not be an important factor for odonates in oviposition site selection. There is a mismatch between the results of the oviposition and development experiments, suggesting there is much more to learn about how dragonflies select habitat for their offspring, how their decisions affect aquatic community assembly, and how these can be used to inform conservation efforts designed to protect threatened odonate species." (Author)] Address: not stated

20671. Senzaki, M.; Kadoya, T.; Francis, C.D. (2020): Direct and indirect effects of noise pollution alter biological communities in and near noise-exposed environments. *Proceedings of the Royal Society B Biological Sciences* 287(1923): 9 pp. (in English) ["Noise pollution is pervasive across every ecosystem on Earth. Although decades of research have documented a variety of negative impacts of noise to organisms, key gaps remain, such as how noise affects different taxa within a biological community and how effects of noise propagate across space. We experimentally applied traffic noise pollution to multiple roadless areas and quantified the impacts of noise on birds, grasshoppers and odonates. We show that acoustically oriented birds have reduced species richness and abundance and different community compositions in experimentally noise-exposed areas relative to comparable quiet locations. We also found both acoustically oriented grasshoppers and odonates without acoustic receptors to have reduced species richness and/or abundance in relatively quiet areas that about noise-exposed areas. These results suggest that noise pollution not only affects acoustically oriented animals, but that noise may reverberate through biological communities through indirect effects to those with no clear links to the acoustic realm, even in adjacent quiet environments." (Authors)] Address: Senzaki, M., Center for Environmental Biology and Ecosystem Studies, National Institute for Environmental Studies, Onogawa 16-2, Tsukuba City, Ibaraki 305-8506, Japan. Email: masayukisenzaki@gmail.com

20672. Smith, B.D.; Patten, M. (2020): Dragonflies at a biogeographical crossroads. *The Odonata of Oklahoma and complexities beyond its borders*. eBook Published 15 June 2020, Pub. location Boca Raton, Imprint CRC Press: 748 pp. (in English) ["This lavishly illustrated book examines the distribution, ecology, conservation status, and biogeography of 176 species of dragonflies in the southern plains of the United States, where twelve ecoregions converge. The topics discussed, such as phenotypic variation and ecology, are applicable and of interest across the United States and much of north America, and will appeal to researchers and dragonfly enthusiasts alike. A series of maps, including a distributional map by specific locality of occurrence, indicate level of documentation and allow the reader to visualize the biogeographical associations of a given species. These maps also encourage citizen scientists to contribute documentation wherever they spend time in the field. Context-driven chapters, including one on the region's rich paleontological history, blend environmental history and biogeography, giving the book a fresh perspective on the natural world while providing a rich summary of the odonates. This book will be sought out by dragonfly researchers and enthusiasts, entomologists, amateur naturalists, paleontologists, conservation biologists, educators, regional historians, and those seeking to meld the disciplines of cultural and environmental history with biology. It will also be readily accessible to

the lay public. Dragonflies combine the visually stunning with acrobatic fireworks in ways no other insect can hope to combine. Table of contents: Introduction. History of Oklahoma Odonatology. Oklahoma Geography and Habitats. Biogeography of Oklahoma Odonata. The Odonata Fossil History of Oklahoma and the Region. Environmental History of Oklahoma. Conservation of Oklahoma Odonata. Seasonality of Oklahoma Odonata. Introduction to Species Accounts. Species Accounts. Zygoptera – Damselflies. Calopterygidae – Broad-winged Damsels. Lestidae – Spreadwings. Coenagrionidae – Pond Damsels. Anisoptera – Dragonflies. Petaluridae – Petaltails. Aeshnidae – Darners. Gomphidae – Clubtails. Cordulegastridae – Spiketails. Macromiidae – Cruisers. Corduliidae – Emeralds. Libellulidae – Skimmers. Appendices. A. Synonyms, Dubious Records, and Hypothetical Species. B. List of Specimen Collections, Data Sources, and Record Contributors. C. Additional Resources. D. Oklahoma Odonata Species Totals by Era. E. First State Records of Oklahoma Odonata. F. Supplementary Tables. G. Species Distribution Models. Literature Cited. Endnotes. Index. (Publisher)] Address: Patten, M.A., Oklahoma Biological Survey, Univ. of Oklahoma, Norman, OK 73019, USA. E-mail: mpatten@ou.edu

20673. Srivastava, D.S.; Ware, J.L.; Ngai, J.T.; Starzomski, N.M.; Amundrud, S.L. (2020): Habitat size thresholds for predators: Why damselflies only occur in large bromeliads. *Biotropica* 52(6): 1030-1040. (in English) ["Predators are often more sensitive to habitat size than their prey and frequently occur in only the largest habitats. Four explanations have been proposed for this pattern: (a) Small habitats do not have enough energy to support higher trophic levels; (b) small habitats are less likely to contain particular prey required by specialist predators; (c) small habitats are risky for predators with slow life histories or large body sizes; and (d) small habitats are numerically unlikely to be colonized by regionally rare species, such as predators. We critically examine these four hypotheses in relation to the predatory damselfly larva, *Mecistogaster modesta* Selys. (Pseudostigmatidae), which occurs almost exclusively in bromeliads > 100ml in capacity. We synthesize multiple years of survey data and three manipulative experiments from the Área de Conservación Guanacaste, Costa Rica, to conclude that damselflies do not occur in small bromeliads due to their higher risk of desiccation—not because of energetic limitation, trophic specialization, risk of terrestrial predation, or pure numerical effects. These results suggest that recent and predicted declines in precipitation in northwestern Costa Rica may further restrict bromeliad occupancy by damselflies, with cascading consequences for the rest of the aquatic food web." (Authors)] Address: Srivastava, Diane, Dept of Zoology & Biodiversity Research Centre, Univ. of British Columbia, 6270 Univ. Blvd., Vancouver, BC Canada V6T 1Z4. Email: srivast@zoology.ubc.ca

20674. Subramanian, K.A.; Babu, R. (2020): 3. Dragonflies and Damselflies. In: S Ramani, Prashanth Mohanraj, Yeshwanth HM (eds.): *Indian Insects: Diversity and Science*: 29-46. (in English) ["Order Odonata, popularly known as dragonflies and damselflies, are primarily associated with wetlands and surrounding landscape. Dragonflies lay broad and elliptical eggs either in flight or by perching on an overhanging vegetation or rock. In dragonflies, the inner surface of the rectum is foliate and richly supplied by tracheae. Dragonflies are very popular in folklore and stories from time immemorial in different Indian cultures. Adult dragonflies are aerial predators and catch small insects like mosquitoes, midges, small butterflies, moths, and bees on wing. Dragonflies

capture their prey by perching at a vantage point and making short sallying flights or by flying continuously. The last abdominal segments of the male have claspers, which are used to hold the female by the posterior side of head in the case of dragonflies and by prothorax in damselflies. Dragonflies found at undisturbed habitats with good riparian vegetation were specialists with narrow distribution." (Authors)] Address: Subramanian, K.A., Zoological Survey of India, Southern Regional Centre 130, Santhome High Rd, Chennai-600 028, India. E-mail: subbuka.zsi@gmail.com

2021

20675. Aliyev, S.I. (2021): Species composition, distribution and ecology (Sanitary-hydrobiological characterisation of macrozoobenthos in Azerbaijan rivers. Research in: Agricultural & Veterinary Sciences 5(3): 102-116. (in English) ["The article studies samples of macrozoobenthos in the hydrobiological scheme of the rivers of Azerbaijan. During the study period, 431 species of macrobenthic organisms were recorded from rivers. 72% of the organisms found are aquatic insects. Of the registered species, 54 species belong to chironomid larvae, 45 species to Trichoptera, 36 species to Coleoptera and Odonata, larvae, and 30 species to mollusks. The maximum number of species on the rivers of the regions was recorded in the Kura River (172). The number of species in the rivers of other regions varied between 84-144 species." (Authors)] Address: Aliyev, S.I., Dept of Zoology & Physiology, Baku State Univ., 23, Zahid Khalilov, AZ1148, Baku, Azerbaijan. Email: alisaleh56@mail.ru

20676. Bancila, R.I.; Plaiasu, R.; Stanescu, F.; Schmidt, B.; Nae, I.; Denoël, M. (2021): Food level and light conditions affect the antipredator behavior in larvae of a stream-breeding amphibian. Behavioral Ecology and Sociobiology 75, Article number: 36 (2021): (in English) ["Understanding how long-term changes in environmental conditions influence the way that individuals cope with threats is essential in the context of behavioral adaptation to a rapidly changing world. However, little is known about the behavioral responses to predation risk for individuals that experienced different environmental conditions for extended periods of time, such as food levels and light conditions. In this experimental study, we tested whether previous long-term exposure to different food levels (low versus high) and light conditions (0-hour light versus 8-hour light) play a significant role in shaping the antipredator response (i.e., the probability of emerging from the refuge and the distance moved) to stimuli from caged larval dragonflies, in larvae of the fire salamander (*Salamandra salamandra*). Specifically, we quantified behavioral differences in the response to predation risk in larval salamanders that were reared in the laboratory for two months under controlled food and light conditions. The results of this study showed that the interaction between food level and light conditions affected the antipredator behavior of the larvae. Fire salamander larvae maintained at low food levels and in 8-hour light conditions emerged from the refuge with a higher probability (i.e., took more risk) than larvae maintained at high food levels and all other combinations of light conditions. Thus, our results highlight the complexity of antipredator responses, pointing attention to the fact that interactions among environmental factors are likely to determine the magnitude of antipredator response." (Authors)] Address: Plaiasu, Rodica, "Emil Racoviță" Institute of Speleology of Romanian Academy, 13 Septembrie Rd, 050711 Bucharest, Romania. E-mail: rodica_plaiasu@yahoo.com

20677. Batista, J.D.; Ferreira, V.R.S.; Cabette, H.S.R.; de

Castro, L.A.; De Marco, P.; Juen, L. (2021): Sampling efficiency of a protocol to measure Odonata diversity in tropical streams. PLoS ONE 16(3): e0248216. <https://doi.org/10.1371/journal.pone.0248216>: 18pp. (in English) ["Odonata can be sampled following different types of protocols. In Brazil, the most used protocol is the scanning in fixed areas method, where a 100-meter transect is delimited in one of the stream margins, subdivided into 20 segments measuring 5 meters. Despite being universally used, the methodological efficiency or limitations of this protocol for Odonata has never been tested. In this scenario, our objective was to assess the efficiency of the sampling protocol to measure the richness and composition of Odonata in three fundamental aspects: the time of sampling and sampling effort over time and space. We show that the best sampling efficiency was achieved in collections performed at noon, in transects measuring 100 meters, requiring at least two samplings in the same location, supporting the procedures traditionally adopted by many studies with the group. While comparing species composition, we did not see any implication between the different treatments on the capture of the local species pool. However, we highlight and discuss some possible methodological flaws when using this protocol to sample specific Odonata groups. We believe the results obtained are fundamental in the inventory of species and to conduct future studies, as well as to aid conservative measures that use the order Odonata as a tool for environmental monitoring." (Authors)] Address: Ferreira, V.R.S., Entomology Laboratory of Nova Xavantina, Universidade do Estado de Mato Grosso, Nova Xavantina, Brazil. E-mail: victor_rennan890@hotmail.com

20678. Bizarro, G.L.; Périco, E.; Dalzochio, M.; Liberato da Silva, G.; Ferla, N.J. (2021): Aquatic larval of the genus *Arrenurus* (Trombidiformes: Parasitengonina: Arrenuridae) associated with Odonata species from Pampa Biome, Brazil. Biota Neotropica 21(2). e20201157: 7 pp. (in English, with Portuguese summary) ["Many studies have reported that the interaction between water mite larvae and their Odonata hosts affects mating success, flight, and longevity. Males and females of Odonata species collected in the steppes and coastal plains (Pampa Biome) of Rio Grande do Sul were analyzed. Mites were removed when present and the prevalence and intensity of parasites was calculated. The aim of this study was to search and report new Odonata hosts species that are parasitized by water mite larvae and also to evaluate the prevalence and intensity rates; the differences in mite occurrence and frequency between males and females, and between thorax and abdomen of the dragonflies and damselflies in the southern Pampa biome located in Rio Grande do Sul. A total of 162 larval mites were found associated to two Odonata families: Coenagrionidae (*Acanthagrion lancea* Selys, 1876, *Ischnura capreolus* Hagen, 1861 and *Ischnura fluviatilis* Selys, 1876) and Libellulidae (*Micrathyrina ocellata* Martin, 1897 and *Perithemis mooma* Kirby, 1889). All mites were identified as *Arrenurus* (*Arrenurus*) sp. (*Arrenuridae*) and showed high numbers when attached to *I. capreolus* (55.5%), *I. fluviatilis* (33.3%), followed by low numbers on *M. ocellata* (6.1%), *A. lancea* (3.7%), and *P. mooma* (1.2%). Mites were found on males and females of *I. capreolus* and *I. fluviatilis*, females of *A. lancea* and *P. mooma* and in *M. ocellata* only in males. As the parasitized Odonata species are generalist and abundant in all water body types, traits associated with mating and oviposition or larval behavior are believed to explain the frequency of parasitism in these species." (Authors)] Address: Bizarro, G.L., Universidade do Vale do Taquari, Laboratório de Acarologia, Tecnovates, 95914-014, Lajeado, RS, Brasil

20679. Borisova, N.V.; Malikova, E.I. (2021): *Brachytron pratense* (Müller, 1764) (Odonata: Aeshnidae): a new species in the fauna of Chuvashia. *Amurian Zoological Journal* 13(1): 146-149. (in Russian, with English summary) ["*B. pratense* is a small Aeshnidae species widespread in the Western Palearctic and most common in Central and Northern Europe. Records from the southern and eastern outskirts of its range are scarce. In summer 2020, the dragonflies were observed and photographed by the first author in the vicinity of Cheboksary, 55°01'30"N, 47°54'19"E, at a pond with dense coastal vegetation. This is the first record of this species in Chuvashia and one of the few in the Middle Volga Region. Including the newly found *Brachytron pratense*, fauna of Chuvashia comprises 54 Odonata species. Adults were seen in flight from 8 June till 4 July; oviposition was recorded on 8 June." (Authors)] Address: Borisova, Natalia, State Nature Reserve Prisursky, Russian Entomological Society, Chuvash branch, Russia. E-mail: natborisova18@yandex.ru

20680. Brasil, L.S.; Ferreira, V.R.S.; Resende, B.O.; Juen, L.; Batista, J.D.; Castro, L.A.; Giehl, N.F.S. (2021): Dams change beta diversity of aquatic communities in the Veredas of the Brazilian Cerrado. *Front. Ecol. Evol.* 9:612642. doi: 10.3389/fevo.2021.612642: (in English) ["The veredas are wetland ecosystems responsible for supplying most of the water for rivers and streams in the Cerrado. The veredas' hydromorphic soils retain a large amount of rainwater, releasing it slowly during drier periods. Therefore, these habitats are often used to build dams for cattle raising. Here we assessed the environmental conditions and beta-diversity of Odonata and Heteroptera on veredas impacted by dams in the Brazilian Cerrado. We sampled biological communities and a set of environmental variables in 13 veredas, six with dams and seven without dams. One limnological variable [oxidation-reduction potential (ORP)] and one landscape metric (% of the altered area) differed among veredas with and without dams. These variables were important predictors of the beta-diversity of both Odonata ($R^2 = 0.650$; $p < 0.001$) and Heteroptera ($R^2 = 0.740$; $p < 0.001$). The veredas stand among the most sensitive wetland ecosystems of the Cerrado. In this study, we show, for the first time, that veredas with dams may lose environmental quality resulting in changes in biological communities, especially ecologically unique species. Because the Cerrado naturally goes through approximately 5 months of severe drought, the veredas are critical for the Cerrado's hydric safety. Therefore, we recommend that cattle-raising activities should rely on artificial water tanks instead of using dams for water storage since it affects ecologically unique species in this poorly known ecosystem." (Authors)] Address: Brasil, L.S., Laboratório de Ecologia e Conservação, Instituto de Ciências Biológicas, Universidade Federal do Pará, Belém, Brazil.

20681. Brito, J.P.; Carvalho, F.G.; Juen, L. (2021): Response of the zygopteran community (Odonata: Insecta) to change in environmental integrity driven by urbanization in eastern Amazonian streams. *Ecologies* 2021, 2(1): 150-163. ["The accelerated and disordered growth of large urban centers has caused a significant loss of biodiversity and the negative effects are more significant in aquatic environments. Thus, the objective of this study is to assess the effects of environmental change due to urbanization in the abundance and biomass patterns of species belonging to the Zygoptera suborder. We tested the hypothesis that, in altered streams, there will be a predominance of organisms with fast growth and small biomass (*r*-strategists), and intermediate streams will have an overlapping of *r* and *k*-strategists. In control streams, there will be a predominance of *k*-strategists, with

slow growth, decreased abundance, and high biomass. Urban expansion in Amazonian streams will cause loss of Zygoptera species richness. Streams draining urban areas will have higher air temperatures than control streams. Thus, small-sized and less abundant species will be favored. We sampled 15 streams in the metropolitan area of Belém. Sites were classified, using the index of physical habitat integrity, as control, intermediate and altered. Comparisons between biomass and abundance were analyzed using *W* Statistics. Our analyses showed that: the effects of urbanization cause loss of *k*-strategists and favors *r*-strategists, once abundance was placed above biomass; in intermediate environments, contrary to what we expected, there was no overlapping of strategies, once *r*-strategists were also placed above *k*-strategists; in control environments, biomass was placed above abundance, suggesting these environments have a predominance of *k*-strategist species, as we suggested; and we observed increased levels of temperature favor the most abundant species, the ones having generalist biological mechanisms; however, contrary to what we expected, there was no difference in richness. With these results, we reinforce the need for public policies to create or maintain the riparian forest along streams running through urban areas and create or maintain urban parks." (Authors)] Address: Brito, J.P., Lab. de Ecologia e Conservação, Instituto de Ciências Biológicas, Univ. Federal do Pará — UFPA, Rua Augusto Correia, Bairro Guamá, Belém, Pará 66.075-110, Brazil. E-mail: jhopb03@gmail.com

20682. Buczynski, P.; Buczynska, E. (2021): *Ordo: Odonata – wazki*. In: Klasa, Anna (ed): *Katalog fauny Ojcowskiego Parku Narodowego*, tom 1. – Catalogue of the fauna of Ojców National Park, volume 1. Publisher: Ojcowski Park Narodowy, Ojców. 75-79. (in Polish) [https://www.researchgate.net/publication/361443091_Ordo_Odonata_-_wazki_-_Ordo_Odonata_-_dragonflies] Address: Buczynski, P., Dept Zool., Maria Curie-Skłodowska Univ., Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

20683. Castillo-Pérez, E.U.; Nava-Bolaños, A.; Rocha-Ortega, M.; Córdoba-Aguilar, A. (2021): Does heat tolerance explain female polymorphism in damselflies? *Journal of Insect Behavior* 34: 41-48. (in English) ["Morphological variation is widespread, and one case is that of female morphs in damselfly insects. Current knowledge indicates that these female morphs are maintained by a fitness balance whereby male-like, clear-colored females (i.e. andromorphs) are more likely to "escape" from male harassment given their male mimicking compared to dark females (i.e. gynomorph). However, males can learn to distinguish the more frequent morph, leading to a frequency-dependent selection. Alternative to frequency-dependent selection, we tested whether temperature plays a role in driving female morph activity and survival. We used *Ischnura denticollis* damselflies to test for differences between female morphs and males in: (a) daily activity; (b) time to resume activity following a chilling event (10°C); and, (c) survival at 30, 35 and 40°C. There was no difference in activity among groups after a chilling event. However, gynomorph females were more active early in the day (ca. 17°C) and less active by 1600 hrs (after reaching 32°C), and had lower thermal tolerance than andromorph females. Thus, high temperatures may act against gynomorph females. This implies a role for high temperatures in the maintenance of female polymorphism." (Authors)] Address: Nava-Bolaños, Angela, Biodiversity Inst., Univ. of Kansas, 1345 Jayhawk Boulevard, Lawrence, KS, 66045, USA

20684. Chandran, A.V.; Jose, S.K.; Gopalan, S.V. (2021):

Dragonflies and damselflies (Insecta: Odonata) of the Kole Wetlands, central Kerala, India. *The Journal of Threatened Taxa* 13(3): 17963-17971. (in English) ["A year-long study was conducted at the Kole Wetlands, a Ramsar site in central Kerala to document the diversity of dragonflies and damselflies and understand their seasonality. Checklist survey method was used to sample adult odonates in 30 randomly chosen locations. A total of 44 species (30 dragonflies and 14 damselflies) belonging to 33 genera and eight families were recorded in the study area. Species richness showed a peak in the post-monsoon season and a dip in the summer. The observations support the value of the Kole Wetlands in providing valuable resources for Odonata." (Authors)] Address: Chandran, A.V., Dept of Geology & Environmental Science, Christ College, Irinjalakuda, Thrissur, Kerala 680125, India.

20685. Chiriboga-Ortega, R.; Van der Heyden, C.; Sulen Burgos, M.E.; Ortega, S.; Oña, T.; Velarde, E.; Goethals, P.; Alfaro-Núñez, A. (2021): Molecular diversity of dragonflies in three high-elevation Andean tropical lakes through DNA barcoding. *Biotropica* 53(2): 354-358. (in English) ["Genetic and morphological identification of dragonflies' larvae species in three high-elevation Andean tropical lakes was done using DNA barcoding of the cytochrome oxidase 1 gene (COI). Phylogeny allowed inferring the evolutionary relationships of at least five species (from 74 samples) that belong to two different families within the Odonata order." (Authors) *Rhionaeschna marchali*, *Rhionaeschna elsia*, *Ischnura ramburii*, *Remartinia luteipennis*] Address: Chiriboga-Ortega, R., Laboratorio de Investigaciones Ambientales, Universidad Técnica del Norte, Ibarra, Ecuador

20686. Clausnitzer, V.; De Knijf, G. (2021): IUCN SSC Dragonfly Specialist Group. 2020 Report. IUCN Species Annual Report 2020: 162-165. (in English) [<https://portals.iucn.org/library/sites/library/files/documents/Species%20no.61.pdf>] Address: Clausnitzer, Viola, Heinzelstr. 3, 02826 Görlitz, Germany. E-mail: violacl@t-online.de

20687. Dawn, P. (2021): A new species of *Cephalaeschna* Selys, 1883 (Odonata: Anisoptera: Aeshnidae) from Neora Valley National Park, West Bengal, India, with notes on *C. acanthifrons* Joshi & Kunte, 2017 and *C. viridifrons* (Fraser, 1922). *Zootaxa* 4949(2): 371-380. (in English, with Bengali language) ["A new species *Cephalaeschna patrai* sp. nov. is described from Neora Valley National Park, Darjeeling Himalayas as the eighth species of the genus from India. This new species is characterized by bright green markings on overall black body color, black is replaced with brown in female. Anterolateral thoracic stripe separated in two patches connected with a narrow line. The cerci are uniformly broad towards end, without any constriction in the lateral view; tip of the same prominently curved upwards to form blunt tubercle which appears to be projected inwards in the dorsal view. An updated key for all the Indian species is provided here. A short note about the affinities among congeners distributed across Himalayas (particularly *C. acanthifrons* Joshi & Kunte, 2017 and *C. viridifrons* (Fraser, 1922)) is also included." (Authors)] Address: Dawn, P., Shyampur Siddheswari Mahavidyalaya, Ajodhya, Howrah – 711312, India. E-mail: prosenjit.dawn@gmail.com

20688. Deacon, C.; Samways, M.J. (2021): A review of the impacts and opportunities for African urban dragonflies. *Insects* 2021, 12(3), 190; <https://doi.org/10.3390/insects12-030190>: 15 pp. (in English) ["Simple Summary: The expansion of urban areas in combination with climate change places

great pressure on species found in freshwater habitats. Dragonflies are iconic freshwater organisms due to their large body sizes and striking coloration. They have been widely used to indicate the impacts of natural and human-mediated activities on freshwater communities, while also indicating the mitigation measures required to ensure their conservation. Here, we review the major threats to dragonflies in southern Africa, specifically those in urban areas. We also provide information on effective mitigation measures to protect dragonflies and other aquatic insects in urban spaces. Using three densely populated areas as case studies, we highlight some of the greatest challenges for dragonflies in South Africa. More importantly, we give a summary of current mitigation measures which have maintained dragonflies in urban spaces. In addition to these mitigation measures, public involvement and raising awareness contribute greatly to the common cause of protecting dragonflies around us. Abstract: Urban settlements range from small villages in rural areas to large metropolises with densely packed infrastructures. Urbanization presents many challenges to the maintenance of freshwater quality and conservation of freshwater biota, especially in Africa. There are many opportunities as well, particularly by fostering contributions from citizen scientists. We review the relationships between dragonflies and urbanization in southern Africa. Shifts in dragonfly assemblages indicate environmental change, as different species are variously sensitive to abiotic and biotic water and bank conditions. They are also conservation umbrellas for many other co-occurring species. Major threats to southern African dragonflies include increasing infrastructure densification, frequent droughts, habitat loss, pollution, and invasive alien vegetation. Mitigation measures include implementation of conservation corridors, maintenance of healthy permanent ponds, pollution reduction, and removal of invasive alien trees. Citizen science is now an important approach for supplementing and supporting professional scientific research." (Authors)] Address: Deacon, C., Dept of Conservation Ecology & Entomology, Stellenbosch Univ., South Africa. E-mail: charldeacon@sun.ac.za

20689. Díaz-Martínez, C.; Conesa García, M.A. (2021): First record of an unintentional introduction of a non-native damselfly in the Iberian Peninsula: *Pseudagrion microcephalum* (Rambur, 1842) (Odonata, Coenagrionidae). *Boln. Asoc. esp. Ent.* 45(3-4): 307-309. (in Spanish, with English title) ["A larva of *P. microcephalum* has been found in a shrimp tank in Valencia (Spain). This is the first record of an unintentional introduction of a non-native damselfly in the Iberian Peninsula." (authors)] Address: Díaz-Martínez, Cecilia, Sociedad Entomológica y Ambiental de Castilla-La Mancha, c/Londres, 7, 45003 Toledo, Spain. E-mail: cdiaz.cuenca@gmail.com

20690. Díaz-Martínez, C.; Cardo-Maeso, N.; Fernández, J.B.; López-Estrada, E.K. (2021): *Onychogomphus cazuma*: Un hallazgo inesperado. *Oleana* 36: 347-360. (in Spanish) ["This paper recounts the events that led to the description of a new dragonfly species in Europe: *Onychogomphus cazuma* Barona, Cardo & Díaz 2020, highlighting the relevant role of amateurs in branches of biology such as taxonomy, and how new technologies can be combined with traditional taxonomic methodology for the discovery of new species." (Authors/DeepL)] Address: Díaz-Martínez, Cecilia, Sociedad Entomológica y Ambiental de Castilla-La Mancha, c/Londres, 7, 45003 Toledo, Spain. E-mail: cdiaz.cuenca@gmail.com

20691. Dudaniec, R.Y.; Carey, A.R.; Svensson, E.I.; Hansson, B.; Yong, C.J.; Lancaster, L.T. (2021): Latitudinal clines in sexual selection, sexual size dimorphism, and sex-specific genetic dispersal during a poleward range expansion. *Journal of Animal Ecology* 91(6): 1104-1118. (in English) ["1. Range expansions can be shaped by sex differences in behaviours and other phenotypic traits affecting dispersal and reproduction. 2. Here, we investigate sex differences in morphology, behaviour and genomic population differentiation along a climate-mediated range expansion in *Ischnura elegans* in northern Europe. 3. We sampled 65 sites along a 583 km gradient spanning the *I. elegans* range in Sweden and quantified latitudinal gradients in site relative abundance, sex ratio and sex-specific shifts in body size and mating status (a measure of sexual selection). Using single nucleotide polymorphism (SNP) data for 426 individuals from 25 sites, we further investigated sex-specific landscape and climatic effects on neutral genetic connectivity and migration patterns. 4. We found evidence for sex differences associated with the *I. elegans* range expansion, namely (1) increased male body size with latitude, but no latitudinal effect on female body size, resulting in reduced sexual dimorphism towards the range limit, (2) a steeper decline in male genetic similarity with increasing geographic distance than in females, (3) male-biased genetic migration propensity, and (4) a latitudinal cline in migration distance (increasing migratory distances towards the range margin), which was stronger in males. Cooler mean annual temperatures towards the range limit were associated with increased resistance to gene flow in both sexes. Sex ratios became increasingly male-biased towards the range limit, and there was evidence for a changed sexual selection regime shifting from favouring larger males in the south, to favouring smaller males in the north. 5. Our findings suggest sex-specific spatial phenotype sorting at the range limit, where larger males disperse more under higher landscape resistance associated with cooler climates. The combination of latitudinal gradients in sex-biased dispersal, increasing male body size, and (reduced) sexual size dimorphism should have emergent consequences for sexual selection dynamics and the mating system at the expanding range front. Our study illustrates the importance of considering sex differences in the study of range expansions driven by ongoing climate change." (Authors)] Address: Dudaniec, R.Y., Dept of Biological Sciences, Macquarie Univ., Sydney, NSW, Australia. Email: rachael.dudaniec@mq.edu.au

20692. Eh Rak, A.; Salam, M.A.; Omar, S.A.S.; Daliman, S.; Mat Nazari, N.N.I.; Azlan, A. (2021): Benthic macroinvertebrates diversity and composition at Lata Janggut Recreational Area, Kelantan, Malaysia. *Serangga* 26(4): 30-41. (in English) ["Lata Janggut is a public-focused recreational area with a high possibility of changes in biodiversity involving benthic macroinvertebrates, reflecting the water quality and health of Lata Janggut itself. Therefore, this study was carried out to determine the river health and water quality of Lata Janggut using benthic macroinvertebrates through common biotic indices. Benthic macroinvertebrates were collected monthly at nine points from three stations, i.e. three points at down-stream (ST1), middle-stream (ST2) and up-stream (ST3), respectively. The sampling protocols have followed Karr's Aquatic Insect Stream Sampling Protocol. The benthic macroinvertebrates were identified based on key identification published by Thorp and Covich, Gooderham and Tsyrlin Mekong River Commission (MRC). Biological Monitoring Working Party (BMWP) index, Family Biotic Index (FBI), and Ephemeroptera, Plecoptera and Tri-

choptera (EPT Index) were used as biotic indices, and Mann-Whitney U was also used as a comparison test of macroinvertebrates compositions. A total of 4037 macroinvertebrates, comprising eight orders, 32 families, and 31 genus, were recorded. These include the order of Ephemeroptera, Plecoptera, Trichoptera, Coleoptera, Diptera, Hemiptera and Odonata. It shows that ST2 (U=73, P=0.05) and ST 3(U=88.5, P=0.02) were significantly higher in compositions than ST1. Apart from that, the benthic macroinvertebrate composition during March was significantly higher than compositions during April to July (U.10, P<0.05). Biotic indices indicate that ST1 has recorded Moderate BMWP (21.0-58.0), Excellent FBI (1.43-3.61) and Fair EPT Index (4-12), while ST2 has recorded Clean BMWP (31-67), Excellent FBI (1.69-3.69) and Fair EPT Index (5-13). Thus, ST2 has recorded a better biotic index value as compared to ST1. Nonetheless, ST3 has recorded Moderate BMWP (31-56), Excellent FBI (1.79-3.53) and Fair EPT Index (5-8). Overall, the biotic indices measured in Lata Janggut have indicated moderate disturbance, river health, and water quality, specifically downstream with high recreational activities." (Authors)] Address: Eh Rak, A., Fac. Earth Science, Univ. Malaysia Kelantan, No. 100, 17600 Jeli, Kelantan, Malaysia. Email: aweng@umk.edu.my

20693. Fekete, J.; Buchner, D.; Leese, F.; Padisák, J.; Várbiro, G. (2021): Application of eDNA method in the detection of *Cordulegaster* (Insecta: Odonata) species. *ARPHA Conference Abstracts 4: e65041: 1-2.* (in English) [Verbatim: The aim of this pilot study was to investigate the potential of eDNA techniques to detect the presence of the two dragonfly species *Cordulegaster heros* and *Cordulegaster bidentata*. Both species are classified as "near threatened" according to the IUCN Red List and are strictly protected in several countries. Monitoring these species with traditional sampling methods is often difficult, time-consuming and invasive. In this pilot study, we first collected tissue samples from *C. heros* and *C. bidentata* to sequence the traditional DNA-barcode gene fragment COI. We then collected further dragonfly COI sequences from BOLD to design species-specific primers. This, however, was impossible given the enormous variability of COI. Therefore, we refrained from species-specific eDNA assays and followed eDNA metabarcoding protocol using universal (BF2/BF2) and a newly designed dragonfly specific primer. For the evaluation of the method, we took water samples from places where *Cordulegaster* specimens are known to occur. After the extraction, we used two sequential PCR steps for obtaining the desired amplicon (two-step PCR) using universal primers in the first step, and group (dragonfly) specific primers or universal primers. Amplicons were sequenced on an Illumina MiSeq platform and then analysed the data with the JAMP pipeline. With the newly designed primers and we could effectively detect the targeted dragonfly species from tissue samples, and also from filtered environmental samples. The detection of the species with the traditional method is time consuming and involves the destruction of the specimens. In comparison, with the eDNA method we could easily detect these near threatened odonates and other dragonfly species in a noninvasive way.] Address: Fekete, Judit, Univ. of Pannonia, Veszprém, Hungary. E-mail: juditfekete-0307@gmail.com

20694. Ferreira, K.G.; Barbosa de Oliveira Junior, J.M.; Sousa, K.; Feitosa de Oliveira, P.A.; Ribeiro da Silva, R.A.; Dias Silva, K. (2021): Divulgação científica na escola: apresentando as libélulas (Odonata: Insecta) através de um projeto de extensão. *Nature and Conservation* 14(2): 9

pp. (in Portuguese with English summary) ["Extension activities are important for the exchange of scientific and popular knowledge, carried out with the aim of bringing the academic environment and society closer together, enabling the development of actions for the popularization of science and scientific dissemination. In this way, we aim to spread knowledge about aquatic insects, with a focus on dragonflies, and the importance of preserving streams and biological communities through the popularization of science. The work was developed as an action of an extension project carried out in a public school with the participation of students from the 2nd and 3rd years of high school in the municipality of Altamira (PA). Lectures and didactic games were presented using the themes "environment" and "dragonflies" in order to take knowledge to school in a playful way, in addition to a diagnostic questionnaire to assess which popular names of dragonflies and which characters in films or drawings with dragonflies the students knew. Through the activity it was possible to observe that some students had previous knowledge about dragonflies, but they did not know that they, in their larval phase, develop in the aquatic environment and what their ecological importance is, reinforcing the relevance of extension projects aimed at scientific dissemination of the group as a tool for environmental education." (Authors)] Address: Ferreira, Kesley Gadelha, Universidade Federal do Pará, Brasil. Email: kesleygadelha@gmail.com

20695. Fiebrich, M. (2021): Die Libellenfauna des Wollmatinger Rieds - ein hundertjähriger Rückblick. *Mercuriale* 21: 23-46. (in German, with English summary) ["The dragonfly fauna of the Wollmatinger Ried (State Baden-Württemberg, Southern Germany). A centennial review - In the Wollmatinger Ried nature reserve on Lake Constance, 58 dragonfly species have been recorded to date. Of particular importance are the dynamically fluctuating water levels, which submerge the extensive reed meadows and are essential for indigenous species such as *Sympecma paedisca* and *Sympetrum depressiusculum*, but also for migratory dragonfly species, such as *Anax ephippiger* and *Sympetrum fonscolombii*. Dragonflies have been recorded in this area for more than 100 years. This publication provides an overview of both historical findings and current observations from 2021." (Author)] Address: Fiebrich, M., Liggeringerstr. 15, 78315 Radolfzell, Germany. Email: fiebrich@posteo.de

20696. Frank, M.; Bruens, A. (2021): Die Libellen Deutschlands - Entdecken – Beobachten – Bestimmen. Quelle & Meyer. 380 pp. (in German) ["Dragonflies are acrobats of the air. Their diverse colour patterns and unusual development strategy in water and on land inspire researchers and nature lovers alike. With this novel photo identification book, all dragonflies in Germany can be identified using excellent image comparisons. The book precisely highlights the main features with enlargements, notes and arrows, making it perfect for use in the field. Each species is portrayed with information on habitat, characteristics, confusion species, behaviour and hatching. Up-to-date distribution maps provide an overview of the regions in which the species can be found." (Publisher/DeepL)] Address: Frank, M., Zur Traubenmühle 5A, 55268 Nieder-Olm, Germany. E-mail: mikel.frank@gmx.de

20697. Garcia Junior, M.D.N.; Damasceno, M.T.; Martins, M.J.L.; Silva da Costa, T.; Ferreira, R.M.; Pinçaço Souto, R.N. (2021): New records of *Forcipomyia* (*Pterobosca*) *incubans* Macfie (1937) (Diptera: Ceratopogonidae) parasitizing wings of Odonata in Brazil / Novos registros de *Forcipomyia*

(*Pterobosca*) *incubans* Macfie (1937) (Diptera: Ceratopogonidae) parasita de asas de Odonata no Brasil. *Brazilian Journal of Development* 7(3): 29996-30001. (in English, with Portuguese summary) ["This report presents the first record of *Forcipomyia* (*Pterobosca*) *incubans* Macfie (1937) (Diptera: Ceratopogonidae) in the states of Amapá and Pará, located in the North Region, and in Rio Grande do Sul and Santa Catarina, in the South Region of Brazil. Besides seven new records of species of Odonata parasitized in Latin America. Females of *F. (P.) incubans* were collected in the wings of 47 specimens of dragonflies. The species *Homoeoura chelifera* Selys, 1876 and *Telebasis willinki* Fraser, 1948 family Coenagrionidae, *Remartinia luteipennis* (Burmeister, 1839) family Aeshnidae, *Erythemis peruviana* (Rambur, 1842), *Erythemis vesiculosa* (F. 1775), *Erythrodiplax fusca* (Rambur, 1842), *E. umbrata* (L. 1758), *Miathyria marcella* (Selys in Sagra, 1857), *Orthemis concolor* Ris, 1919 and *O. nodiplaga* Karsch, 1891 representatives from family Libellulidae comprise the new records for the Brazil, thus increasing to 13 the number of species with parasitism *F. (P.) incubans* in the country." (Authors)] Address: Manoel Daltro Nunes Garcia Junior Doutorando em Biodiversidade Tropical-PPGBio Universidade Federal do Amapá-UNIFAP, Rodovia Juscelino Kubitschek, KM-02 Jardim Marco Zero, Macapá, Amapá, Brasil. E-mail: m.d.juniorbio@gmail.com

20698. Ge, Y., X. Meng, J. Heino, J. Garc'ya-Gir'on, Y. Liu, Z. Li, and Z. Xie (2021): Stochasticity overrides deterministic processes in structuring macroinvertebrate communities in a plateau aquatic system. *Ecosphere* 12(7):e03675.: 19 pp. (in English) ["Deterministic and stochastic processes are two major factors shaping community dynamics, but their relative importance remains unknown for many aquatic systems, including those in the high-elevation Qinghai-Tibet Plateau. Here, we explored the causes of multidimensional beta diversity patterns (i.e., taxonomic, functional, and phylogenetic) of a macroinvertebrate metacommunity in this large aquatic system by using multiple approaches (i.e., null models, phylogenetic signal testing, and ordination-based approaches). To obtain insights into community assembly mechanisms, we also analyzed beta diversity in two deconstructed sub-metacommunities (e.g., different tributaries and the main lake body). We found that most functional traits showed significant phylogenetic signals, indicating that the functional traits were profoundly influenced by evolutionary history. The null models showed randomness of functional and phylogenetic beta diversities for the whole basin and its tributaries, confirming the importance of stochasticity over deterministic processes in controlling community structure. However, both phylogenetic and functional community structures were clustered in the Qinghai Lake, probably reflecting the importance of environmental filtering. Ordination-based approaches also revealed that both environmental factors and spatial processes accounted for variation in taxonomic, functional, and phylogenetic beta diversity. More specifically, environmental filtering was more important than spatial processes for the functional dimension, but the opposite was true for the taxonomic and phylogenetic dimensions. The paleogeographic history of the Qinghai Lake basin may have contributed substantially to the prevalence of stochastic processes. Overall, this study provides a better understanding of ecological patterns and assembly mechanisms of macroinvertebrate communities across this poorly known high-elevation aquatic system that is highly sensitive to climate warming." (Authors) *Enallagma cyathigerum*] Address: Xie, Y., The Key Lab. of Aquatic Biodiversity & Conservation, Inst. of Hydrobiology, Chinese Acad. Sciences, Wuhan, China E-mail: zhcxie@ihb.ac.cn

20699. Goldberg, R.; Balkenhol, B.; Gebert, J.; Haase, H.; Liebig, W.H.; Müller, J.; Natuschke, A.; Sander, B.; Scholz, A.; Trampenau, M.; Wünsche, A.E. (2021): Eine Momentaufnahme zur Artenvielfalt an der Neiße – Beobachtungsergebnisse vom GEO-Tag der Natur 2019. *Berichte der Naturforschenden Gesellschaft der Oberlausitz* 29: 207-223. (in German) [In June 2019, in the alluvium of Neiße River (Saxony, Germany), a total of 350 animal and plant species were recorded. The list of taxa includes 10 odonate species.] Address: Goldberg, R., Mittelstr. 13, 02730 Ebersbach-Neugersdorf, Germany. EMail: ronnsen@gmx.de

20700. G-Santoyo, I.; González-Tokman, D.; Tapia-Rodríguez, M.; Córdoba-Aguilar, A. (2021): What doesn't kill you makes you stronger: Detoxification ability as a mechanism of honesty in a sexually selected signal. *Functional Ecology* 35(8): 1666-1678. (in English) ["1. Sexual selection leads to the expression and maintenance of colourful signals. The metabolic pathways to produce such signals often involve toxic byproducts that can reduce survival. However, rather than discarding these otherwise harmful byproducts, animals may use them by integrating them into sexually selected traits. 2. We tested this using the damselfly *Hetaerina americana*, where males bear a red wing spot (RWS) that has evolved by intrasexual competition. 3. By using confocal microscopy and several biochemical techniques, we determined that the RWS are generated by ommochrome pigments derived from tryptophan metabolism. 4. Second, we injected a group of males with the toxic precursor of these ommochromes, 3-hydroxy-kynurenine(3-Hk), confirming the toxicity of this compound in adult males. 5. Finally, we showed that adult males injected with a median lethal concentration of 3-Hk had more ommochromes in their RWS than controls but similar survival, suggesting that the deposition of ommochrome pigment in the wing counteracts the 3-HK toxicity. 6. Thus, we report that sexually selected pigmented signals may involve the co-option of excreted compounds that could otherwise have lethal effects, a hypothesis we call 'detoxifying ability signalling'. Our results provide new insights about the evolution of sexual signals, elucidating a mechanism for the evolution of honest indicators of quality that could have arisen due to natural selection." (Authors)] Address: González-Santoyo, I., Neuroecology Lab, Facultad de Psicología, Universidad Nacional Autónoma de México, Ciudad Universitaria, Ciudad de México, México. Email: isantoyo.unam@gmail.com

20701. Guellaf, A.; Bennis, N.; El Haissofi, M.; L'Mohdi, O.; Kettani, K. (2021): New data on the biodiversity and chorology of aquatic insects (Odonata, Coleoptera and Hemiptera) of Martil Basin (Northwestern Morocco). *Graellsia* 77(2): e149: 24 pp. (in English, with Spanish summary) ["New records on aquatic insects (Coleoptera, Odonata and Hemiptera), collected seasonally from Autumn 2015 to Spring 2018 at a total of 20 sites in the Mediterranean Martil River basin in Northwestern Morocco are presented. An annotated list of 102 species identified from 6,596 individuals collected from recent investigations is provided. These species are grouped into 61 genera, 27 families and 102 species divided into 13 species of Odonata, 65 species of Coleoptera and 24 of Hemiptera. *Helophorus atlantis* is newly recorded from the Rif region, *Hydroporus memnonius* and *Hydroporus rifensis* are new to the Occidental Rif, while *Zygonyx torridus*, *Pelodytes caesus*, *Agabus conspersus*, *Hydroporus rifensis*, *Deronectes theyri*, *Hydrochus grandicollis*, *Hydroporus memnonius*, *Helochares punctatus*, *Hydrochus grandicollis*, *Gerris brasili*, *Hebrus pusillus*, *Parasigara rivularis* and *Notonecta obliqua* are cited for the first time in

Martil basin. Taxa richness and abundance were higher in spring and the beginning of summer compared to autumn and winter. A biogeographical analysis shows that the three aquatic insect orders of the Martil River basin are essentially Mediterranean (52%) and Palaearctic (31%) elements, while wide distribution elements are a minority (17%). Taxonomic composition exhibited strong variability among sites and seasons in response to the levels of intermittency and human pressures. These include agricultural, industrial and urban activities, construction of dams and rehabilitation projects operating at the level of the Martil River, altering its ecological status and creating good opportunities for the establishment of alien species such as *Trichocorixa verticalis*." (Authors)] Address: Guellaf, A., Dépt de Biologie, Faculté des Sciences de Tétouan, Université Abdelmalek Essaâdi. Tétouan, Maroc. Email: achraf1949@gmail.com

20702. Hossie, T.J.; Chan, K.; Murray, D.L. (2021): Increasing availability of palatable prey induces predator-dependence and increases predation on unpalatable prey. *Scientific Reports* volume 11, Article number: 6763: 12 pp. (in English) ["Understanding the factors governing predation remains a top priority in ecology. Using a dragonfly [*Aeshnidae*] nymph-tadpole system, we experimentally varied predator density, prey density, and prey species ratio to investigate: (i) whether predator interference varies between prey types that differ in palatability, (ii) whether adding alternate prey influences the magnitude of predator interference, and (iii) whether patterns of prey selection vary according to the predictions of optimal diet theory. In single-prey foraging trials, predation of palatable leopard frog tadpoles was limited by prey availability and predator interference, whereas predation of unpalatable toad tadpoles was limited by handling time. Adding unpalatable prey did not affect the predator's kill rate of palatable prey, but the presence of palatable prey increased the influence of predator density on the kill rate of unpalatable prey and reduced unpalatable prey handling time. Prey selection did not change with shifts in the relative abundance of prey types. Instead, predators selected easy-to-capture unpalatable prey at low total densities and harder-to-capture palatable prey at high densities. These results improve our understanding of generalist predation in communities with mobile prey, and illustrate that characteristics of the prey types involved govern the extent to which alternate prey influence the predator's kill rate." (Authors)] Address: Hossie, T.J., Dept Biology, Trent Univ., 2140 East Bank Drive, Peterborough, ON, K9J 7B8, USA

20703. Ilhamdi, M.L.; Idrus, A.A.; Santoso, D.; Hadiprayitno, G.; Syazali, M. (2021): Species richness and conservation priority of dragonflies in the Suranadi Ecotourism Area, Lombok, Indonesia. *Biodiversitas* 22(4): 1846-1852. (in English) ["Dragonflies are insects that have attractive colors and play an important role to balance ecosystems. They also act as bioindicators of the aquatic environment. The purpose of this study was to investigate the species richness and conservation priorities of dragonflies in the Suranadi Ecotourism Area, Lombok, Indonesia, expecting that the dragonflies will be used as charismatic species to support ecotourism. The research was conducted in August-December 2020 by surveying transect lines across 9 types of habitat. We then determined the conservation priority for each species found by referring to the Government Regulation using scoring method through a Focus Group Discussion (FGD) involving five experts. The score for each species was determined based on the percentage of the opinion from the experts. We found 18 dragonfly species from 2 suborders (Zygoptera and Anisoptera) and 5 families (Chlorocyphidae,

Coenagrionidae, Platycnemididae, Aeshnidae and Libellulidae). The habitat type that supports the highest species richness was the waterway and irrigation (16 species), while the lowest species richness was found in the areas inside the forest habitat (2 species). The species that had the highest conservation priority scores were *Pseudagrion pilidorsum declaratum*, *Libellago lineata*, and *Gynacantha subinterrupta*. These three species can be used as conservation priority species in the ecotourism area of Suranadi, Lombok, Indonesia." (Authors)] Address: Ilhamdi, M.L., Dept of Biology Education, Faculty of Teacher Training and Education Science, Universitas Mataram. Jl. Majapahit 62, Mataram 83125, West Nusa Tenggara, Indonesia. E-mail: liwa_ilhamdi@unram.ac.id

20704. IUCN (2021): The conservation status of species and habitat in freshwater Key Biodiversity Areas (KBAs) and key additional sites from the Sebou Basin. Project WAMAN (Water MANagement) Sebou Project, Málaga: 57 pages + annexes- (in English) ["This report presents the results of a broad assessment of the freshwater diversity in four Key Biodiversity Areas (KBAs)1 and some key additional sites in the Sebou river basin in Morocco. The Sebou river basin houses a large proportion of the Moroccan human population that depends on the river for their livelihood. The basin has important ecosystems for threatened species that are currently being recognized as Ramsar sites or national parks. Additionally, four sites have been identified as Key Biodiversity Areas (KBAs) for the persistence of freshwater biodiversity. Assessments were made on the effectiveness of the existing Key Biodiversity Areas (KBAs) in containing important populations of trigger species. During the summers of 2018 and 2019, biodiversity surveys of the taxa used to identify freshwater KBAs (fishes, molluscs, dragonflies and damselflies, crabs and aquatic plants) were undertaken by a team of experts in 39 sampling points, of which 29 were located in KBAs, and the remaining 10 were located in surrounding areas. A total of 192 species was recorded: 17 fish, 6 bivalve, 17 gastropod, 44 Odonata, 2 crayfish/crab species and 106 aquatic plant species. Twenty-one of these species are classified as threatened with extinction in the IUCN Red List of Threatened SpeciesTM (7 aquatic plant species, 2 fish species, 1 damselfly species, 1 crayfish species, 4 bivalve species, and 6 gastropod species). The highest native freshwater biodiversity was recorded in the South and East of KBA Oued Imouzzar Kandar. Also, in the central-east of KBA Oued Tizguite & Oued Ouaslane a high number of native species were found, especially aquatic plants. On the other hand, the number of threatened species was especially high in the KBA Oued Bouhlou and the KBA Oued Tigrigra. KBA Oued Bouhlou and its surroundings hosted a high number of threatened fish and a total of 7 threatened molluscs, including the Critically Endangered *Pseudunio maroccanus* (assessed as *Margaritifera marocana* in the IUCN Red List) and *Unio foucauldianus*. Many threatened molluscs species were also found in the surroundings of the KBA Oued Tigrigra, as well as the Endangered damselfly species *Calopteryx exul* and several threatened aquatic plants. For the surrounding areas, high freshwater biodiversity was found in the main channel of Oued Sebou, especially a high number of fish and dragonfly species. A major threat to the survival of the freshwater biodiversity is the introduction of non-native species that might outcompete the native species. A total of 11 non-native fish species were found in this study. High numbers of non-native fish were found in KBA Oued Tizguite & Oued Ouaslane and KBA Oued Tigrigra, as well as in the lakes' region (Dayat Iffer/ Dayat Yfrah/ Dayat Afourgah) and the sites in

Aguelmam n'Tifounassine and Sidi Ali. Habitat Quality Assessments (HQA) produced high values for KBAs and surrounding areas, but the Habitat Modification scores (HMS) were neither clearly negative nor positive. The region around the KBA Oued Tizguite & Oued Ouaslane is especially affected by human activity, and management plans have to be implemented to properly protect the biodiversity in the area. Other important threats are the construction of dams that are hindering the environmental flow required by many threatened species, soil erosion and siltation of river substrate and wastewater/solid waste disposal in the rivers. The Sebou basin has a high socio-economic importance for the Moroccan population, and is extensively used both for agriculture and industry. The effluents from agricultural or industrial activities have caused high contamination levels, that are harmful to humans, their livestock and the biodiversity. Another issue is the water shortage due to the water extraction for agricultural and urban uses, causing extreme droughts in some sites, especially in KBA Imouzzar Kandar. This intensive water extraction causes soil saline extrusion and increased water conductivity, as has been witnessed in the sites Aguelmam n'Tifounassine & Sidi Ali. Lastly, many of the springs and lakes are becoming unsustainable tourism destinations and have been completely altered and polluted, with the risk of a complete destruction of the freshwater biodiversity in the near future. The inclusion of freshwater biodiversity into the management plan for the Sebou basin, with the involvement of local authorities and communities, is necessary in order to preserve these high valued freshwater ecosystems. In the river Bouhlou crossing the Tazekka natural park, one of the best recruiting populations of the freshwater mussel *Pseudunio maroccanus* (assessed as *Margaritifera marocana* in the IUCN Red List), one of the world's 100 most threatened species, was detected. In order to protect this precious freshwater biodiversity, several measures should be taken to adjust the agricultural and industrial sector: inclusion of freshwater biodiversity into the water management plans and the increase of riparian buffers, wastewater treatment plans, the prevention of cattle overgrazing and bank destruction by trampling near the river banks. Campaigns on the correct management of the channels and the control of recreational activities by local authorities, could aid to manage the environmental flow necessary for many native species. For the rivers/lakes suffering from droughts, it will be necessary to setup an aquifer management plan covering the catchment of the aquifer on which the rivers/lakes depend, and develop artificial reservoirs to enable the reduction of exploitation of ground water. Finally, measures should be taken to stop the active restocking of fish in order to avoid non-native species outcompeting the native species. Further studies should be conducted to have a better understanding on the freshwater biodiversity in the Sebou basin. It is necessary to re-evaluate some of the KBAs to assess the presence of their trigger species and other threatened species. Finally, many of the additional sites that were studied here could be included as extension of the KBA, or a new KBA should be created to help focusing conservation efforts and promoting management actions that allow the persistence of the biodiversity elements present in there." (Authors)] <https://portals.iucn.org/library/sites/library/files/documents/2022-028-En.pdf>

20705. Janssens, L.; Verberk, W.; Stoks, R. (2021): The pace-of life explains whether gills improve or exacerbate pesticide sensitivity in a damselfly larva? *Environmental Pollution* 282: (in English) ["Highlights; •Surface area and metabolic rate are important for pesticide uptake and elimination. •Slow-paced (low metabolic rate) animals are more

sensitive to pesticides. •Gill loss increases pesticide sensitivity at fast and decreases it at slow pace. •Importance of oxygen versus pesticide uptake determines effect of gill loss. •Traits predicting pesticide sensitivity can interact. Trait-based approaches are promising to make generalizations about the sensitivity of species and populations to pesticides. Two traits that may shape the sensitivity to pesticides are the surface area (related to pesticide uptake) and the metabolic rate (related to pesticide elimination). We compared the sensitivity of damselfly larvae to the pesticide chlorpyrifos and how this was modified by loss of external gills (autotomy, reducing the surface area) in both fast pace-of-life (high metabolic rate) and slow pace-of-life (low metabolic rate) populations of *Ischnura elegans*. The slow-paced populations were more sensitive to the pesticide than the fast-paced populations in terms of survival, growth and energy metabolism. This suggests the higher metabolic rate of fast-paced populations enabled a faster pesticide elimination. Pesticide exposure also reduced heat tolerance, especially in slow-paced larvae under hypoxia. Gill loss had opposite effects on pesticide sensitivity in slow- and fast-paced populations. In slow-paced larvae, gill loss lowered the sensitivity to the pesticide, while in fast-paced larvae, gill loss increased the sensitivity. This difference likely reflects the balance between the roles of the gills in pesticide uptake (more detrimental in slow-paced populations) and oxygen uptake (more important in fast-paced populations). Our results highlight the need to consider trait interactions when applying trait-based approaches to predict the sensitivity to pesticides." (Authors)] Address: Verberk, W., Animal Ecology and Physiology, Radboud Univ., Heyendaalseweg 135, 6525, AJ Nijmegen, the Netherlands. Email: w.verberk@science.ru.nl

20706. Jödicke, R.; Borkenstein, A. (2021): 100 Jahre *Aeshna subarctica* in Europa (Odonata: Aeshnidae). *Libellula Supplement* 16: 141–160: 141-160. (in German, with English summary) ["100 years of *A. subarctica* in Europe – In Europe, *Aeshna subarctica* became known only one hundred years ago. Its history of discovery of the Palaearctic population is traced on the basis of literature. We critically scrutinise its taxonomy, especially that of the European subspecies *elisabethae* and *interlineata*. The phenomenon of a light coloration variety in north-western Central Europe is discussed but not finally explained. The identification in the field is difficult. With comments on a reliable determination we will support a better differentiation between *subarctica* and *juncea*. The most important surveys on the biology of *A. subarctica* are reported on; the species can be regarded as well researched." (Authors)] Address: Jödicke, R., Am Liebfrauenbusch 3, D-26655 Westerstede, Germany. E-mail: reinhard.joedicke@magenta.de

20707. Klausnitzer, B.; Altmann, I. (2021): Zum 200. Geburtstag von Michael Rostock / Michal Rostok, nebst einer Übersicht zur Psocoptera-Fauna (Insecta). *Berichte der naturforschenden Gesellschaft der Oberlausitz* 29: 125-136. (in German, with English summary) ["The 200th birthday of Michael Rostock/Michal Rostok is an occasion to remember this important Sorbian entomologist. His work on the Psocoptera is discussed in some detail. Including the findings of Feurich (1896), 25 species from the Oberlausitz were reported. These are the only faunistic data from the period 1868–1896. For seven species, the data from Rostock and Feurich are uncertain, but four of them have been confirmed by other authors. An additional 19 species reported from the Oberlausitz by Roesler (1939, 1954), Günther (1974) and Schmidt (2016) are listed. Currently, 41 species

of Psocoptera are known from the Oberlausitz." (Authors)] Address: Altmann, Ingrid, Adlerweg 30, 93437 Furth im Wald, Germany

20708. Koyanagi, T.; Maoka, T.; Misawa, N. (2021): Fecal microflora from dragonflies and its microorganisms producing carotenoids. *Adv. Exp. Med. Biol.* 1261: 209-216. (in English) ["The intestines of insects are assumed to be the niche of various microbial groups, and a unique microflora could be formed under environmental conditions different from mammalian intestinal tracts. This chapter describes the bacterial flora formed in the intestines of two dragonfly species, "akatombo" (the red dragonfly; *Sympetrum frequens*) and "usubaki-tombo" (*Pantala flavescens*), which fly over a long distance, and carotenoid-producing microorganisms isolated from this flora. C30 carotenoids, which were produced by a bacterium *Kurthia gibsonii* isolated from *S. frequens*, were structurally determined." (Authors)] Address: Koyanagi, T., Dept of Food Science, Ishikawa Prefectural Univ., Nonouchi-shi, Ishikawa, Japan

20709. Kuznetsova, V.; Maryanska-Nadachowska, A.; Anokhin, B.; Shapoval, N.; Shapoval, A. (2021): Chromosomal analysis of eight species of dragonflies (Anisoptera) and damselflies (Zygoptera) using conventional cytogenetics and fluorescence in situ hybridization: Insights into the karyotype evolution of the ancient insect order Odonata. *Journal of Zoological Systematics and Evolutionary Research* 59(2): 387-399. (in English) ["All Odonata species studied to date using fluorescence in situ hybridization (FISH) belong to the dragonfly (Anisoptera) families Corduliidae and Libellulidae. It was shown that 18S rRNA gene loci locate on one of the largest pairs of autosomes in every species, whereas the "insect" telomere motif (TTAGG)_n is absent in all but one species. For better understanding the chromosomal organization and evolution of Odonata, we used C-banding and FISH to study the karyotypes and map TTAGG sequences and major rRNA loci on chromosomes of three more dragonfly species from the families Corduliidae, Libellulidae, and Aeshnidae. Moreover, we obtained the first FISH-data on the suborder Zygoptera (damselflies) by analyzing five species of the families Coenagrionidae and Calopterygidae. We showed that all studied dragonfly species had 2n = 24A + X. The same karyotype was observed in the damselfly family Coenagrionidae, whereas in species of the Calopterygidae, the karyotype 2n = 26A + X was found. Both dragonfly and damselfly species had a pair of m-chromosomes; constitutive heterochromatin tended to be concentrated in the terminal regions of their chromosomes. The use of (TTAGG)_n and 18S rRNA gene probes in dual-color FISH did not generate (TTAGG)_n fluorescent signals in any species; major rRNA clusters were revealed on one of the largest pairs of autosomes in all Anisoptera species but on m-chromosomes in all Zygoptera species. Our results suggest that the former 18S location pattern was ancestral in the Odonata and the latter pattern had an ancient origin and could arise in a common ancestor of the damselfly superfamilies Calopterygoidea and Coenagrionoidea." (Authors)] Address: Kuznetsova, Valentina, Dept of Karyosystematics, Zoological Institute, Russian Academy of Sciences, St. Petersburg 199034, Russia. Email: valentina_kuznetsova@yahoo.com

20710. Lai, Y.-H.; Ma, J.-F.; Yang, J.-T. (2021): Flight maneuver of a damselfly with phase modulation of the wings. *Integrative and Comparative Biology* 61(1): 20-36. (in English) ["We developed a numerical model for four-wing self-propulsion to calculate effectively the flight velocity generated

with varied wing motions, which satisfactorily verified biological experiments. Through this self-propulsion model, we analyzed the flight velocity of a damselfly (*Matrona cyanoptera*) at varied phases. The results show that after phase modulation of the wings, the aerodynamic performance of the forewing is affected by the incoming flow and an effective angle of attack, whereas that of the hindwing is dominated by the vortex interaction and induced flow generated by the shed vortex of the forewing. Cooperating with the flow interaction, in stable flight, the hindwing in the lead phase has a larger vertical velocity, whereas the forewing in the lead phase has a larger horizontal velocity. Regarding the aerodynamic efficiency, the forewing in the lead phase has greater horizontal efficiency, whereas the hindwing in the lead phase has greater vertical efficiency; the overall efficiency does not vary with the phase. This work interprets that a dragonfly adopts the hindwing in the lead phase to generate a larger lift, thus supporting the larger body weight, whereas a damselfly adopts the forewing in the lead phase to have a greater forward velocity, which can supplement the lack of flapping frequency." (Authors)] Address: Yang, J.-T., Dept of Mechanical Engineering, National Taiwan Univ., Taipei, Taiwan. Email: jyang@ntu.edu.tw

20711. Lima da Silva, J.R.; Lima da Silva, A.; Santiago, A.S.; da Silveira Júnior, A.M. (2021): Composition, abundance and diversity of immature Odonata (INSECTA) insects living in stretches of middle Araguari River, Amapá State, Amazonian Region, Brazil. *Nature and Conservation* 14(2): 11 pp. (in English, with Portuguese summary) ["Odonata order, popularly known as dragonflies, comprises insects belonging to group Palaeoptera and presents hemimetabolous development encompassing three life cycle stages: eggs, larvae and adults. Odonata order has three suborders, namely: Anisoptera, Zygoptera and Anisozygoptera - the last one is exclusively distributed in Asia. The aim of the current study is to investigate the composition, abundance and diversity of Odonata larvae in middle Araguari River (Amapá, Brazil) by evaluating space-seasonal fluctuations and their association with different substrates. Eight collection sites were set along the river. Quarterly samplings were performed within an annual cycle (April/2018 to April/2019) by positioning a trawl "D" net (Rapiché) on the riverbed and scraping the substrate to collect 2L of sample. Odonata richness, abundance and diversity indices were evaluated. Data were statistically treated based on simple descriptive analysis, means, medians and standard deviations, Kruskal-Wallis test (nonparametric data) and ANOVA (parametric data) in the R-statistics Software. 297 individuals were identified; Libellulidae was the most abundant family (80.13%). Diversity and equitability have shown variations between sampling sites ($p < 0.05$) and collection campaigns ($p < 0.05$). Only abundance was influenced by categorical variables such as downstream/upstream river and substrate type. Higher taxonomic resolution, in combination to environmental variables, could help establishing ecosystem relationships that were not identified in the current study." (Authors)] Address: Lima da Silva, J.R., Universidade Federal do Amapá, Brasil. Email: jho.rodrigues.1701@gmail.com

20712. Liu, X.; Hefler, C.; Shyy, W.; Qiu, H. (2021): The importance of flapping kinematic parameters in the facilitation of the different flight modes of dragonflies. *Journal of Bionic Engineering* 18: 419-427. (in English) ["To better understand dragonflies' remarkable flapping wing aerodynamic performance, we measured the kinematic parameters of the wings in two different flight modes (Normal Flight Mode (NFM) and Escape Flight Mode (EFM)). When the specimens

switched from normal to escape mode the flapping frequency was invariant, but the stroke plane of the wings was more horizontally inclined. The flapping of both wings was adjusted to be more ventral with a change of the pitching angle that resulted in a larger angle of attack during downstroke and smaller during upstroke to affect the flow directions and the added mass effect. Noticeably, the phasing between the fore and hind pair of wings varies between two flight modes, which affects the wing-wing interaction as well as body oscillations. It is found that the momentum stream in the wake of EFM is qualitatively different from that in NFM. The change of the stroke plane angle and the varied pitching angle of the wings diverts the momentum downwards, while the smaller flapping amplitude and less phase difference between the wings compresses the momentum stream. It seems that in order to achieve greater flight maneuverability a flight vehicle needs to actively control positional angle as well as the pitching angle of the flapping wings." (Authors)] Address: Qiu, H., Dept of Mechanical and Aerospace Engineering, The Hong Kong Univ. of Science and Technology, Hong Kong SAR, China

20713. Liu, X.; Hefler, C.; Fu, J.; Shyy, W.; Qiu, H. (2021): Implications of wing pitching and wing shape on the aerodynamics of a dragonfly? *Journal of Fluids and Structures* 101, February 2021, 103208: (in English) ["The forewing and the hindwing of a dragonfly have different geometry that could be an evolutionary specialization for better aerodynamic performance via sophisticated wing pitch control. Under different extent of wing pitching by the wing root musculature, the fore- and hindwings could exhibit different shape deformation and aerodynamic characteristics as a result of passive shape deformation. We measured the flow around the flapping wings using time-resolved particle image velocimetry (TR-PIV) to investigate the consequences of shape and the pitching mechanisms of the wings on the aerodynamics of dragonflies. The flow fields and pitching angle variations of the naturally actuated wing of the dragonfly were compared with that of the same wing artificially actuated only by flapping motion. We found that the trailing edge vortex dynamics and the wake were affected by the wing shape only for the in-vivo experiment with muscle induced pitching. Under the in-vivo with muscle induced pitching, the hindwing took more part in generating horizontal momentum with larger pitching magnitude, due to the larger chord length compared with forewing. Meanwhile, when there was only pitching due to the wing membrane deformation of artificially actuated flapping, a slight difference in the surrounding flow structures was found between the hindwing and the forewing, and the net flow in one period was reduced nearly to zero. These results provided quantified evidence to the extent and importance of the pitching motion of the wings in dragonfly flight. The results of this work can be useful for the design of wings, their actuation mechanism, and the in-flight kinematics control of flapping wing micro air vehicles (MAVs)." (Authors)] Address: Qiu, H., Dept of Mechanical and Aerospace Engineering, The Hong Kong Univ. of Science and Technology, Hong Kong Special Administrative Region of China. E-mail: meqiu@ust.hk

20714. Martens, A. (2021): Hansruedi Wildermuth: Facetten seiner Libellenstudien. *Libellula Supplement* 16: 13-18. (in German, with English summary) ["Hansruedi Wildermuth: Some highlights of his Odonata studies. Hansruedi Wildermuth is one of the most creative odonatologist in the present time. This paper focuses on two aspects: (1) his special contribution on midges as odonate parasites and (2) the development of his fundamental monography on European

Corduliidae." (Author)] Address: Martens, A., Institut für Biologie, PH Karlsruhe, Bismarckstrasse 10, D-76133 Karlsruhe, Germany. E-mail: martens@ph-karlsruhe.de

20715. Martins, R.T.; Brito, B.; Dias-Silva, K.; Leal, C.G.; Leitao, R.P.; Oliveira, V.C.; Oliveira-Júnior, J.M.B.; Ferraz, S.F.B.; de Paula, F.R.; Roque, F.O.; Hamada, N.; Juen, L.; Nessimian, J.L.; Pompeu, P.S.; Hughes, R.M. (2021): Low forest-loss thresholds threaten Amazonian fish and macroinvertebrate assemblage integrity. *Ecological Indicators* 127 (2021) 107773: 12 pp. (in English) ["Deforestation is a major threat globally, but especially in tropical regions because they are biodiversity strongholds and carbon storehouses. Some studies have reported changes in species richness and composition in lotic ecosystems with increased forest-loss in their catchment, presumably resulting from the replacement of sensitive taxa by more resistant or tolerant taxa. Also, sensitive taxa respond to deforestation in a non-linear manner and fish and macroinvertebrates have different sensitivities to landscape pressures. Therefore, it is useful to determine the effects of forest-loss on widespread sensitive or threshold taxa in aquatic ecosystems. We used Threshold Indicator Taxa Analysis (TITAN) to assess forest-loss and land use history impacts in 92 eastern Amazonian stream sites. We determined TITAN peak-change thresholds for fish at 1% and 6% of forest-loss at total-catchment and local-riparian spatial extents, respectively, and at 2% and 40% of land-use intensity change at total-catchment and local-riparian spatial extents, respectively. For macroinvertebrates, TITAN peak-change thresholds were 1% and 11% of forest loss at total-catchment and local-riparian spatial extents, respectively, and at 3% of land-use intensity change for both total-catchment and local-riparian spatial extents. Because of these thresholds, inherent ecoregional variability and key literature, we have three major recommendations. 1) Logging should be prohibited in riparian reserves that are at least 100-m wide on each side of headwater streams and in a network of catchments across all biomes and as many landscape types as possible. 2) An ecologically and statistically rigorous monitoring program with standard methods should be implemented to assess and regulate land uses better. 3) Conservation planning areas should consider aquatic biota as well as terrestrial biota." (Authors)] Address: Martins, R.T., Coordenação de Biodiversidade, Instituto Nacional de Pesquisas da Amazonia, Manaus, AM 69067-375, Brazil. E-mail address: martinsrt@gmail.com

20716. Mehmood, S.A.; Zia, A.; Ahmad, S.; Shah, M.; Ali, W.; Rababa; Irfanullah (2021): Distribution and abundance of odonates fauna of Tanawal region district Mansehra, Pakistan. *Journal of Animal & Plant Sciences* 31(6): 1848-1854. (in English) ["Throughout the present study a total of 425 specimens were collected to assess the distribution and abundance of Odonata fauna. [...]. They are environmental indicators and play important role in biological control of insect pests. Result revealed 19 species belonging to [...] under 6 families. Most abundant family recorded was Libellulidae (74%) followed by Chlorocyphidae and Calopterygidae (11%) and (7%) respectively. Whereas Aeshnidae were found least abundant (2%). Genus *Orthetrum* dominated with percentage (51%) followed by genera *Rhinocypha*, *Neurobasis* and *Pantala* 11%, (7%) and (7%) respectively. While least abundant genus was *Sympetrum* having percentage (2%). Highest richness is observed at locality Galli badral (12.47%) followed by Shungli (12.00%) and Phulra (11.29%) respectively. However lowest richness was recorded at locality Lassan (4.47%). Regarding species

abundance *Orthetrum triangulare triangulare* was dominated (18.11%) followed by *O. prinosum neglectum*, (16.47%), *Neurobasis chinensis chinensis*, (7.05%) and *Rhinocypha quadrimaculata*, (5.88%), respectively. While lowest abundance was observed for *Ictinogomphus rapax* (1.41%). The canonical correspondence analysis showed that all Odonata species were associated with submerged vegetation. Anisoptera and Zygoptera species were associated with sunny and shady biotypes. Two species; *O. triangulare triangulare* and *O. prinosum neglectum* showed positive association with temperature. A Zygoptera species *Megalestes major* was found in moist habitat. Relative humidity was found as an influencing factor for the population growth of Anisopteran and Zygopteran species. Cluster analysis showed that all species were clustered into two groups; genera *Anax*, *Ictinogomphus*, *Crocothemis*, *Neurothemis*, *Orthetrum Palpopleura*, *Pantala* and *Sympetrum* were clustered into group I. Whereas Group II comes up with all Zygoptera species. The current information/data base will be helpful in preservation of ecosystem management approaches of Odonata." (Authors)] Address: Mehmood, S.A., Dept of Zoology, Hazara Univ., Mansehra, Pakistan. Email: sardar.azhar@hu.edu.pk

20717. Miya, M.S.; Gautam, D.; Neupane, B.; Chhetri, A. (2021): Species diversity and abundance of Odonata in Sishaghat of Tanahun district, Nepal. *Journal of Animal Diversity* 3(3): 45-55. (in English) ["Odonates are one of the most ancient, well studied and fascinating insects considered as bio-indicators of aquatic ecosystems. Studies of Odonata have been carried out in many parts of Nepal, but no specific study has been performed in Tanahun. Hence, a study was conducted to determine the species diversity and abundance of Odonata in the Sishaghat region of Tanahun district, Nepal from June to August 2020. A transect survey method was used for data collection. A total of six transects, each with a length of 200 m: - (three in each habitat type: agricultural lands and forest streams) were laid out randomly and each transect was surveyed three times. Data were pooled and analyzed with SPSS. A total of 629 individuals of 26 Odonata species from 20 genera and 7 families were recorded. The overall Shannon-Wiener diversity index was $H = 2.25$, Shannon Equitability was $E = 0.69$ and Margalefs' richness index was $R = 3.88$. Sub-order Anisoptera was more diverse ($H = 1.94$) and more abundant ($n = 545$) than Zygoptera ($H = 1.31$, $n = 84$). However, species richness was higher and evenness lower in Zygoptera ($R = 2.26$, $E = 0.55$) than Anisoptera ($R = 2.22$, $E = 0.72$). Anisoptera comprised 15 species under 10 genera from two families and Zygoptera comprised 11 species under seven genera from five families. The family Libellulidae represented the highest species richness ($R = 1.75$). *Neurothemis fulvia* and *Orthetrum prinosum* were the most abundant species ($RA = 23.21$ and 21.78 respectively). While considering the global context, among the recorded Odonata, 25 species are included under the least concern and one under the vulnerable category by IUCN. A higher number of species was found in agricultural lands (nine species); hence, the water bodies around should be preserved to conserve the Odonata." (Authors)] Address: Neupane, B., Tribhuvan Univ., Institute of Forestry, Pokhara Campus, Pokhara, Nepal. E-mail: bijneu@gmail.com

20718. Montalvão, M.F.; Guimarães, A.T.A.; Rodrigues, A.S.; Malafaia, G. (2021): Carbon nanofibers are bioaccumulated in *Aphylla williamsoni* (Odonata) larvae and cause REDOX imbalance and changes of acetylcholinesterase activity. *Science of The Total Environment* 756:143991: (in

English) ["Carbon-based materials have been considered very promising for the technological industry due to their unique physical and chemical properties, namely: ability to reduce production costs and to improve the efficiency of several products. However, there is little information on what is the level of exposure that leads to adverse effects and what kind of effects is expected in aquatic biota. Thus, the aim of the present study was to evaluate the toxicity of carbon nanofibers (CNFs) in dragonfly larvae (*Aphylla williamsoni*) based on predictive oxidative-stress biomarkers, antioxidant activity reduction and neurotoxicity. After ephemeral models' exposure to CNFs (48 h; at 500 µg/L), data have shown that these pollutants did not change larvae's nutritional status given the concentration of total soluble carbohydrates, total proteins and triglycerides in them. However, the levels of both nitric oxide and substances reactive to thiobarbituric acid (lipid peroxidation indicators) have increased and the antioxidant activity based on total thiol levels and on 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity (%) has reduced, and it suggests REDOX imbalance induction by CNFs. In addition, larvae exposed to these pollutants showed significant acetylcholinesterase activity reduction in comparison to the control group. Thus, the present study has brought further knowledge about how carbon-based materials can affect benthic macroinvertebrates and emphasized their ecotoxicological potential in freshwater environments." (Authors)] Address: Programa de Pós-Graduação em Ecologia e Conservação de Recursos Naturais, Universidade Federal de Uberlândia, Uberlândia, MG, Brazil; Lab. de Pesquisas Biológicas, Programa de Pós-Graduação em Conservação de Recursos Naturais do Cerrado, Inst. Federal Goiano, Urutaí, GO, Brazil; Programa de Pós-Graduação em Biotecnologia e Biodiversidade, Univ. Federal de Goiás, Goiânia, GO, Brazil

20719. Nakamura, H.; Kurimoto, N.; Imura, Y.; Hatakeyama, Y. (2021): The first isolation of microsporidia from dragonflies in Japan. *Jpn. J. Appl. Entomol. Zool.* 65: 29-34. (in Japanese, with English summary) ["Entomopathogenic microsporidia are pathogens of various arthropods and therefore cause disease in important host species ranging from agricultural pests to beneficial insects. Here, we investigated three genera of entomopathogenic microsporidia from dragonflies; these were isolated in Kanagawa, Japan, in 2014. In total, the infection rate was 0.85% (16 of the 1,886 surveyed dragonfly adults). Four strains of microsporidia selected from infected *Orthetrum albistylum speciosum* adults were measured for spore size and analyzed at the molecular level. According to spore size, the four strains were roughly divided into two groups. Analysis of small-subunit ribosomal RNA sequences indicated that the microsporidia strains belonged to the *Trachipleistophora*, *Vavraia*, and *Paranosema* clusters. Microsporidia species that are closely related to the strains isolated in this study have previously been reported to infect insects other than dragonflies. Therefore, we suggest the possibility that the microsporidian strains we isolated in *O. albistylum speciosum* may also infect other insect species." (Authors)] Address: Hatakeyama, Y., Laboratory of Applied Entomology, Dept of Agricultural Bioscience, College of Bioresource Science, Nihon Univ.; 1866 Kameino, Fujisawa, Kanagawa 252.0880, Japan. E-mail: hatakeyama.yoshinori@nihon-u.ac.jp

20720. Nakamura, Y.; Tominaga, A. (2021): Diet of the American Bullfrog *Lithobates catesbeianus* naturalized on Okinawajima, Ryukyu Archipelago, Japan. *Current Herpetology* 40(1): 40-53. (in English) ["The diet of the nonnative American Bullfrog *Lithobates catesbeianus* occurring in

Ogimi Village of Okinawajima, Ryukyu Archipelago, is investigated. Seventy two of 89 frogs (nine adults, five sub-adults, and 58 juveniles) captured had food items in its stomach. We identified a total of 64 taxa from 253 food items. Our analyses show that (1) the diet consists mainly of terrestrial prey, (2) mollusks and vertebrates are the essential prey groups for adults and subadults, and (3) odonates, mollusks, and arachnids are the main prey for juveniles. Such dietary habits are quite different from those of several conspecific nonnative populations in mainland Japan and other regions. Part of this is most likely related to the absence of the frog's favorite prey, nonnative American crayfish *Procambarus clarkii*, in the study area. We also confirm the predation of a poisonous newt *Cynops ensicauda popei* (Salamandridae) and several aquatic insects by this frog and present some implications for these results." (Authors)] Address: Nakamura, Y., Faculty of Education, Univ. of the Ryukyus, Senbaru 1, Nishihara, Okinawa 903-0213, Japan. Email: ynaka.riukiaria@gmail.com

20721. Nidup, T.; Tamang, D.T.; Tobgay, S.; Wangmo, S.; Wangchuck, K.; Rinzin, P.; Dorji, T. (2021): Nymphs of Odonata (Insecta) from Eastern Bhutan with identification keys to nymphs of the Odonata families known from Bhutan. *Sherub Doenme: The Research Journal of Sherubtse College* 14: 65-76. (in English) ["The nymphs of Odonata is least studied in Bhutan despite being the good indicator of aquatic ecosystem. Through the survey of streams and lakes in Trashigang and Trashi Yangtse districts, nymphs of four Zygoptera, one Anisozygoptera and six Anisoptera families are reported from eastern Bhutan. The identification key to the families of the nymphs of Odonata in Bhutan, recorded either through adult or nymphs provided to facilitate the future identification. However, further work is needed to document the nymphs of all the families of the adult Odonata found in Bhutan." (Authors)] Address: Nidup, T., Centre for Science & Environmental Research, Sherubtse College, Bhutan. E-mail: tsheringnidup.sherubtse@rub.edu.bt

20722. Norling, U. (2021): Growth, winter preparations and timing of emergence in temperate zone Odonata: control by a succession of larval response patterns. *International Journal of Odonatology* 24(1): 1-36. (in English) ["As warm-adapted insects of tropical origin, Odonata cope with cold periods by seasonal regulation and diapause. A model for larval-overwintering species is proposed with three response patterns related to the timing of emergence, which can be predicted from seasonal cues during the last few stadia. For emergence during the present season, there is an often time constrained preemergence development, accelerated by long days and higher temperatures. In regulatory development, emergence is postponed to the next season, and a complex of diapause-like delays controlled by photoperiod and temperature prevents premature emergence. Instead, development converges on a winter diapause in sizes suitable for emergence during the following year. Long days are particularly delaying, and thermal responses are variable, sometimes inverted. In early development, with rapid growth, emergence is usually not predicted to season, but short-day winter diapauses may occur, and precocious preparations for a penultimate winter may be predictive. Thermal responses are steep, extremely so if a short-day diapause is suppressed by higher temperatures. Other physiological and also behavioural properties may differ between response patterns. Changes in photoperiod and temperature control the timing of seasonal events, and the transition from regulatory to pre-emergence development follows the increase in temperature and photoperiod after winter,

which is an important time-setter. Interactions of larval size, photoperiod, temperature and previous changes affect development rate, and long-term constant conditions often end in regulatory diapauses. Proximate mechanisms of cohort splitting and the implications of the model for design and interpretation of experiments are discussed." (Authors)] Address: Norling, U., Dept of Urban Studies, Malmö Univ., Malmö, Sweden, Spårnögratan 53, 22652 Lund, Sweden. E-mail: ulfg.norling@gmail.com, ulf.norling@mau.se

20723. Oki, D.S. (2021): Numerical simulation of the effects of groundwater withdrawal and injection of high-salinity water on salinity and groundwater discharge, Kaloko-Honokohau National Historical Park, Hawai'i. U.S. Geological Survey Scientific Investigations Report 2021-5004: 59 pp. (in English) ["Kaloko-Honokohau National Historical Park (KAHO) is located on the west coast of the island of Hawai'i and contains water resources exposed in fishponds, anchialine pools, and marine waters that are cultural resources and that provide habitat for threatened, endangered, and other culturally important native species. KAHO's water resources are sustained by and dependent on groundwater discharge. In 1978, the year of KAHO authorization, the lands immediately surrounding KAHO were undeveloped and zoned for conservation purposes; at present, most surrounding lands are either developed or zoned for industrial, commercial, or residential use. Urbanization of the North Kona District has increased the need for additional drinking and nonpotable (irrigation) water. Because KAHO's water resources may be affected by existing and proposed groundwater withdrawals and injections of high-salinity water in the surrounding area, the U.S. Geological Survey, in cooperation with the National Park Service, undertook this study to refine the understanding of how groundwater withdrawals and injection of high-salinity water may affect KAHO's water resources. Changes in KAHO water resources, in terms of changes in salinity and groundwater discharge, were modeled for selected scenarios of groundwater withdrawal and high-salinity water injection in the aquifer. The numerical model was developed using the model code SUTRA, which accounts for density-dependent flow and salinity transport, and included the coastal-confined groundwater system beneath the coastal freshwater-lens system. Model results indicate that withdrawal of additional groundwater from the coastal freshwater-lens system will affect the salinity of KAHO's anchialine pools, which provide habitat for the endangered orangeblack Hawaiian damselfly (*Megalagrion xanthomelas*). The magnitude of the effect is dependent on the amount and location of the withdrawal. Greater withdrawal rates cause greater increases in salinity in KAHO, other factors being equal. For a given withdrawal rate, the greatest increase in salinity in KAHO is associated with wells withdrawing groundwater in an area inland of KAHO and the least increase in salinity is associated with wells near the coast. Model results also indicate that withdrawal of additional groundwater from the coastal freshwater-lens system will affect the groundwater discharge, in terms of the freshwater component (water with zero salinity) of the discharge, through KAHO. Greater withdrawal rates cause greater reductions in freshwater discharge through KAHO. For a given withdrawal rate, the greatest reduction in freshwater discharge through KAHO is associated with wells near the north boundary of KAHO and the least reduction is associated with wells near the coast to the north and south of KAHO. Injection of high-salinity water that is denser than ocean water can affect the salinity of damselfly habitat in KAHO, with the magnitude of the effect dependent on the location of the injection. Model results indicate that salinity

may either increase or decrease in the anchialine pools that provide damselfly habitat in KAHO, depending on the site of injection. Injection inland of KAHO and at sites immediately north and south of KAHO causes a simulated decrease in salinity at the damselfly habitat, whereas injection farther north and south of KAHO causes an increase in salinity. Injection of high-salinity water also causes a reduction in freshwater discharge through KAHO, with the greatest reduction associated with distant injection wells to the north and south of KAHO and the least reduction associated with wells located near and immediately inland from KAHO. The numerical groundwater models developed for this study have a number of limitations. Lack of understanding of the subsurface geology constrains the ability to accurately model the groundwater-flow system. The models developed for this study are nonunique, cannot account for local-scale heterogeneities in the aquifer, and contain uncertainties related to recharge, boundary conditions, assigned parameter values in the model, and representations of the different hydrogeological features. Confidence in model results can be improved by addressing these and other limitations. In spite of these limitations, the three-dimensional numerical model developed for this study provides a useful conceptual understanding of the potential effects of additional withdrawals and injections on groundwater resources in KAHO. Further evaluation of the ecologic effects of the simulated changes in groundwater quality and quantity in KAHO is needed but is beyond the scope of this study." (Author)] Address: Pacific Islands Water Science Center, U.S. Geological Survey, Inouye Regional Center, 1845 Wasp Blvd., B176, Honolulu, HI 96818, USA

20724. Okude, G.; Fukatsu, T.; Futahashi, R. (2021): Electroporation-mediated RNA Interference Method in Odonata. *Journal of Visualized Experiments* (168), e61952: 20 pp. (in English) ["Odonata represent one of the most ancestral insects with metamorphosis, in which they change their habitat, morphology, and behavior drastically from aquatic larvae to terrestrial/aerial adults without pupal stage. Odonata adults have a well-developed color vision and show a remarkable diversity in body colors and patterns across sexes, stages, and species. While many ecological and behavioral studies on Odonata have been conducted, molecular genetic studies have been scarce mainly due to the difficulty in applying gene functional analysis to Odonata. For instance, RNA interference (RNAi) is less effective in the Odonata, as reported in the Lepidoptera. To overcome this problem, we successfully established an RNAi method combined with *in vivo* electroporation. Here we provide a detailed protocol including a video of the electroporation-mediated RNAi method as follows: preparation of larvae, species identification, preparation of dsRNA/siRNA solution and injection needles, ice-cold anesthesia of larvae, dsRNA/siRNA injection, *in vivo* electroporation, and individual rearing until adult emergence. The electroporation-mediated RNAi method is applicable to both damselflies (suborder Zygoptera) and dragonflies (suborder Anisoptera). In this protocol, we present the methods for the blue-tailed damselfly *Ischnura senegalensis* (Coenagrionidae) as an example of damselfly species and the pied skimmer dragonfly *Pseudothemis zonata* (Libellulidae) as another example of dragonfly species. As representative examples, we show the results of RNAi targeting the melanin synthesis gene multicopper oxidase 2. This RNAi method will facilitate understanding of various gene functions involved in metamorphosis, morphogenesis, color pattern formation, and other biological features of Odonata. Moreover, this protocol may be generally applicable to non-model organisms in which RNAi is less effective

in gene suppression due to the inefficiency and low penetrance." (Authors)] Address: Okude, G., Dept of Biological Sciences, Graduate School of Science, The Univ. of Tokyo; Bioproduction Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Japan. Email: gentaokude@gmail.com

20725. Okude, G.; Fukatsu, T.; Futahashi, R. (2021): Comprehensive comparative morphology and developmental staging of final instar larvae toward metamorphosis in the insect order Odonata. *Scientific Reports* volume 11, Article number: 5164: 13 pp. (in English) ["The order Odonata is among the most ancestral groups of winged insects with drastic morphological changes upon metamorphosis, and thus important for understanding evo-devo aspects of insects. However, basic developmental descriptions of Odonata have been scarce. In an attempt to establish the foundation of developmental and experimental biology of Odonata, we present an unprecedentedly comprehensive survey of dragonflies and damselflies, in total 158 larvae representing 49 species and 14 families, wherein morphological changes of all the final and/or penultimate instar larvae were photographed and monitored everyday. Although their morphology and development were diverse, we consistently identified two visually recognizable morphogenetic events in the final larval instar, namely start of wing expansion and onset of melanization on the wing sheaths, thereby categorizing the final instar into three stages. While the duration of the first stage ranged 4–66 days across diverse Odonata species, the second or third stages exhibited relatively small variation ranging 3–22 days or 1–8 days, respectively, probably reflecting the steady and irreversible metamorphosis process after stage 2. We also described other characteristic morphological changes during the larval development, although they were observed only in some Odonata species and lineages." (Authors)] Address: Okude, G., Dept of Biological Sciences, Graduate School of Science, The Univ. of Tokyo, Tokyo, Japan. E-mail: gentaokude@gmail.com

20726. Olthoff, M.; Hannig, K. (2021): Die Libellen (Insecta, Odonata) einer Sandabgrabung bei Haltern-Flaesheim (Kreis Recklinghausen, Nordrhein-Westfalen). *Abhandlungen aus dem Westfälischen Museum für Naturkunde* 94: 261-278. (in German, with English summary) ["Between 2015 and 2017, the dragonfly fauna of a sand pit next to Haltern-Flaesheim (Recklinghausen district, North Rhine-Westphalia) was investigated at ten sampling days. In addition to the actual water filled excavation site, a fire water pond was investigated. Altogether, 27 species of dragonflies could be recorded, one of which is listed in the German Red List of endangered species [*Orthetrum coerulescens*]. With 21 species, a comparatively high diversity could be recorded at the fire water pond. Only 14 species could be observed at the excavation site. The sand pit with its favourable climatic conditions offers habitat for many warmth-loving Mediterranean species [*Erythromma lindenii*], *E. viridulum*, *Anax parthenope*, *Gomphus pulchellus*, *Crocothemis erythraea*, *Sympetrum fonscolombii*. What is particularly remarkable here is the occurrence of *Gomphus vutgatissimus* at the water-filled excavation site, which is also its breeding site. Due to the absence of shallow water zones with riparian vegetation, no further dragonfly species that are a high priority for conservation were recorded." (Authors)] Address: Olthoff, M., Naturförderstation im Kreis Coesfeld, Borkener Str. 13, 48653 Coesfeld, Germany. Email: matthias.olthoff@naturfoerderstation.de

20727. Pianezze, S.; Perini, M.; Bontempo, L.; Piasentier, E.; Poma, G.; Covaci, A.; Camin, F. (2021): Stable isotope ratio analysis for the characterisation of edible insects. *Journal of Insects as Food and Feed* 7(6): 955-964. (in English) ["Entomophagy, or the act of eating insects, has been practiced since ancient times, but it started to gain more popularity, especially in Western countries, only recently. As sustainability is one of the current emerging themes, the inclusion of insects in our diet is a valid alternative that might help reduce the amount of water and land used for livestock and the associated emissions of greenhouse gasses. Moreover, insects are a source of protein, fibres, vitamins, minerals and fats. Edible insects are considered a novel food, for which no isotopic reference values are yet available. In the present work, samples of farmed edible insects (n=40) belonging to different orders (namely, Coleoptera, Hemiptera, Hymenoptera, Lepidoptera, Odonata and Orthoptera) and insect-based food items (n=4) for human consumption were analysed. The following isotopes, d13C, d15N, d34S, d18O and d2H of the defatted samples, together with the d13C of the fat, were investigated. The aim of the work was to provide the first reference isotopic ratios that can be used for future investigations in the food quality field. The variability of these parameters was dependent on the life stage and diet of insects, their geographical origin, and the addition of ingredients as seasoning." (Authors)] Address: Camin, Federica, Fondazione E. Mach, Via Mach 1, San Michele all'Adige, 38010 Trento, Italy. E-mail: federica.camin@fmach.it

20728. Piersanti, S.; Salerno, G.; Di Pietro, V.; Giontella, L.; Rebora, M.; Jones, A.; Fincke, O.M. (2021): Tests of search image and learning in the wild: Insights from sexual conflict in damselflies. *Ecology and Evolution* 11(9): 4399-4412. (in English) ["Search image formation, a proximal mechanism to maintain genetic polymorphisms by negative frequency-dependent selection, has rarely been tested under natural conditions. Females of many nonterritorial damselflies [*Ischnura elegans*] resemble either conspecific males or background vegetation. Mate-searching males are assumed to form search images of the majority female type, sexually harassing it at rates higher than expected from its frequency, thus selectively favoring the less common morph. We tested this and how morph coloration and behavior influenced male perception and intersexual encounters by following marked *I. elegans* and noting their reactions to conspecifics. Contrary to search image formation and associative learning hypotheses, although males encountered the minority, male-like morph more often, sexual harassment and clutch size were similar for both morphs. Prior mating attempts or copula with morphs did not affect a male's subsequent reaction to them; males rarely attempted matings with immature females or males. Females mated early in the day, reducing the opportunity for males to learn their identity beforehand. Once encountered, the male-like morph was more readily noticed by males than the alternative morph, which once noticed was more likely to receive mating attempts. Flexible behavior gave morphs considerable control over their apparency to males, influencing intersexual encounters. Results suggested a more subtle proximal mechanism than male learning maintains these color polymorphisms and call for inferences of learning to be validated by behavior of wild receivers and their signalers." (Authors)] Address: Fincke, Ola, Dept of Biology, Univ. of Oklahoma, Norman, OK, 73019 USA. E-mail: fincke@ou.edu

20729. Rivas-Torres, A.; Cordero-Rivera, A.; Luque-Pino, P. (2021): Evolució i diversitat de la translocació esperma-

tica intramasculina en odonats: comportament únic i essencial - Evolution and diversity of intramasculine sperm translocation in odonates: unique and essential behavior. *L'Atzer- vara* 31: 115-120. (in Catalan, with English summary) ["Evolution and diversity of intra-male sperm translocation in odonates: unique and essential behaviour. – The reproductive behaviour of Odonata is unique among insects and is conditioned by the anatomical separation between the male's reproductive organs and the intromittent organ. Prior to mating, males must translocate sperm from the ninth abdominal segment to the seminal vesicle located in the second abdominal segment. This behaviour, exclusive to odonates, is known as intra-male sperm translocation. In this brief review, we present the variants of this sperm translocation and propose a plausible explanation for how this behaviour may have evolved. We also present the intraspecific variability in this sperm translocation within the species *Ischnura graellsii* and the possible consequences within sperm fertility." (Authors)] Address: Rivas-Torres, A., Univ. de Vigo, Grupo ECOEVO, Escola de Enxeñaría Forestal, Campus Universitario A Xunqueira, 36005 Pontevedra, Spain

20730. Saefullah, A.A.; Latifah, L.; Sa'adah, M.; Salsabila, N.; & Muslimah, S. (2021): The inventory of dragonfly species in Kedung Kopong and Banyak Angkrem areas in Kali-rejo village, Salaman-Magelang. *Proceeding International Conference on Science and Engineering* 4: 41-47. (in Indonesian, with English summary) ["Dragonflies are classified into the Odonata order. The existence of dragonflies can be used as bioindicators of good water, related to their life cycle. The difference of habitats in the Kedung Kopong and Banyak Angkrem areas affects the diversity of dragonflies found in the location. The purpose of this research was to determine the types of dragonflies and their habitats in the Kedung Kopong and Banyak Angkrem areas. The method used in this research is the point count, which is by tracing the predetermined transects and divides it into some points. The distance between the points is 15 meters while the diameter of the points is 10 meters. The result of data collection of dragonflies in the Kedung Kopong and Banyak Angkrem areas as a whole obtained 19 species which is divided into 7 families, they are Aesnidae (2 species), Libellulidae (10 species), Calopterygidae (1 species), Cholorocyphidae (1 species), Coenagrionidae (2 species), Euphaeidae (1 species), and Platycnemidae (1 species). Habitats in the Kedung Kopong areas is the river. Meanwhile, in Banyak Angkrem are settlements and hills." (Authors)] Address: Latifah, L., Biology Dept, Faculty of Science & Technology, UIN Sunan Kalijaga, Jl. Marsda Adisucipto No 1 Yogyakarta 55281, Indonesia. E-mail hafitalala@gmail.com

20731. Shustov, Yu. A.; Lesonen, M.A. (2021): Food competition of roach and perch in the water bodies of the Republic of Karelia. *Hydrobiological Journal*: 17-25. (in English) ["A comparative analysis of the dietary competition between roach and perch in lakes and rivers of Karelia (Onega and Ladoga lakes basins) is presented. It was revealed that in summer competition occurs when fishes feed on aquatic invertebrates (zooplankton and zoobenthos), as well as aerial insects, flying at the water surface. Food competition, according to the diet similarity index, ranged from 39.0 to 49.5. First of all, fish competed for the benthic organisms (30.0-35.5) and zooplankton (5.0-16.5). It was found that there is practically no competition for the aquatic plants (higher plants, algae and detritus), which formed on average 35% of the roach diet. On average, 25% of the perch diet was made by fish. Thus, the perch, which has high physical strength, also feeds on other most mobile and large organisms

of zoobenthos - the waterlouse, lake gammarus and Odonata larvae." (Authors)] Address: Shustov, Yu.A., Petrozavodsk State Univ. Petrozavodsk, Russia North Research Institute of Fishery Petrozavodsk, Russia

20732. Steenken, S.; Kleinschmidt, M.; Remy, D. (2021): Erprobungs- und Entwicklungsvorhaben zur Auenrenaturierung – Erfolgskontrollen 20 Jahre später. *BfN-Skripten* 588: 445 pp. (in German) ["The success of four floodplain restoration projects was re-evaluated 10 to 20 years after the completion of the restoration measures. These are former E+E projects on the Berkel, Hase, Oster and Oberweser rivers, which were funded by the Federal Agency for Nature Conservation between 1988 and 2003. The aim of this success control was to evaluate the long-term effects of the implemented renaturation measures and to identify common development patterns that would enable the derivation of generally applicable recommendations for floodplain renaturation. For this purpose, the scientific accompanying studies from the original projects were partially resumed for two vegetation periods. The topics covered were hydrology and morphology, vegetation and use, and fauna. The focus of this success control was on the assessment of the development of the floodplain biocoenosis. In order to improve the comparability of the results from the different study areas, the catalogue of organism groups to be studied has been standardised as far as possible. In detail, vegetation, avifauna, amphibians, dragonflies, grasshoppers, ground beetles, macrozoobenthos (Oster only) and fish (Oster only) were investigated. For a better understanding of the projects, their framework conditions and socio-economic aspects, additional expert interviews were conducted with the former stakeholders. The evaluation was carried out in two basic steps, a longitudinal analysis, in which the projects were examined individually for their long-term effects, and a cross-sectional analysis, in which the results from the four study areas were compared to identify common development patterns. It turned out that all four D+E projects largely met the goals they had set for themselves. However, a closer look revealed that although the projects achieved a fundamental enhancement of the study areas and the investigated organism groups benefited from the renaturations as a whole, the promotion of floodplain-specific biotic communities was often only successful in a limited space or for a limited time. The necessary hydrodynamics and morphodynamics were often lacking in the study areas, even after restoration. A decisive, limiting factor in this context has turned out to be the demand for use of the watercourses as part of the infrastructure. This often prevented self-dynamic processes from being permitted to the extent that would have been necessary to allow the initial activating measures for the redynamisation of the floodplains to develop their potential. Thus, the few areas in which it was possible to give free rein to self-dynamic processes showed that the projects were in principle quite suitable for promoting typical floodplain communities. Furthermore, the comparison has shown that initial measures that use the self-dynamic forces of flowing waters to develop the floodplain are fundamentally more recommendable than engineering attempts to construct dynamic structures. The results of this success control confirm the necessity of a functional unity of floodplain and watercourse. In order to restore the ecological functionality of river floodplains, it is therefore essential that the deficits in the watercourses forming the floodplain are given more consideration in planning and, if necessary, that accompanying measures are planned to compensate for these deficits. In this context, synergies could be used with measures to implement the EU Water Framework Directive and the

federal programme "Blue Ribbon Germany". Translated with www.DeepL.com/Translator (free version)] Address: <https://www.bfn.de/sites/default/files/BfN/service/Dokumente/skripten/skript588.pdf>

20733. Susanto, M.A.D.; Arianti, O.F. (2021): Diversity and abundance of dragonfly (Anisoptera) and damselfly (Zygoptera) at Sabo Dam Complang, Kediri, East Java, Indonesia. *Biosfer* 12(2): 110-122. (in English, with Indonesian summary) ["Sabo Dam Complang is a dam area that is minimally polluted and disturbed so that it has the potential as a natural habitat for various types of dragonflies. Diversity and abundance of dragonflies in a location is one component of biodiversity that plays an important role as a predator to maintain the balance of the food chain in natural ecosystems and as a bioindicator of water quality. This study aims to identify and analyze the diversity and abundance of dragonflies species at Sabo Dam Complang. Samples were taken using the VES (Visual Ecounter Survey) method and 2 transect methods, namely line transects and belt transects. The data that has been obtained were analyzed using the Shannon-Wiener species diversity index (H') and the relative abundance of species (KR). The results of this study show the diversity index value of 2.59 which is included in the relatively medium category. There were 20 species of dragonflies that belonged to 6 families." (Authors)] Address: Susanto, M.A.S., Program Studi Biologi, Fakultas Sains dan Teknologi UIN Sunan Ampel Surabaya, Jalan A. Yani 117, Surabaya, Indonesia. E-mail: muhammadazmidwi@gmail.com

20734. Svenningsen, C.S.; Guldberg Frøslev, T.; Bladt, J.; Bruhn Pedersen, L.; Colling Larsen, J.; Ejrnæs, R.; Fløjgaard, C.; Hansen, A.J.; Heilmann-Clausen, J.; Dunn, R.R.; Tøttrup, A.P. (2021): Detecting flying insects using car nets and DNA metabarcoding. *Biol. Lett.* 17: 20200833. <https://doi.org/10.1098/rsbl.2020.0833>: 6 pp. (in English) ["Monitoring insects across space and time is challenging, due to their vast taxonomic and functional diversity. This study demonstrates how nets mounted on rooftops of cars (car nets) and DNA metabarcoding can be applied to sample flying insect richness and diversity across large spatial scales within a limited time period. During June 2018, 365 car net samples were collected by 151 volunteers during two daily time intervals on 218 routes in Denmark. Insect bulk samples were processed with a DNA metabarcoding protocol to estimate taxonomic composition, and the results were compared to known flying insect richness and occurrence data. Insect and hoverfly richness and diversity were assessed across biogeographic regions and dominant land cover types. We detected 15 out of 19 flying insect orders present in Denmark, with high proportions of especially Diptera compared to Danish estimates, and lower insect richness and diversity in urbanized areas. We detected 319 species not known for Denmark and 174 species assessed in the Danish Red List. Our results indicate that the methodology can assess the flying insect fauna at large spatial scales to a wide extent, but may be, like other methods, biased towards certain insect orders." (Authors) Odonata: relative proportion of individual species Denmark (%); 0.32; proportion of species detected in car nets compared to species in Denmark (%): 11.7.] Address: Tøttrup, A.P., Natural History Museum of Denmark. Email: aptottrup@snm.ku.dk

20735. Vargas Merchán, D.L.; L-Botero, A.A.; Realpe Rebolledo, E.A. (2021): Extreme pools: ecological adaptations in the order Odonata at the inselbergs in the Colombian Guiana shield. BSc. thesis, Facultad de Ciencias, Departamento

de Biología, Universidad de los Andes: 10 pp. (in English) ["This study has been purposed to evaluate adaptation strategies in insects of the order Odonata from three main families allocated at the Colombian Guiana shield: Libellulidae, Aeshnidae, and Coenagrionidae. A controlled habitat was used to monitor some previously identified variables to evaluate if there is an environmental effect related to water conditions or quantity that may be responsible for inducing plasticity events, due to stress sensing. All individuals used in this experiment were in the larval stage. Also, we evaluated if there is a behavioral strategy for Odonata larvae to sense different environmental signals that may help them to allocate suitable places to settle. Due to extreme climate changes can make disappear a perfectly suitable place for this type of organism in a short period, it is valuable to know if they have behavioral and/or phenotypic plasticity mechanisms to cope with these demanding conditions. We found relevant information from the Libellulidae family, in which changes in water conductivity had significant effects on their life history. However, we did not find data that supported our main hypothesis about their behavioral mechanisms, but the findings showed some light about some interesting behavior related to the studied families." (Authors)] Address: no details stated.

20736. Vila-Verde, G.; Santos, C.R. dos; Bomfim, G.S. (2021): Insetos (Insecta: Hymenoptera, Lepidoptera e Odonata) e as mudanças climáticas. *Terræ Didactica* 17 (Publ. Continua), 1-11, e021054: 11 pp. ["The Earth's climate has been affected by human activities, triggering environmental changes that may affect biodiversity. Furthermore, climate change is related to a higher concentration of CO₂ in the atmosphere and a greater incidence of ultraviolet radiation. Combined with deforestation, agriculture, and urban sprawl, these changes disrupt the environment. Because insects are sensitive to disturbances they can be used as bioindicators, because the changes influence life cycle, geographical distribution limits, and nutrition of insects. This study is a literature review that has examined the effects of climate change on groups of aquatic insects (order Odonata) and terrestrial insects (orders Hymenoptera and Lepidoptera). Climate change has a significant impact on entomofauna, especially in its distribution." (Authors)] Address: Vila-Verde, G., Mestrando em Zoologia pela Universidade Estadual de Santa Cruz, Ilhéus, BA, Brasil. Email: gabvilaverde@gmail.com

20737. Zimmermann, F. (2021): 30 Jahre Naturschutz im Land Brandenburg - Eine Bilanz zur Situation der Biodiversität der Arten und Lebensräume. *Naturschutz und Landschaftspflege in Brandenburg* 30(2): 4-35. (in German) ["5.1 Dragonflies In the new Red List of dragonflies, Mauersberger et al. (2017) conclude that of 66 species assessed, 15 are to be assessed as threatened, but no species is considered extinct or missing. The reasons for changes from the previous to the current Red List include increases in knowledge and changes in the method of compiling the Red List. However, real population changes predominate, both for the species that have been upgraded and for those that have been downgraded or removed from the Red List. With 38% downlisting compared to 14% negative category changes, a cautiously positive picture of the current situation of dragonfly species in Brandenburg can be drawn overall. The "winners" are primarily species of flowing waters. On average, the conditions for dragonflies in flowing water habitats have improved significantly in Brandenburg and partly also across Germany. Reduced pollution caused by water pollution, but also renaturation measures have had

positive effects. Examples include *Calopteryx virgo*, *Gomphus vulgatissimus*, *G. flavipes*, *Ophiogomphus cecilia* and *Orthetrum coerulescens*. Species that were previously mainly distributed southwards, such as *Crocothemis erythraea* or more recently the wandering dragonfly (*Pantala flavescens*) - the dragonfly of the year 2021 - seem to benefit from the climatic changes. The latter species was recorded for the first time for Germany in 2019 with a male in the Lower Lusatian post-mining landscape in Brandenburg - apart from earlier displacements (Günther 2019). The "losers", on the other hand, are mainly species of the moors. *Aeshna juncea*, *A. subarctica*, *Leucorrhinia dubia* and *L. rubicunda* show a negative long-term and/or short-term trend. The current climate changes probably also play a not insignificant role in this." (Authors/DeepL)] Address: Zimmermann, F., Landesamt für Umwelt des Landes Brandenburg (LfU), Ref. N3/Grundlagen Natura 2000/Monitoring Seeburger Chaussee 2 14476 Potsdam, Germany. E-mail: Frank.Zimmermann@lfu.brandenburg.de

2022

20738. Abdizadeh, G.R.; Farokhinejad, M.; Ghasemloo, S. (2022): Numerical investigation on the aerodynamic efficiency of bio-inspired corrugated and cambered airfoils in ground effect. *Scientific Reports* volume 12, Article number: 19117: 19 pp. (in English) ["This research numerically investigates the flapping motion effect on the flow around two subsonic airfoils near a ground wall. Thus far, the aerodynamic efficiency of the dragonfly-inspired flapping airfoil has not been challenged by an asymmetric cambered airfoil considering the ground effect phenomenon, especially in the MAV flight range. The analysis is carried out on the basis of an unsteady Reynolds-averaged Navier-stokes (URANS) simulation, whereby the Transition SST turbulence model simulates the flow characteristics. Dragonfly-inspired and NACA4412 airfoils are selected in this research to assess the geometry effect on aerodynamic efficiency. Moreover, the impacts of Reynolds number (Re), Strouhal number (St), and average ground clearance of the flapping airfoil are investigated. The results indicate a direct relationship between the airfoil's aerodynamic performance (Cl/Cd) and the ground effect. The Cl/Cd increases by reducing the airfoil and ground distance, especially at $h_0=c$. At $Re=5 \times 10^4$, by increasing the St from 0.2 to 0.6, the values of Cl/Cd decrease from 10.34 to 2.1 and 3.22 to 1.8 for NACA4412 and dragonfly airfoils, respectively. As a result, the Cl/Cd of the NACA4412 airfoil is better than that of the dragonfly airfoil, especially at low oscillation frequency. The efficiency difference between the two airfoils at $St=0.6$ is approximately 14%, indicating that the Cl/Cd difference decreases substantially with increasing frequency. For $Re=5 \times 10^3$, the results show the dragonfly airfoil to have better Cl/Cd in all frequencies than the NACA4412 airfoil." (Authors)] Address: Abdizadeh, G.R., Aerospace Engineering Dept, Amirkabir Univ. of Technology, Tehran, Iran. Email: g.abdizadeh@aut.ac.ir

20739. Adu, B.; Dada, O.; Tunwase, V. (2022): An ecological study of freshwater ecosystem and its colligation to Odonates assemblages in Ipogun, Southwest Nigeria. *Bulletin of the National Research Centre* 46 (Art. No. 86): 12 pp. (in English) ["Background: Odonata (dragonfly and damselfly) are particularly good indicators of freshwater ecosystem health. The constant disturbance of freshwater habitats can result in the reduction of Odonata species diversity. Changes in Odonata biodiversity are influenced by several human activities, such as agriculture, urbanization,

input of pollutants in water and construction. This study was carried out to assess the abundance and diversity of Odonata, evaluate the physicochemical characteristics of water, and compare the community structure of Odonata at three selected sites along River Aponmu in Ipogun. Adult odonates were sampled and identified for 11 months using a sweep net, water samples were collected and some parameters were determined during the study period. Results: A total of 906 specimens representing sixty-four (64) species and sixteen genera in seven families (Coenagrionidae, Lestidae, Platycnemididae, Chlorocyphidae, Calopterygidae, Libellulidae, and Gomphidae) were collected and identified. Of the 906 specimens, Libellulidae had the highest percentage composition (44%) with 395 individuals out of which *Trithemis arteriosa* (a pollution tolerant species) had the highest number of individuals (225) and Gomphidae had the lowest percentage composition (0.03%) with 1 individual. Most of the species collected are known for their tolerance to disturbed environments. They include *Pseudagrion melanicterum*, *Paragomphus genei*, and *Orthetrum julia*. Aponmu area had the highest species diversity ($H' = 2.312$) while Idi area had the least species diversity ($H' = 2.021$). Alaasin area had the highest Simpson's d value (0.8557) and the best taxa distribution (Evenness = 0.524; Equitability $_J = 0.7764$) which makes the area more pristine than other sites while Aponmu area had the least distribution (Evenness = 0.3365; Equitability $_J = 0.6798$). Analysis of variance (ANOVA) result of physicochemical parameters revealed that temperature ($^{\circ}C$), pH, Dissolved Oxygen (mg/L), turbidity (NTU), Biochemical Oxygen Demand (mg/L), NO_3 (mg/L), and PO_4 (mg/L) did not show significant difference at the three sites while EC ($\mu S/cm$) and TDS (mg/L) which have moderately high mean values indicated significant difference at Aponmu area ($p < 0.05$). *T. arteriosa* exhibited a weak negative correlation to both temperature and DO. Conclusions: This study has provided information on Odonata assemblage at River Aponmu and infers based on the assemblage that the river may be somewhat polluted at the period the research was carried out. It is therefore recommended that efforts should therefore be taken to discourage water pollution in order to preserve the diversity of these insects and the water quality." (Authors)] Address: Dada, O., Dept. Biol., Fed. Univ. Technology Akure, Akure, Ondo State, Nigeria. Email: omololacomfy@gmail.com

20740. Aghade, J.B.; Saraf, S.A. (2022): Diversity and abundance of Dragonflies in Harsul and Salim Ali Lake Region, in Aurangabad, Maharashtra (India). *Journal of Entomology and Zoology Studies* 10(5): 387-389. (in English) ["The current study aimed to investigate the variety and number of dragonflies (Phylum Arthropoda, class Insecta) in the Harsul and Salim Ali Lake regions. The region around the Harsul and Salim Ali Lakes was examined for diversity and abundance. Three families and a total of nine different species of dragonflies were identified. Libellulidae was the family with the greatest abundance in our study, followed by Gomphidae, while Coenagrionidae had the lowest abundance. Gomphidae and Coenagrionidae each have one species, while the Libellulidae family contains seven different species. We found that the dragonfly diversity is greatest in Area 1." (Authors) *Orthetrum sabina*, *O. glaucaum*, *Brachythemis contaminata*, *Aethriamanta brevipennis*, *Trithemis pallidinervis*, *Diplocodes trivialis*, *Crocothemis servilia*, *Ictinogomphus rapax*, *Acisoma panorpoides*.] Address: Aghade, J.B., Dept Zoology, Government College of Arts & Science, Dr. B. A. M. Univ., Aurangabad, Maharashtra, India

20741. Bota-Sierra, C.A.; García-Robledo, C.; Escobar, F.;

Novelo-Gutiérrez, R.; Londoño, G.A. (2022): Environment, taxonomy and morphology constrain insect thermal physiology along tropical mountains. *Functional Ecology* 36(10): 2685-2685. (in English) ["1. Tropical mountains display limited variation in monthly temperatures, but high spatial climatic variability. It is assumed this stability promotes ecological and physiological adaptations to local temperatures, which may preclude dispersal up or downslope. Determining how environmental, taxonomic, and morphological factors affect thermal limits is fundamental to understand biotic responses to global warming. 2. We selected 54 species of dragonflies and damselflies (Order Odonata) distributed from 300 to 2550 m along one of the most biodiverse regions on the planet, the Tatamá elevational gradient in the Andean - Choco region transition. We estimated for 846 individuals three thermal tolerance parameters: CTmax, the highest temperature preceding the loss of motor control, Tvol, the temperature at which individuals avoid heat, and CTmin, the minimum temperature required for wing movement. 3. For each thermal tolerance parameter, we evaluated associations between physiological and behavioral responses, species elevational distribution, and specialization to forests or open areas. We also evaluated the effect of autecological characteristics such as body mass, sex, and taxonomy on temperature regulation. 4. Temperatures prevalent at different elevations and habitats are associated with odonate upper thermal limits. However, tolerance to low temperatures is not associated with habitat use or elevation. Forest species display lower thermal tolerances. Small species are more tolerant to high temperatures than larger species. Dragonflies are more tolerant to high temperatures than damselflies with similar body mass. Females are more tolerant to high temperatures than males. 5. Our results highlight the importance of considering differences in morphology, life history and behavior when comparing thermal tolerances of organisms along elevational gradients. Only by incorporating such factors, it would be possible to generate accurate predictions on the impact of climate change on tropical organisms." (Authors)] Address: Bota-Sierra, C.A., Red de Biodiversidad y Sistemática, Instituto de Ecología (INECOLA.C.), Xalapa, Mexico. Email: cornelio.bota@posgrado.ecologia.edu.mx

20742. Bower, L.M.; Peoples, B.K.; Eddy, M.C.; Scott, M.C. (2022): Quantifying flow–ecology relationships across flow regime class and ecoregions in South Carolina. *Science of The Total Environment* 802, 149721: 14 pp. (in English) ["Highlights: • Quantifying flow–ecology relationships allow for the development of flow standards. • All flow regime components affected fish and benthic macroinvertebrate assemblages. • Aquatic organisms' response to flow varied across flow classes and ecoregions. • Single metric flow standards would underestimate the impacts of any flow alteration. Abstract: The natural flow regime (i.e. magnitude, frequency, duration, timing and rate of change of flow events) is crucial for maintaining freshwater biodiversity and ecosystem services. Protecting instream flow from anthropogenic alterations first requires an understanding of the relationship between aquatic organisms and the flow regime. In this study, we used a unique framework based on random forest modeling to quantify effects of natural flow regime metrics on fish and macroinvertebrate assemblages across ecoregions and flow regime types in the state of South Carolina, USA. We found that all components of the natural flow regime affected both fish and benthic macroinvertebrate assemblages, suggesting that maintaining natural aspects of all flow regime components is critical for protecting freshwater diversity. We identified hydrologic metrics and flow regime

components such as magnitude, frequency, and duration of flow events, that were associated with the greatest ecological responses for individual stream classes to help managers prioritize hydrologic and biological metrics of interest during environmental flow standard development. The response of aquatic organisms to hydrologic metrics varied across stream classifications and ecoregions, highlighting the importance of accounting for differences in flow regime and ecoregion when designing environmental flow standards. We provide a flexible framework based on statistical flow–ecology relationships that can be used to inform in-stream flow management and assess effects of flow alteration on riverine assemblages." (Authors)] Address: Bower, L.M., U.S. Geological Survey, South Carolina Cooperative Fish & Wildlife Res. Unit, 234 Lehotsky Hall, Clemson Univ., Clemson, SC 29634, USA. Email: lmbower@clemson.edu

20743. Brans, K.I.; Tüzün, N.; Sentis, A.; De Meester, L.; Stoks, R. (2022): Cryptic eco–evolutionary feedback in the city: urban evolution of prey dampens the effect of urban evolution of the predator. *Journal of Animal Ecology* 91(3): 514-526. (in English) ["Most research on eco–evolutionary feedbacks focuses on ecological consequences of evolution in a single species. This ignores the fact that evolution in response to a shared environmental factor in multiple species involved in interactions could alter the net cumulative effect of evolution on ecology. We empirically tested whether urbanization-driven evolution in a predator (nymphs of the damselfly *Ischnura elegans*) and its prey (the water flea *Daphnia magna*) jointly shape the outcome of predation under simulated heatwaves. Both interactors show genetic trait adaptation to urbanization, particularly to higher temperatures. We cross-exposed common-garden reared damselflies and *Daphnia* from replicated urban and rural populations, and quantified predation rates and functional response traits. Urban damselfly nymphs showed higher encounter and predation rates than rural damselflies when exposed to rural prey, but this difference disappeared when they preyed on urban *Daphnia*. This represents a case of a cryptic evo-to-eco feedback, where the evolution of one species dampens the effects of the evolution of another species on their interaction strength. The effects of evolution of each single species were strong: the scenario in which only the predator or prey was adapted to urbanization resulted in a ca. 250% increase in encounter rate and a ca. 25% increase in predation rate, compared to the rural predator - rural prey combination. Our results provide unique evidence for eco–evolutionary feedbacks in cities, and underscore the importance of a multi-species approach in eco–evolutionary dynamics research." (Authors)] Address: Tüzün, N., Lab. Evolutionary Stress Ecology & Ecotoxicology, KU Leuven, Charles Deberiotstr. 32, 3000, Leuven, Belgium

20744. Büsse, S.; Ware, J.L. (2022): Taxonomic note on the species status of *Epiophlebia diana* (Insecta, Odonata, Epiophlebiidae), including remarks on biogeography and possible species distribution. *ZooKeys* 1127: 79-90. (in English) ["The species included in the genus *Epiophlebia* Calvert, 1903 represent an exception within Recent lineages – they do not belong to either dragonflies (Anisoptera) nor damselflies (Zygoptera). Nowadays, the genus is solely known from the Asian continent. Due to their stenoecious lifestyle, representatives of *Epiophlebia* are found in often very small relict populations in Nepal, Bhutan, India, Vietnam, China, North Korea, and Japan. We here present a taxonomic re-evaluation on the species status of *Epiophlebia diana* Carle, 2012, known from the Sichuan province in China, supplemented with a morphological character mapping on a genetic

tree to highlight synapomorphies of *E. diana* and *E. laidlawi* Tillyard, 1921. We conclude that *E. diana* is a junior synonym of *E. laidlawi*. Furthermore, we discuss the Recent distribution of the group, allowing for predictions of new habitats of representatives of this group." (Authors)] Address: Büsse, S., Functional Morphology and Biomechanics, Institute of Zoology, Kiel University, Am Botanischen Garten 9, 24118 Kiel, Germany. Email: sbuesse@zoologie.uni-kiel.de

20745. Carvalho-Soares, A.A.; Ferreira, K.G.; Sousa, K.S.; Nascimento, A.C.L.; Mendoza-Penagos, C.C.; Vieira, T.B.; Salcedo, A.K.M.; Oliveira-Junior, J.M.B.; Calvão, L.B.; Dias-Silva, K. (2022): Checklist and new occurrences of Odonata (Insecta) from Volta Grande do Xingu, Pará, Brazil. *Hydrobiology* 1(2): 183-195. (in English) ["The order Odonata (Insecta) is composed of aquatic insects popularly known as dragonflies and damselflies. Members of this order are closely linked to the conservation status of their habitats; however, the Wallacean shortfall in some regions still remains high. The Volta Grande do Xingu region is known to have high endemism of some groups, such as Actinopterygii (fish), which can be applied to other groups that do not yet have their fauna known at the site, such as the order Odonata. The Wallacean shortfall and constant anthropic changes (for example, the construction of the Belo Monte Hydroelectric) have been obstacles in the preservation of these and other groups. In that regard, the main aim of this paper is to provide a checklist of Odonata (Insecta) adult species from the streams of Volta Grande do Xingu, Pará, Brazil. The collections were carried out in 19 streams in the Volta Grande do Xingu region in September 2019, corresponding to the drought period. A total of 526 specimens were collected, where two suborders, six families, 26 genera and 43 species were identified. Three species of Odonata were registered for the first time in the state of Pará: *Erythrodiplax famula* (Erichson in Schomburgk, 1848); *Acanthagrion chacoense* Calvert, 1909 and *Epipleoneura lamina* Williamson, 1915. These data allow us to help increase the knowledge of Odonata fauna in the streams of Volta Grande do Xingu, a region that is under intense anthropic pressure. This helps to reduce the Wallacean shortfall, with another area sampled for the state of Pará." (Authors)] Address: Carvalho-Soares, A.A., Fac.Ciências Biológicas (FCB), Univ. Federal do Pará (UFPA), Rua Coronel José Porfírio, N. 2515, Bairro São Sebastião, Altamira 68372-040, Brazil. Email: andersonxacs@gmail.com

20746. Chandran, A.V.; Sherif, K.M. (2022): Comments on "The Dragonflies and Damselflies (Odonata) of Kerala – Status and Distribution". *Journal of Threatened Taxa* 14(6): 21282-21284. (in English) ["This is a rejoinder to the article "The Dragonflies and Damselflies (Odonata) of Kerala – Status and Distribution". In the said paper, certain species are of doubtful occurrence in Kerala and the Western Ghats. First reports of certain species which were available in open-access biodiversity portals and published articles in peer-reviewed journals were ignored. Additions to the checklists have been made without conducting taxonomic investigations, or in one case, even presenting a photograph. These shortcomings will lead to confusion and misunderstanding among odonatologists and naturalists in the region." (Authors)] Address: Chandran, A.V., Charutha house, Ayyappa Nagar, Punkunnam, Thrissur, Kerala 680002, India. Email: avivekchandran2@gmail.com

20747. Detilleux, L.; Poligui, R.N.; Iannello, L.; Dogot, T.; Francis, F.; Caparros Megido, R. (2022): Entomophagy in Gabon across the African context. *Journal of Insects as Food*

and Feed 8(7): 711-720. (in English) ["Entomophagy is well established in the food habits of Africa; however, country-wide knowledge remains limited for several countries, including Gabon. Here, two surveys on entomophagy were conducted in Gabon through face-to-face interviews. The first survey collected information on insect eating habits from 169 potential consumers. Edible insects formed part of the diet of most Gabonese people, with more than 60% of consumers within participants, and were particularly common among the Teke ethnic group (93%). Familiarity with edible insects was influenced by culture and family, but not by gender or study level. The second survey focused on edible insect species and their host plants, by interviewing a sample of 113 both villagers and retailers. Seventy-five species of insects from six insect orders (Coleoptera, Hemiptera, Isoptera, Lepidoptera, Odonata and Orthoptera) were consumed in Gabon, and were collected from 48 species of host plant. Many insects were formerly reported in the literature related to entomophagy; however, 13 species were newly reported as edible in this study: *Bidessus batekensis*, *Bunaeopsis licharbas*, *Copelatus ateles*, *C. confinis*, *C. fizpaci*, *C. tondangoyei*, *Gonobombyx angulata*, *Gonometa titan*, *Hydrocyrius columbiae*, *Oxychirus semisericeus*, *Philobota* sp., *Psara* sp. and *Ptyelus flavescens*. Consequently, these surveys highlighted that entomophagy is common in Gabon. However, strategies to promote edible insects are needed to have a significant impact on food issues in Gabon (e.g. food insecurity and dependence on foreign food supplies). Additional researches on entomophagy in Gabon are required to further develop these strategies." (Authors)] Address: Detilleux, L., Economics & Rural Development, Gembloux Agro-Bio Tech, Univ. of Liège, Passage des déportés 2, 5030 Gembloux, Belgium. Email: loic.detilleux@uliege.be

20748. Franke, S.; Pinkert, S.; Brandl, R.; Thorn, S. (2022): Modeling the extinction risk of European butterflies and odonates. *Ecology and Evolution*. 2022;12:e9465. 9 pp. (in English) ["Insect populations have become increasingly threatened during the last decades due to climate change and landuse intensification. Species characteristics driving these threats remain poorly understood. Trait-based analyses provide a straight-forward approach to gain a mechanistic understanding of species' extinction risk, guiding the development of conservation strategies. We combined morphological traits and phylogenetic relationship for 332 European species of butterflies and 115 species of odonates (dragon and damselflies) to model their red list status via phylogenetically controlled ordered logistic regression. We hypothesized that extinction risk increases with increasing body volume and wing area, decreasing range size, and is larger for brighter species. All investigated traits exhibited a strong phylogenetic signal. When controlling for phylogenetic relationship, we found that extinction risk of butterflies increased with decreasing range size. The extinction risk of odonates showed no relationship with the selected traits. Our results show that there is no universal trait defining the extinction risk of our investigated insect taxa. Furthermore, evolutionary history, measured as the phylogenetically predicted part of our analyzed traits, poorly predicted extinction risk. Our study confirms the focus of conservation measures on European butterfly species with small range sizes." (Authors)] Address: Franke, Sophia, Dept of Animal Ecology, Faculty of Biology, Philipps-Universität Marburg, Karl-von-Frisch-Str. 8, 35032 Marburg, Germany. Email: sophia.franke@posteo.d

20749. Futahashi, R. (2022): Sexual differentiation in dragonflies and damselflies. In: Minoru Tanaka & Makoto Tachibana (eds.): *Spectrum of sex. The molecular bases that induce various sexual phenotypes*. Springer, Singapore: 13-35. (in English) ["As represented by gynandromorphs (sexually mosaic individuals), sexual differentiation in insects proceeds primarily cell autonomously depending on sex chromosomes. Insect sex determination systems, although dominated by male heterogamety, are highly diverse. Dragonflies and damselflies (the order Odonata) are the most ancestral winged insects and have male heterogametic sex determination systems. Some species (e.g., *Crocothemis servilia*) have intraspecific polymorphisms in their karyotypes, such as switching from X0 to neo-XY sex chromosome system by chromosome fusion. In dragonflies and damselflies, adults of many species exhibit sexual color dimorphism, color transition upon adult maturation, and intraspecific color polymorphisms within the same sex. Molecular mechanisms underlying sex determination and sexual differentiation in insects have been investigated extensively in the fruit fly *Drosophila melanogaster*, but recent studies have revealed that the upstream genes of insect sex determination cascade are highly diverse. Most insects have sex-specific isoforms for doublesex (*dsx*) gene, which is important for sexual differentiation, and *dsx* gene plays important roles in masculinization not only for males but also for androchrome females in the damselfly *Ischnura senegalensis*. In this review, current knowledge on sex determination and sexual differentiation of insects is summarized, with particular focus on the most ancestral winged insects, dragonflies and damselflies." (Author)] Address: Futahashi, R., National Institute of Advanced Industrial Science and Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

20750. Gómez-Tolosa, M.; Mendoza-Cuenca, L.F.; Rivera-Velázquez, G.; Rioja-Paradela, T.M.; Tejeda-Cruz, C.; Pérez-Farrera, M.A.; López, S. (2022): Using the ecological relationships of Odonata with a habitat integrity index to test the biodiversity ecosystem function framework. *Journal of Insect Conservation* 26: 191-203. (in English) ["As a result of human activities causing changes to their environments, many species are facing an increased risk of extinction. In order to determine such changes and their effects on species assemblages, rapid stream assessment techniques of environmental analysis and monitoring can be used. We determined the Habitat Integrity Index (HII) and its correlation with the composition and assemblage of adult odonates at different taxonomic levels in the region of the Selva Lacandona, Chiapas in southeastern Mexico. Both suborders Zygoptera and Anisoptera, the family Coenagrionidae, and the assemblage of 20 species of the genera *Argia*, *Cora*, *Hetaerina*, and *Heteragrion* (ACHH) were related with the HII. All taxonomic levels were included in the analyses as predictors of habitat integrity. However, we hypothesized that the abundance, species richness, and diversity of stenotopic species (ACHH) could be a better predictor of the HII than the other taxonomic levels. We found a positive and statistically significant relationship between the HII and the ACHH species, richness, and diversity. In contrast, we found a negative and significant relationship between HII and Anisoptera species, abundance, richness and diversity. Implications for insect conservation: in this case, the protected area hosts more specialist species than the surrounding zone. For example, Ejido El Tumbo, which presents a severe level of disturbance and is outside of protected natural areas, has the lowest species diversity of all sites. We recommend further

research to determine the link between disturbance and the prevalence of stenotopic species." (Authors)] Address: Gómez-Tolosa, María, Programa de Doctorado en Ciencias en Biodiversidad y Conservación de Ecosistemas Tropicales, Instituto de Ciencias Biológicas, Universidad de Ciencias y Artes de Chiapas, Libramiento Norte Poniente 1150, C.P. 29039, Tuxtla Gutiérrez, Chiapas, Mexico.

20751. Guedes, M.B.; Vilela, D.S.; Magalhães de Souza, M. (2022): Odonata (Insecta) community in the Environmental Protection Area of the Machado River hydrographic basin, southern Minas Gerais State, Brazil. *Papéis Avulsos de Zoologia* (São Paulo) 62:e202262061. 7 pp. (in English) ["Only 8% of the approximately 120 conservation units in Minas Gerais State collect information on the order Odonata, which motivated this study. We aimed to survey communities of this insect group in the Environmental Protection Area of the Machado River hydrographic basin, southern Minas Gerais State, Brazil. For this purpose, 12 areas were sampled by active searching from September 2018 to March 2019. Representatives of 71 Odonata species belonging to 8 families were collected. Seven species were found exclusively in this conservation unit, and two species were newly recorded for the state, namely *Erythrodiplax chromoptera* (Borror, 1942) and *Micrathyria venezuelae* De Marmels, 1989. This study surveyed the fifth richest odonata fauna in Minas Gerais State, underscoring the importance of the studied area for conservation of Odonata communities and necessitating actions for decreasing environmental impacts on this biological patrimony." (Authors)] Address: Guedes, Marcella, Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas (IFSULDEMINAS). Inconfidentes, MG, Brasil. E-mail: marcellabigoni22@gmail.com

20752. Halassi, I. (2022): Evaluation du métabolisme lipidique des Odonates bioindicateurs de la qualité de l'eau des écosystèmes aquatiques et étude de leur microflore au cours de leur cycle de développement. PhD thesis, Faculté Sciences de la Nature et de la Vie et Sciences de la Terre et de l'Univers, Département de Biologie, Laboratoire de domiciliation: Biologie, Eau et Environnement: 120 pp. (in French, with English and Arabian summaries) ["Odonates are one of the most important taxa in Algerian and North African wetlands. In this thesis, we aim to study several life history parameters of two populations of *Sympetrum meridionale*, coming from two different habitats across north-eastern Algeria. The first one is a RAMSAR wetland called 'Mekhada' (a perennial water body), and the second one is a temporary pond located at 'Maouna' Mountain (1400 m altitude). Moreover, the evolution of biochemical components was carried out during the larval stages, and MDA levels were evaluated after a chronic exposure to spirodicfen (ENVIDOR® 240 SC). Furthermore, to obtain a first overview of bacterial communities in the gut of odonates and to measure the effect of changes in environmental conditions including diet and water quality on the composition of these communities, microbiological analysis was carried out. The developmental patterns of the two dragonfly populations varied according to the type of habitat occupied by the parental generation of the species (factorial ANCOVA: $p < 0.05$) (Low larval mortality, slow development and low weight in the dragonfly population inhabiting the RAMSAR wetland compared to those inhabiting the Maouna. For biochemical compounds, no significant difference is observed between the two populations. Exposure to Spirodiclofen was revealed insecticidal activity towards larvae with a significant dose response relationship; it induces an increase in MDA levels compared to controls groups We found that

the gut microbiota of the larvae was dominated by Proteobacteria, mainly of the genus *Enterobacter* and *Proteus*. In addition, the microbiota of reared larvae of both species was much richer in terms of taxonomic diversity and number of bacteria compared to the other stage. Such studies will add considerably to our understanding of the mechanisms that are responsible for the possible impacts of environmental changes on the life history traits of dragonflies in the southern part of their range." (Author)] Address: not stated

20753. Hasik, A.Z.; Siepielski, A.M. (2022): A role for the local environment in driving species-specific parasitism in a multi-host parasite system. *Freshwater Biology* 67: 1571-1583. (in English) ["(1) The extent and magnitude of parasitism often vary among closely related host species and across populations within species. Determining the ecological basis for this species and population-level variation in parasitism is critical for understanding infection dynamics in multi-host-parasite systems. To investigate such ecological underpinnings of variation in parasitism, we studied *Enallagma damselfly* host species and their water mite (*Arenurus* spp.) ectoparasites in lakes. (2) We first evaluated how host identity and density could shape parasitism. To test the effects of con- and heterospecific host density on parasitism, we used a field experiment with *Enallagma basidens* and *E. signatum*. We found that parasitism did not vary with con- or heterospecific density and was determined by host identity alone, with no spillover effects. (3) We also evaluated the potential role of local adaptation and resource availability in shaping parasitism. To do so, we used *E. signatum* in a reciprocal transplant experiment crossed with a prey resource-level manipulation. This experiment revealed that parasitism declined sharply for one host population in its non-local lake, but not the other source population, with no effects of prey levels. This asymmetry implies that damselflies express enhanced defences against parasitism that are neither population-specific nor dependent on resource abundance, or that mites developed heightened local host specificity. (4) The results of multivariate modeling from an observational study generally supported these experimental findings: neither host density nor resource abundance strongly explained among-population variation in parasitism. Instead, local abiotic conditions (pH) had the strongest relationship with parasitism, with minimal associations with predator density, temperature and a measure of immune function. (5) Collectively, our findings suggest a crucial role for the local environment in shaping host-parasite interactions within multi-host-parasite systems. More generally, these results show that research at the intersection of community ecology and disease ecology is critical for understanding host-parasite dynamics within natural communities." (Authors)] Address: Hasik, A.Z., Dept of Biological Sciences, Univ. of Arkansas, Fayetteville, Arkansas, U.S.A. Email: adamzhasik@gmail.com

20754. Heim, O.; Puisto, A.I.E.; Sääksjärvi, I.; Fukui, D.; Vesterinen, E.J. (2022): Dietary analysis reveals differences in the prey use of two sympatric bat species. *Ecology and Evolution* 11(24): 18651-18661. (in English) ["The two common, but understudied Japanese bat species *Murina ussuriensis* and *Myotis ikonnikovi* consumed prey from the orders Lepidoptera and Diptera most frequently. Furthermore, we found a higher prey diversity in the diet of *M. ikonnikovi* compared to that of *M. ussuriensis* that might indicate that the former is a more generalist predator than the latter. Our results also indicate that *M. ussuriensis* might switch between aerial-hawking and gleaning modes of foraging behavior, while *M. ikonnikovi* seems to use predominantly aerial

hawking." (Authors) Odonata contributed to the diet of *Murina ussuriensis*.] Address: Vesterinen, E.J., Dept Biol., Univ. of Turku, 20014 Turku, Finland. Email: ejvest@utu.fi

20755. Huang, D.-Y.; Corentin, J.; Nel, A. (2022): The second species of *Rudiaeschna* (Odonata, Rudiaeschnidae) discovered in the Lower Cretaceous of Inner Mongolia, Northeast China. *Palaeoentomology* 5(3): 240-245. (in English) ["*Rudiaeschna jarzembowskii* sp. nov., the second species of the small aeshnopteran family Rudiaeschnidae, is described from the Lower Cretaceous Yixian Formation at the Liutiaogou locality, Ningcheng County, Inner Mongolia, NE China. The new species differs from the type species of the family, namely *Rudiaeschna limnobia*, in possessing less cells and crossveins in nearly all parts of forewing. It also shows a distally forked vein RP2, a character that was previously only known in taxa of the much more recent and derived aeshnopteran family Aeshnidae." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@mnhn.fr

20756. Janra, M.N.; Gusman, D.; Singkam, A.R.; Susanto, A.; Yatap, H.; Fahrudin, A.; Andriyansyah, F.; Prameswara, A.; Melian, M.; Herwina, H. (2022): Into the database of bencoolen Odonata: Synthesis of two years dragonfly survey in Bengkulu Province. 1st Lekantara Annual Conference on Natural Science and Environment (LeNS 2021), IOP Conf. Series: Earth and Environmental Science 1097 (2022) 012056: 181-190. (in English) [Bengkulu, as part of Sumatra, receives less attention for its odonatological aspect during the current advance of life science. Historical records on Odonata were contributed by many foreign researchers from Dutch colonial era, including accounts provided by Lieftinck and Ris. In order to compile Odonata database for Bengkulu, there have been conducted dragonfly surveys from two years ago at some representative sites in this province. Conservation area of Seluma in the southern Bengkulu was visited in 2019 for two weeks survey, while conservation area of Lemo Nakai was surveyed in 2020 for the same work duration. Random survey and continuous citizen science have been performed at Bengkulu City to further the database from human impacted area. Thirty-five species were recorded from Seluma, thirty-nine were from Lemo Nakai and ten species were observed to exist within the human impacted area in Bengkulu City. In total, there were total 52 dragonfly species recorded within the administrative boundary of Bengkulu Province which more than half of historical Odonata records for this province. Thirty-one species belonged to Anisoptera (true dragonflies) and twentyone species are grouped into Zygoptera (damselflies). Some noteworthy records are highlighted in this paper, such as the rare *Dysphaea dimidiata* (Euphaeidae), *Anax panybeus* (Aeshnidae) and *Orthetrum schneideri* (Libellulidae); Sumatran endemic *Heliocypha angusta angusta* (Chlorocyphidae) and *Megalogomphus sumatranus* (Gomphidae); as well as the observation of three aeshnid species within human settlement in Bengkulu City. Further details on prominent Odonata species were also outlined along with their significances." (Authors)] Address: Janra, M.N., Universitas Andalas, Padang, West Sumatra, Indonesia. Email: *mjanra@sci.unand.ac.id

20757. Jeyasekhar, M.P.; Srinivas, G. (2022): Effect of different diets on the body indices of Granite Ghost Dragonfly nymph *Bradinopyga geminata*. *Journal of Xi'an Shiyou Univ., Natural Science Edition* 18(4): 377-384. (in English) ["The present experimental study was conducted on nymph

Bradinopyga geminata. The nymphs were fed with four different diets and their association with length and weight measurements was taken into account, before and after the experimental period of seven weeks. Diet of nymph consists of mosquito larva, chironomus larva, earthworm, mixed diet and control group was also maintained. The length of nymphs fed mosquito larva 1.6 cm, chironomus larva 1.6 cm rest of them earthworm, mixed diet and control group larval length reached 1.8 cm during the seventh week. The weight of nymph mosquito larva 0.17gm, chironomus larva 0.2 gm earthworm 0.24gm, control group 0.25 mixed diet 0.29 gm." (Authors)] Address: Jeyasekhar, M.P., Scott Christian College, Nagercoil, India. Email: jeyasekhar24@yahoo.com

20758. Kalkman, V.J.; Boudot, J.-P.; Futahashi, R.; Abbott, J.C.; Bota-Sierra, C.A.; Guralnick, R.; Bybee, S.M.; Ware, J.; Belitz, M.W. (2022): Diversity of Palaearctic Dragonflies and Damselflies (Odonata). *Diversity* 2022, 14, 966. <https://doi.org/10.3390/d14090966>. (in English) ["More than 1.2 million distribution records were used to create species distribution models for 402 Palaearctic species of dragonflies and damselflies. On the basis of these diversity maps of total, lentic and lotic diversity for the whole of the Palaearctic (excluding China and the Himalayan region) are presented. These maps show a clear pattern of decreasing diversity longitudinally, with species numbers dropping in the eastern half of Europe and remaining low throughout a large part of Russia, then increasing again towards Russia's Far East and Korea. There are clear differences in diversity patterns of lentic and lotic species, with lentic species being dominant in colder and more arid areas. Areas with a high diversity of species assessed as threatened on the IUCN red list are largely restricted to the Mediterranean, Southwest Asia, and Japan, with clear hotspots found in the Levant and the southern half of Japan. The diversity at species, generic, and family level is higher in the south of Japan than in areas at a similar latitude in the western Mediterranean. This is likely to be the result of the more humid climate of Japan resulting in a higher diversity of freshwater habitats and the stronger impact of the glacial periods in the Western Palaearctic in combination with the Sahara, preventing tropical African lineages dispersing northwards." (Authors)] Address: Kalkman, V.J., Naturalis Biodiversity Center, 2300 RA Leiden, The Netherlands. Email: vincent.kalkman@naturalis.nl

20759. Kalniņš, M.; Pipkaleja, Z. (2022): The Latvian Red List of dragonflies Odonata: preliminary results. 11th International Conference on Biodiversity Research (ICBR) to be held in the Daugavpils Univ., Latvia, on 20 – 22nd October, 2022. (<https://biodiversityconference.biology.lv/index.php/ICBR/ICBR2022/paper/view/248>): 1 p-[Verbatim: "The National Red List of dragonflies for Latvia is an extinction risk assessment of Latvian dragonfly species a made in accordance with the IUCN regional Red Listing guidelines. The redlisting process highlights those species that are threatened with extinction at the national level, so thereafter appropriate conservation actions can be undertaken to improve status of threatened species. There are 65 dragonfly species present in Latvia and all of them were assessed within the project framework. Two species were preliminary assessed Endangered (*Aeshna crenata*, *Stylurus flavipes*), five species assessed Vulnerable (*Coenagrion armatum*, *C. johanssoni*, *Cordulegaster boltonii*, *Ischnura pumilio*, *Somatoclora arctica*), and six species assessed Near Threatened (*Aeshna subarctica*, *A. viridis*, *Leucorrhinia albifrons*, *L. caudalis*, *Nehalennia speciosa*, *Ophiogomphus cecilia*). Other species assessed Least Concern, except one species,

which is assessed Data Deficient. The the most recent published recommendation recommendation for the Latvian national Red List of dragonflies contains 17 species. The difference between the number of species recently assessed as endangered/vulnerable/near threatened (13 in total) and the previously recommended number of species (17) can be explained by the category of species included in the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, but not assessed threatened in Latvia. The main threats to dragonfly species in Latvia are related to the changes in boggy habitats resulting of anthropogenic activity and natural factors, the chance of construction of new, large hydroelectric power plants and ongoing eutrophication of natural flowing waters. The impact of the general insect decline phenomenon (mainly due to agricultural chemicals) on dragonfly populations in Latvia remains unclear. We consider insufficient human resource capacity the most significant factor impacting long term dragonfly protection and conservation in Latvia. There is a limited number of available qualified specialists, which automatically results in the underrepresentation of the dragonfly (and invertebrates' in general) interests in various aspects - from drafting legislative and planning documents to performing specific activities in field." (Authors)] Address: Kalniņš, M., Nature Protection Board, Eksporta iela 5, Rīga, LV-1010, Latvia. E-mail: martins.kalnins@dap.gov.lv

20760. Kartini, J.; Syachruddin, S.; Ilhamdi, M.L. (2022): The diversity of dragonflies (Odonata) in the Joben Resort area, East Lombok. *Jurnal Biologi Tropis* 22(2): 675-688. (in Indonesian, with English summary) ["Dragonfly is a family of insects that are closely related to water. During their life cycle, especially when laying eggs and at the stage of dragonfly nymphs, they spend their lives in healthy water areas because dragonfly nymphs are very sensitive to polluted water quality. Therefore, dragonflies have an important role for the sustainability of the ecosystem, namely acting as predators and indicators of environmental pollution. The high diversity of dragonflies in an area indicates that the area is still not polluted because the environment supports the life of dragonflies. This study aims to determine the diversity of dragonflies (odonata) in the Joben Resort area of East Lombok. This research is an exploratory descriptive study conducted from November to December 2021. Data collection was carried out 4 times and was repeated within 1 month in the morning and evening (08.00-17.00 WITA). The method used is a survey method with a sweeping net technique following a 500 m research path on 3 research paths, namely lane 1 (the river that borders Joben Ecopark), lane 2 (thepath leading to the Resort Office and Joben Ecopark) and lane 3 (the river that flows through Joben Ecopark). Bordered by rice fields and Kokok Joben Brain Baths). The calculation of the diversity index of dragonflies uses the Shannon-Wiener formula (H'). The results showed that the types of dragonflies (odonata) found in the Joben Resort Area consisted of 20 species with a total number of individuals found from 3 lanes as many as 864 individuals. The diversity index of dragonflies in the Joben Resort area of East Lombok is 2,309. The conclusion is that the diversity of dragonflies in the Joben Resort area of East Lombok is in the medium category." (Authors)] Address: Kartini, J., Program Studi Pendidikan Biologi, FKIP, Universitas Mataram, Mataram, Indonesia. Email: junikartini12@gmail.com

20761. Knysh, K.M.; Saunders, M.D.; Macintyre, L.P.; Courtenay, S.C.; van den Heuvel, M.R. (2022): Sometimes you can add a bit of salt: Additional freshwater insect species in Canadian estuaries. *Northeastern Naturalist* 29(1):

N9-N17. (in English) ["Along the river–ocean transition, few freshwater species persist into polyhaline zones. Among those insect species capable of living in estuaries, it is unclear which Odonata, Trichoptera, and Coleoptera species can occur at intermittent or average salinities above 18 PSU. During surveys of fish and crustaceans in Prince Edward Island (PEI), we noted 3 unexpected insect species from within subtidal-channels. Multiple instars of Coenagrionidae n. det. and Enallagma civile were collected around marine macroalgae at 5 localities with 6–26 PSU salinities and observed emerging atop macroalgae. Also, collections of the larvae of the caddisfly *Limnephilus externus* (Limniphilidae), and adult *Haliplus cribrarius* (Haliplidae) beetles at sites with maxima of 23 and 20 PSU, respectively, suggest rare occurrences of these species within estuarine ecotones." (Authors)] Address: Knysht, Kyle, Canadian Rivers Inst., School of Environment, Resources & Sustainability, Univ. Waterloo, Waterloo, ON N2L 3G1, Canada. Email: kknysht@upei.ca

20762. Kumianto, A.S.; Purnomo, H.; Septiadi, L. (2022): The Influence of agrochemicals on macroinvertebrate community structure in various agricultural rivers in Jember regency. *Journal of Tropical Biodiversity and Biotechnology* 7(1): 15 pp. (in English) ["The intensive use of agrochemicals in agricultural areas of Jember's Regency presents a potential threat to the freshwater ecosystem's community. The use of the benthic macroinvertebrates community may provide a key to monitor the extent of agrochemical impact to maintain valuable ecosystem services. Macroinvertebrates community structure and environmental factors were studied from September–December 2020 in Jember Regency by comparing three different types of agricultural rivers (organic, semi-organic, and conventional). Five community indices (taxa, individuals, Simpson dominance index, Margalef species richness, and Shannon diversity index) were used to compare the macroinvertebrates community structure between sites. Using community composition and physicochemical properties (bare sediment, width, depth, water current, pH, conductivity, dissolved oxygen (DO), and temperature), we generated CCA triplot and correlogram plot to investigate the grouping and the correlation between variables and sites. Results on macroinvertebrate composition showed the importance of using sensitive taxa-group and community indices as an indicator of environmental changes. The family of Tipulidae, Naididae, Cysticidae, and Nereididae demonstrated relation to semi-organic agricultural rivers. Temperature and water current correlate to the presence of clean water indicator species such as Philorheitridae and Chironomidae, as observed in organic agricultural rivers. Conventional and semi-organic agricultural rivers were grouped and largely contributed by the 5 families including Ampullariidae, Pachychillidae, Baetidae, Enchytraidae, and Gomphidae. Correlogram plot suggests a complex interaction between macroinvertebrate community and environmental variables. It can be concluded that the intensive use of agrochemicals may lead to a detrimental change toward the diminished quality of freshwater community and environment." (Authors) ["Telephlebiidae, Corduliidae, Gomphidae, Petaluridae, Platycnemididae"] Address: Kumianto, A.S., Agrotechnology Study Program, Fac.Agriculture, Jember Univ., Jember 68121, East Java, Indonesia. Email: agung.sih.kumianto@unej.ac.id

20763. Lashgari, A.M.; Naghash, B.A. (2022): Hover controller design and implementation for a dragonfly-like flapping wing. 13th International Micro Air Vehicle Conference, Delft, December 12–16, 2022: 183–192. (in English) ["The aim of this paper is modelling, simulating and designing a

controller for a micro aerial vehicle (MAV) as well as implementing an innovative scheme for it. The MAV scheme inspired by the dragonfly using clap and fling mechanism with an active rigid abdomen. The gearboxes are responsible for moving two pairs of four flying wings in front and back of the MAV. Also, change in the motors speed generates differential thrust to create a control pitch moment. The linearization about a hover point is performed to analyze the motion and design an LQR controller. Moreover, validity of the linearized equations is verified by comparing the responses of linear and nonlinear models. The theoretical results are experimented with a hardware-in-the-loop testbed. The experimental results demonstrate good agreement between theoretical and validated responses along with accurate and robust hovering at the desired point." (Authors)] Address: Lashgari, A.M., Amirkabir Univ. of Technology, Tehran

20764. Lencioni, F.A.A. (2022): A new species of *Forcepsioneura* Lencioni, 1999 in honor to Queen Elizabeth II (Odonata: Protoneuridae). *Zootaxa* 5200(2): 181–190. (in English) ["A new species of *Forcepsioneura* Lencioni, 1999 is described from seven males and three females (Holotype male (FAAL NC 4521), Brazil, São Paulo, Monteiro Lobato—SP, 22° 57' 19" S & 45° 50' 27" W, 653 m, 28.xi.2010). The new species is compared with *F. itatiaiae* (Santos, 1970) its closest congener. Diagnostic illustrations are presented. The main differences between *Forcepsioneura* species are: in females, the posterior lobe of the prothorax and in males the shape of cerci and the posterior lobe of the prothorax. The species is named *Forcepsioneura elizabethae* sp. nov. in honor of Her Majesty Queen Elizabeth II on the occasion of her platinum jubilee." (Author)] Address: Lencioni, F.A.A., Rua Anibal, 216, Jd. Coleginho, Vila Zezé, Jacaréi, CEP (ZIP) 12310–780 São Paulo, Brazil

20765. Lewinsohn, T.M.; Agostini, K.; Freitas, A.V.L.; Melo, A.S. (2022): Insect decline in Brazil: an appraisal of current evidence. *Biology Letters* 18: 20220219: 8 pp. (in English) ["Recent reviews of data on worldwide insect decline include almost no information on Brazil. We gathered evidence from literature searches and a survey sent to researchers, to which 96 replied and 56 provided information and publications. We present 75 instances of trends recorded over an average span of 11 years for aquatic and 22 years for terrestrial insects. These include time-replicated samples and expert opinion based on long-term local collections. Most terrestrial data are for butterflies, bees and scarab beetles. Aquatic studies include several insect orders, usually sorted to genus or family. Terrestrial insects showed significantly more cases of declines than increases, both in abundance (17 : 3) and in diversity (11 : 1). In aquatic cases, no tendency was detected in abundance (2 : 2) or diversity (3 : 4), not counting cases with no trend. Differences in these results among habitats may be due to the shorter span and less change in environmental conditions in the aquatic surveys, which included sites already degraded before sampling. We offer guidelines for future long-term assessments, including resampling of legacy collection sites." (Authors)] Address: Lewinsohn, T.M., Depto de Biologia Animal, Inst. Biol., Univ. of Campinas, 13083970 Campinas, São Paulo, Brazil. Email: thomasl@unicamp.br

20766. Lorenzo-Carballa, M.O.; Sanmartín-Villar, I.; Cordero-Rivera, A. (2022): Molecular and morphological analyses support different taxonomic units for Asian and Australo-Pacific forms of *Ischnura aurora* (Odonata, Coenagrionidae). *Diversity* 14(8), 606; <https://doi.org/10.3390/d14080606>.

30 pp. (in English) ["Despite the great technological progress that has aided taxonomical identification, taxonomical issues remain for certain species found in remote and/or understudied geographical areas. The damselfly species *Ischnura aurora* has been the subject of a long-standing taxonomical debate, focused mainly on the existence of morphological and behavioural differences between Asian and Australo-Pacific forms of this species that could justify their placement into two different species. Here, we carried out a comparative morphological analysis of specimens currently identified as *I. rubilio* from India and *I. aurora* from Asia and Oceania, combined with the analysis of mitochondrial and nuclear sequence data, both developed by us and available in public repositories. Our results split the Asian and Australo-Pacific forms of *I. aurora* into two well-differentiated taxonomic units and, hence, different (albeit closely related) species, and support the specific status of *I. rubilio*. The results of our genetic analyses suggest the existence of a third (and even fourth) taxonomic unit, stressing the need to revise all available material belonging to the different *I. aurora* subspecies that have been described. Finally, we have identified several questionable DNA sequences currently available in public repositories, upon which previous conclusions about the phylogenetic position of *I. rubilio* are based. Our study stresses the importance of being able to link available DNA sequence data with voucher specimens as well as to carry out a careful examination of DNA sequence data prior to their inclusion in taxonomical studies." (Authors)] Address: Lorenzo-Carballe, M. Olalla, ECOEVO Lab, Escola de Enxeñaría Forestal, Campus A Xunqueira, Univ. de Vigo, 36005 Pontevedra, Spain

20767. Lundyshv, D.S.; Kitel, D.A. (2022): Additional data on rare and protected species of arthropod (Arthropoda) of south of Belarus. Baranovich State Univ. - BarSU Herald. A scientific and practical journal Series "Biological Sciences (General biology). Agricultural Sciences (Agronomy)" 1(11): 41-47. ["Some findings on rare and protected species of arthropods (Arthropoda) collected in the south of Belarus are presented. Out of 17 listed rare and protected species of arthropods, 10 species are included in the Red Book of Belarus; 7 species are in the IUCN Red List; 9 species are in the Red Book of European saproxylic beetles; 6 species are classified as species-indicators of valuable forest habitats of the Republic of Latvia, and 3 species are included into Appendix II of the European Council Directive No. 92/43/EEC. The data obtained can be used for preparation of the next edition of the Red Data Book of Belarus, as well as for planning and implementation of other nature conservation measures." (Authors) Records of *Anax imperator*, *Sympecma paedisca*, and *Nehalennia speciosa* are documented.] Address: Kitel, D.A., Public organization "Birdlife Belarus", 11 Parnikovaya Str., 220050 Minsk, Belarus. Email: kitel_apb@tut.by

20768. Manikandan, K.R.; Muthuswami, M.; Chitra, N.; Ananthan, M. (2022): Diversity of Odonata in a coffee ecosystem. Indian Journal of Entomology Online published Ref. No. e21238 DoI.: 10.55446/IJE.2022.439: 3 pp. (in English) ["A total of 419 individuals under 5 families, 10 genera and 10 species of Odonata were observed in the present study on the Odonata from a coffee ecosystem at the lower Palni Hills, Tamil Nadu, India. Among these, the family Libellulidae included six species followed by Euphaeidae (2), and Chlorocyphidae, Coenagrionidae and Aeshnidae (1 each). The dominant species were: *Pantala flavescens* (44.40%) > *Diplacodes trivialis* (22.70%) > *Orthetrum chrysis* (7.40%). *Pantala flavescens* was maximum during northeast monsoon

season (50.0%) followed by summer and winter (43.8% each). Margalef index of species richness was maximum (2.00) during winter, and that of Simpson index was maximum (0.75) during south west monsoon. Shannon-Wiener index of dominance was maximum (1.75) during summer. The species were evenly distributed during summer with Pielou's evenness index value of 0.76." (Authors)] Address: Manikandan, K.R., Dept of Agricultural Entomology; Directorate of Open and Distance Learning Tamil Nadu Agricultural Univ., Coimbatore, 641003, Tamil Nadu, India. Email: manibscagri@gmail.com

20769. Merrill, I. (2022): Status and distribution of Dragonflies and Damselflies of Leicestershire & Rutland Beautiful Demoiselle female, Ullesthorpe, Leicestershire, June 2021. Lesops 48: VC55 Odonata: 34 pp. (in English) [<https://www.naturespot.org.uk/sites/default/files/2022-06/LESOPS%2048%20Odonata%20of%20VC55.pdf>] Address: Merrill, I. Email: i.merrill@btopenworld.com

20770. Mola, L.M.; Rebagliati, P.J.; Fourastié, M.F.; Agopian, S.S. (2022): Meiotic analysis of Gomphidae species sheds light on the large X chromosome of the family (Anisoptera, Odonata). Diversity 14, 874. <https://doi.org/10.3390/d141-00874>: 17 pp. (in English) ["In most Anisoptera families, the modal diploid number is 25 in males (24 autosomes + X), and the X chromosome is one of the smallest elements of the complement. The family Gomphidae is an exception, as it has a modal diploid number of 23 (22 + X), and the X chromosome is the largest of the complement and of medium-to-large size in many species. We studied the meiosis of three gomphid species from Argentina: *Aphylla* cf. *distinguenda* (Campion, 1920), *Phyllocyca propinqua* Belle, 1972 and *Phyllocyca* sp. Chromosome number is $2n = 23$, $n = 11 + X$, except for *Phyllocyca propinqua*, showing $n = 10 + X$. The X chromosome of these species is medium-sized and presents heteropyknotic blocks of different sizes. Despite the small number of gomphid species analysed, there is a clear trend of increasing size of the X chromosome with the increasing amount of heterochromatin. Our results, together with those from the literature, suggest that its large size might have been due to a progressive accumulation of repetitive DNA and heterochromatinisation and not to fusion, as previously suggested. This led us to propose that the ancestral number coincided with the modal number of Gomphidae. A revision of the derived sex-determining systems in Odonata is also provided." (Authors)] Address: Mola, Liliana, Laboratorio de Citogenética y Evolución, Depto de Ecología, Genética y Evolución, Instituto de Ecología, Genética y Evolución (CONICET-UBA), Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Intendente Güiraldes 2160, Ciudad Autónoma de Buenos Aires C1428EGA, Argentina. Email: lilimola@yahoo.com.ar

20771. Moreno Pallares, M.I.; Bonilla Gómez, M.A.; Guillot Monroy, G.H.; Torregroza-Espinosa, A.C. (2022): Distribution of *Miathyria marcella* larvae (Odonata: Libellulidae) and water quality of wetlands in Northern Colombia. Journal of Freshwater Ecology 37(1): 569-581. (in English) ["This study aims to assess the physicochemical characteristics regulating the distribution and abundance of *M. marcella* larvae in six wetlands in the northern Colombia. Standardized techniques for collecting invertebrate and physicochemical data were used in 29 sampling points in an intraannual period. Mean pH and temperature oscillated in narrow ranges within wetlands (7.7 ± 0.09 – 8.6 ± 0.07 ; 28.1 ± 0.29 – 32.8 ± 0.17 C, respectively), whereas ammonium concentrations and conductivity exhibited a wide variation (0.2 ± 0.03 – 2.8

± 0.54 mg NH₄ L⁻¹; 861 ± 30.7 – 19254 ± 1706 mS cm⁻¹, respectively). A total of 2586 individual *M. marcella* larvae were collected. Abundance was greater in wetlands influenced by the Magdalena River, with 19.4 ± 1.7 and 9.3 ± 1.4 individuals; followed by wetlands hydrologically influenced by seasonal runoff, with 8.1 ± 0.4 and 6.4 ± 0.4 individuals; and lowest in wetlands with influence of the Caribbean Sea, with 3.9 ± 0.3 and 0.3 ± 0.1 individuals. Abundances of *M. marcella* larvae exhibited similar variations at different months during the sampling period. Abundance and distribution of *M. marcella* larvae in wetlands of northern Colombia is strongly dependent on water conductivity, transparency and alkalinity. This study evidence that Odonata larvae are a valuable tool as bioindicators for wetland assessment and monitoring." (Authors)] Address: Moreno Pallares, M.I., Depto de Biología, Univ. Nac. Colombia, Bogotá, Colombia. Email: mimorenop@unal.edu.co

20772. Nagdev, P.; Beerendra; Ganguli, J. (2022): Determination of insect faunal diversity through light trap catches at Raipur, Chhattisgarh during kharif 2018. The Pharma Innovation Journal SP-11(2): 373-375. (in English) ["The experiment on Determination of insect faunal diversity through light trap catches was conducted during the kharif, 2018-19, at the Instructional research farm of IGKV, Raipur, Chhattisgarh. Investigations were undertaken to know the species composition of insect fauna attracted towards the light trap. The most dominated order in the light trap catches during kharif season was Coleoptera followed by Hemiptera, Lepidoptera, Hymenoptera, Orthoptera, Dermaptera and Ephemeroptera. According to the percentage of insects collected, maximum number of Coleoptera 3185.96 (68%) which were recorded highest during the 35th SMW, followed by Hemiptera 867.14 (19%) being highest during the 46th SMW, Lepidoptera 316.63 (7%) with peak during the 40th SMW, Hymenoptera 156.36 (3%) highest in the 33th SMW, Orthoptera 66.00 (2%) highest in the 31st SMW and Dermaptera 55.30 (1%) highest during the 34th SMW, Odonata (5.61) highest during the 36th SMW and Ephemeroptera (5.16) highest in the 37th SMW." (Authors)] Address: Nagdev, P., Dept Entomology, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

20773. Öztürk, S.; Seçer, B.; Sungur, S.; Kökçü, C.A.; Çiçek, E. (2022): Benthic macroinvertebrate fauna of Karagöl and Çiniligöl (Bolkar Mountains, Niğde, Turkey). LIMNOFISH - Journal of Limnology and Freshwater Fisheries Research 8(1): 59-69. (in Turkish, with English summary) ["This study was carried out between June and September 2018 to identify the macrobenthic invertebrate fauna of Karagöl and Çiniligöl which are high altitude lakes in Bolkar Mountains (Niğde). As a result of the systematic examination of the collected benthic samples; macrobenthic fauna of Karagöl consist of 30 taxa belonging to 14 families out of 11 orders (Sphaeriida, Coleoptera, Diptera, Hygrophila, Hemiptera, Rhynchobdellida, Odonata ["Coenagrion sp."], Haplotaksida, Lumbriculida, Trichoptera, Amphipoda) and macrobenthic invertebrate fauna of Çiniligöl composed of 11 taxa belonging to 7 families out of 7 orders (Sphaeriida, Coleoptera, Diptera, Hemiptera, Rhynchobdellida, Haplotaksida, Trichoptera). Except for *Allogamus auricollis*, *Paranais frici* and *Potamothenis hammoniensis* species among the determined taxa, others are new records for these localities. Determining the relationship between diversity of habitats, dominance and population density index was used. According to the results of the Shannon- Wiener (H'), Simpson (S) and Margalef (DMg) indexes used in the calculation of the

species diversity and species richness in habitats, the highest diversity is the Karagöl coast station with values of 3.07, 0.94 and 5.54, respectively. According to the dominance (SD) index results, the highest value was determined as Çiniligöl bottom station with 0.23. According to the results of the Shannon (EH) and Simpson (ES) indexes used in the population density relationship, the highest value was calculated as Karagöl bottom with 0.87 and 0.13, and the lowest value as 0.72 and 0.03, respectively. Cluster analysis based on the Sorensen and Ward's analysis method was applied to show the similarities of the taxa and their distribution in the stations. Accordingly, the highest similarity was observed between the Karagöl coast and Çiniligöl coast stations (0.35), the lowest between the bottom and coast stations of Karagöl (0.15)." (Authors)] Address: Öztürk, S., Nevşehir Hacı Bektaş Veli Üniversitesi, Fen Edebiyat Fakültesi, Biyoloji Bölümü, 50300 Nevşehir, Turkey. Email: seldaozturkk50@gmail.com

20774. Onishko, V.V. (2022): A new habitat of rare species of dragonflies (Odonata) in the territory of Moscow and the first known population of *Ischnura pumilio* in the Moscow region. Amurian Zoological Journal 14(1): 139-155. (in Russian, with English summary) ["The article presents new data on dragonfly species rare in Moscow, which inhabit the reservoirs on a wasteland near the Scientific Library of Lomonosov Moscow State Univ., namely, *Sympecma fusca* (the second habitat within the city), *Coenagrion johanssoni* (the first habitat within the Moscow Ring Road), *Ischnura pumilio* (the first reliable habitat within the city and the first stable population in the Moscow region), *Aeshna affinis*, *A. juncea* (the first habitat within the Moscow Ring Road), *A. viridis* (the second habitat within the Moscow Ring Road), *Soma-tochlora flavomaculata* (the third habitat within the Moscow Ring Road), *Sympetrum fonscolombii* (the second place of development of the migrant species in Moscow)." (Author)] Address: Onishko, V., Moscow Zoo, 1 Bolshaya Gruzinskaya Str., 123242, Moscow, Russia. E-mail: wervolf999@yandex.ru

20775. Ožana, S.; Dolný, A.; Pánek, T. (2022): Nuclear copies of mitochondrial DNA as a potential problem for phylogenetic and population genetic studies of Odonata. Systematic Entomology 47(4): 591-602. (in English) ["The use of mitochondrial markers for taxonomic identification and biodiversity monitoring is not without risks or limitations. Most importantly, the natural transfer of DNA from the mitochondria to the nucleus generates nonfunctional nuclear copies of mitochondrial DNA (NUMTs). Their abundance and size vary significantly among taxa, and NUMTs have been reported to complicate molecular studies based on mitochondrial markers in several insect orders, most prominently in Orthoptera. The significance of this phenomenon in Odonata has not yet been properly addressed. Here, we present a complete mitochondrial genome and a draft nuclear genome of *Leucorrhinia albifrons*, as well as NUMT and *cox1* sequences from the related species *Leucorrhinia dubia*. We document the presence of NUMTs in the *L. albifrons* nuclear genome and in nuclear genomes of two other Odonata species available in public databases. Our results show that NUMTs can have a serious impact on barcoding, phylogenetic, population and phylogeographic studies of Odonata, especially when the barcode is located in the *cox1* gene, the most frequently used molecular marker for Odonata. We suggest that *nad1* should be used alone or in combination with *cox1* to minimize unintended confusion with NUMTs. Finally, we present a mitophylogenomic analysis of Odonata and document several cases of misidentified mitochon-

drial genomes belonging to species different from those indicated in public databases. In conclusion, our findings represent an important step for future metabarcoding studies of Odonata based on mitochondrial DNA markers." (Authors)] Address: Dolný, A., Dept Biology & Ecology, Faculty of Science, Univ. of Ostrava, Chittussiho 10, 710 00 Slezská Ostrava, Czech Republic. E-mail: ales.dolny@osu.cz

20776. Péliissié, M.; Johansson, F.; Hyseni, C. (2022): Pushed northward by climate change: Range shifts with a chance of co-occurrence reshuffling in the forecast for northern European odonates. *Environmental Entomology* 51(5): 910-921. (in English) ["Biodiversity is heavily influenced by ongoing climate change, which often results in species undergoing range shifts, either poleward or uphill. Range shifts can occur provided suitable habitats exist within reach. However, poleward latitudinal shifts might be limited by additional abiotic or biotic constraints, such as increased seasonality, photoperiod patterns, and species interactions. To gain insight into the dynamics of insect range shifts at high latitudes, we constructed ecological niche models (ENMs) for 57 Odonata species occurring in northern Europe. We used citizen science data from Sweden and present-day climatic variables covering a latitudinal range of 1,575 km. Then, to measure changes in range and interactions among Odonata species, we projected the ENMs up to the year 2080. We also estimated potential changes in species interactions using niche overlap and co-occurrence patterns. We found that most Odonata species are predicted to expand their range northward. The average latitudinal shift is expected to reach 1.83 and 3.25 km y⁻¹ under RCP4.5 and RCP8.5 scenarios, respectively, by 2061–2080. While the most warm-dwelling species may increase their range, our results indicate that cold-dwelling species will experience range contractions. The present-day niche overlap patterns among species will remain largely the same in the future. However, our results predict changes in co-occurrence patterns, with many species pairs showing increased co-occurrence, while others will no longer co-occur because of the range contractions. In sum, our ENM results suggest that species assemblages of Odonata—and perhaps insects in general—in northern latitudes will experience great compositional changes." (Authors)] Address: Péliissié, M., Dépt de Biologie, École Normale Supérieure de Lyon, Université Claude Bernard Lyon I, Université de Lyon, 69342 Lyon cedex 07, France. Email: mathieu.pelissie@ens-lyon.fr

20777. Ramlee, S.; Norma-Rashid, Y.; Mohd, S.-A. (2022): Odonata nymphs as potential biocontrol agent of mosquito larvae in Malaysia. *The Southeast Asian Journal of Tropical and Public Health* 53(4): 426-435. (in English) ["Biocontrol has been proposed as an effective approach in controlling mosquito population. In this study, three Odonata (dragonfly) nymphs (*Neurothemis fluctuans*, *Orthetrum chrysis* and *O. sabina*) were investigated for their feasibility as biocontrol agents against dengue virus vectors *Aedes aegypti*, *Ae. albopictus* and *Culex quinquefasciatus*. Each Odonata nymph species was separately fed each of the mosquito species IV instar larvae maintained at a fixed level by replenishing every three hours for 24 hours under controlled laboratory conditions and 12-hour light-dark period. *N. fluctuans* and *O. sabina* nymphs preferred *Ae. aegypti* as their prey, while *O. chrysis* favored *Cx. quinquefasciatus*. Amount of larval consumption is significantly higher during light compared to dark period (p -value <0.05). However, overall there are no significant differences in consumption rates of the three dragonfly nymph species for the test mosquito larvae.

Thus, Odonata nymphs are potential biocontrol agents against mosquito vectors of dengue disease." (Authors) *Neurothemis fluctuans*, *Orthetrum sabina*, *O. chrysis*] Address: Correspondence: Saleeza Ramlee, S., Fac. Defence Study & Management, National Univ. of Defence Malaysia, Kuala Lumpur 57000, Malaysia. Email: saleeza@upnm.edu.my

20778. Seehausen, M. (2022): Henry Walter Bates' manuscripts on the Amazon Odonata in the archive of Friedrich Ris. *Odonatologica* 51(1-2): 11-40. (in English) ["Manuscripts on the Amazon Odonata and four letters from Henry Walter Bates were found in the private papers of Friedrich Ris at the Senckenberg Museum Frankfurt, Germany. They contain descriptions as well as sketches and coloured illustrations of Odonata collected by Bates during his eleven years (1848–1859) on the Amazon. Bates recorded about 194 species-group names and proposed 13 new genera and subgenera of Odonata. Some of these taxa were subsequently described and published by Edmond de Selys Longchamps, René Martin, and Friedrich Ris. Annotations on the genera *Oxystigma* and *Aeschnosoma* are given, and several valid species are associated with species-group names used by Bates. An annotated list of species described from specimens of Bates manuscripts is provided and corresponding labels of type specimens are noted where possible. Type specimens of *Polythore batesii*, *P. inaequalis*, *P. vittata*, *Chalcopteryx scintillans*, *Triacanthagyna satyrus*, *Aphylla dentata*, and *Progomphus intricatus* are discussed in connection with Bates' manuscripts. In addition, specimens of *Neuraeschna dentigera*, *Staurophebia gigantula*, *S. reticulata*, and *Rhodopygia geijskesi* are discussed when associated with species names used by Bates." (Author)] Address: Seehausen, M.; Fährhofstr. 11, 18439 Stralsund, Germany. Email: m.seehausen@gmx.de

20779. Sisa, E.M.; Kamb, J.-C.T.; Pwema, V.K.; Mutambel, D.H.; Bunda, N.P.M. (2022): Structure of Odonata populations in the riparian strips of the Bumbu River watershed in Kinshasa /RD Congo. *International Journal of Science and Research Archive* 6(1): 28-39. (in English) ["The study of the structure of the Odonata populations was undertaken during the dry season 2021, in the watershed of the Bumbu River. After capture with an entomological net, identification and enumeration, 393 individuals were collected and are divided into 2 suborders and 8 families. Several biotic indices were used to study the structure of the population on the one hand, and its diversity on the other. Raw abundance, relative frequency, taxonomic richness, Shannon and Weaver diversity, Jaccard's similarity index, Pielou's equitability and riparian strip quality index were calculated. The evaluation of the biotic indices in the different stations showed that there is a parallelism between them. The Libellulidae family was the most represented with 161 individuals or 40.9% of the total abundance and 15 species. It is followed by the families Lestidae with 97 individuals and 4 species, Coenagrionidae with 87 individuals and 5 species, Corduliidae with 23 individuals and 3 species, Gomphidae with 15 individuals and 3 species, Platycnemidae with 9 individuals and 2 species, Chlorocyphidae with 6 individuals and 2 species and Calopterygidae with 1 individual and 1 species. The relative abundance of the species *Chalcostephia flavifrons*, *Ceriagrion corallinum*, *Lestes virgatus*, *L. ictericus* and *L.s. tridens* can be explained by the aquatic vegetation which serves them as perches and shelters." (Authors)] Address: Sisa, E.M., Hydrobiology Laboratory, National Pedagogical Univ. (NPU) B.P. 8815 Kinshasa I, DRC

20780. Šigutová, H.; Pyszko, P.; Valušák, J.; Dolný, A. (2022):

Highway stormwater ponds as islands of Odonata diversity in an agricultural landscape. *Science of The Total Environment* 837, 1 September 2022, 155774. (in English) ["Highlights: • Stormwater ponds have a higher Odonata richness and β -diversity. • Stormwater ponds have low taxonomic distinctness. • Stormwater ponds host more variable communities with higher conservation values. • Fish stocking intensity is the most important factor affecting the differences. • Management practices must enhance the biodiversity conservation of stormwater ponds. Abstract: Stormwater management ponds, which are constructed to retain excess runoff and pollutants from traffic, play an important role in the freshwater biodiversity in highly modified areas. However, their roles in agricultural and semi-natural landscapes remain largely unexplored. In this study, we used Odonata as a bioindicator to compare a set of highway stormwater ponds and surrounding ponds within an agricultural and semi-natural landscape to examine the extent to which stormwater ponds act as biodiversity refuges. We analyzed the differences in environmental parameters and the richness, compositions, and conservation values of the odonate communities of stormwater and surrounding ponds. We also examined the factors controlling the differences in the communities of both pond types. The stormwater ponds were smaller, less eutrophicated, less shaded by trees, less stocked with fish, and less connected with other waterbodies than the surrounding ponds. However, they had a higher plant diversity and pH values and were more densely overgrown with vegetation. Compared with surrounding ponds, stormwater ponds had a higher Odonata richness and β -diversity, but their taxonomic distinctness was significantly lower. Therefore, stormwater ponds hosted more variable communities but their assemblages were taxonomically similar. Indicator species were only identified in stormwater ponds. Furthermore, stormwater ponds harbored more species with higher conservation values. The most important factors affecting the differences between stormwater and surrounding ponds were the trophic state, relative tree shading, and fish stocking intensity. With their increase, the richness and rarity decreased. Our results highlight the potential of stormwater ponds to enhance the biodiversity outside urban areas by providing specific habitat conditions that are unique to the surrounding agricultural landscape. In addition, we suggest management practices that can be used to enhance their biodiversity conservation function." (Authors)] Address: Šigutová, Hana, Dept of Biology & Ecology, Faculty of Science, Univ. of Ostrava, Chittussiho 10, 71000 Ostrava, Czech Republic

20781. Soni, A.; Brightwell, G. (2022): Nature-inspired antimicrobial surfaces and their potential applications in food industries. *Foods* 2022, 11, 844. <https://doi.org/10.3390/foods11060844>: 15 pp. (in English) ["Antimicrobial resistance (AMR) is a growing global concern and has called for the integration of different areas of expertise for designing robust solutions. One such approach is the development of antimicrobial surfaces to combat the emerging resistance in microbes against drugs and disinfectants. This review is a compressive summary of the work done in the field of material science, chemistry, and microbiology in the development of antimicrobial materials and surfaces that are inspired by examples in nature. The focus includes examples of natural antimicrobial surfaces, such as cicada wings or nanopillars, dragonfly wings, shrimp shells, taro leaves, lotus leaves, sharkskin, gecko skin, and butterfly wings, along with their mechanism of action. Techniques, compositions, and combinations that have been developed to synthetically mimic these surfaces against bacterial/viral and fungal

growth in food-processing areas have also been discussed. The applications of synthetic mimics of natural antimicrobial surfaces in food-processing environments is still a naïve area of research. However, this review highlights the potential applications of natural antimicrobial surfaces in the food-processing environment as well as outlines the challenges that need mitigations." (Authors)] Address: Soni, A., Food Assurance, AgResearch, Palmerston North 4442, New Zealand. Email: aswathi.soni@agresearch.co.nz

20782. Späth, J.; Fick, J.; McCallum, E.; Cerveny, D.; Nording, M.L.; Brodin, T. (2022): Wastewater effluent affects behaviour and metabolomic endpoints in damselfly larvae. *Scientific Reports* 12:6830: 13 pp. (in English) ["Wastewater treatment plant effluents have been identified as a major contributor to increasing anthropogenic pollution in aquatic environments worldwide. Yet, little is known about the potentially adverse effects of wastewater treatment plant effluent on aquatic invertebrates. In this study, we assessed effects of wastewater effluent on the behaviour and metabolic profiles of damselfly larvae (*Coenagrion hastulatum*), a common aquatic invertebrate species. Four key behavioural traits: activity, boldness, escape response, and foraging (traits all linked tightly to individual fitness) were studied in larvae before and after one week of exposure to a range of effluent dilutions (0, 50, 75, 100%). Effluent exposure reduced activity and foraging, but generated faster escape response. Metabolomic analyses via targeted and non-targeted mass spectrometry methods revealed that exposure caused significant changes to 14 individual compounds (4 amino acids, 3 carnitines, 3 lysolipids, 1 peptide, 2 sugar acids, 1 sugar). Taken together, these compound changes indicate an increase in protein metabolism and oxidative stress. Our findings illustrate that wastewater effluent can affect both behavioural and physiological traits of aquatic invertebrates, and as such might pose an even greater threat to aquatic ecosystems than previously assumed. More long-term studies are now needed evaluate if these changes are linked to adverse effects on fitness. The combination of behavioural and metabolomic assessments provide a promising tool for detecting effects of wastewater effluent, on multiple biological levels of organisation, in aquatic ecosystems." (Authors)] Address: Späth, Jana, Dept of Chemistry, Umeå Univ., KB.C6, Linnaeus väg 10, 90187 Umeå, Sweden. Email: jana.spath@umu.se

20783. Tongo, I.; Onokpasa, A.; Emerure, F.; Balogun, P.T.; Enuneku, A.A.; Erhunmwunse, N.; Asemota, O.; Ogbomida, E.; Ogbeide, O.; Ezemonye, L. (2022): Levels, bioaccumulation and biomagnification of pesticide residues in a tropical freshwater food web. *International Journal of Environmental Science and Technology* 19: 1467-1482. (in English) ["The study assessed pesticide contamination transfer in Ikpoba River, an important tropical freshwater ecosystem in Southern Nigeria. The study quantified concentrations, bioaccumulation and biomagnification of pesticides in Ikpoba River's food web, with emphasis on less frequently assessed lower trophic-level organisms. Concentrations of pesticides were quantified in water, sediment and biota (phytoplankton, green algae (*Cladophora*), macrophyte (*Comelina erecta*), macrobenthic invertebrates (*Lestes* species, *Caridina africana*, *Enallagma* species, *Gerris lacustris*, *Culex* species, *Pentaneura* species, *Sympetrum* species, *Argyroneta aquatica*, *Lecane* species (*Cladocera*) and pelagic fish (*Tilapia zilli*)). Samples were collected at two separate stations and were analyzed using gas chromatography equipped with electron capture detector. Aldrin was the dominant pesticide in the Ikpoba River food web with

concentrations accounting for 14.4% of the total pesticide residues in the assessed matrices. Sediment samples had significantly higher pesticide concentrations among the matrices assessed, with a total mean concentration of $0.095 \pm 0.02 \mu\text{g}/\text{kg dw}$. Among the biota samples, total pesticide levels were significantly higher ($p < 0.05$) in *Commelina erecta*. BAF and BSAF values were also highest in this species indicating that *Commelina erecta* may represent a greater reservoir for pesticides and may be a principal factor in subsequent transfer of pesticides along the food web of Ikpoba River. The BMF values for α -HCH, γ -HCH, β -HCH, glyphosate, heptachlor, aldrin, heptachlor epoxide, endosulfan I, endrin, carbofuran and diazinon showed that these pesticides have the potential to biomagnify along the trophic levels. The persistence of these pesticides in Ikpoba River supports the need for continuous monitoring." (Authors)] Address: Tongo, I., Laboratory for Ecotoxicology and Environmental Forensics, Dept of Animal & Environmental Biology, Fac. of Life Sciences, Univ. of Benin, Benin City, Nigeria

20784. Tüzün, N.; Stoks, R. (2022): A fast pace-of-life is traded off against a high thermal performance. *Proc. R. Soc. B* 289: 20212414. 10 pp. (in English) ["The integration of life-history, behavioural and physiological traits into a 'pace-of-life syndrome' is a powerful concept in understanding trait variation in nature. Yet, mechanisms maintaining variation in 'pace-of-life' are not well understood. We tested whether decreased thermal performance is an energetic cost of a faster pace-of-life. We characterized the pace-of-life of larvae of the damselfly *Ischnura elegans* from high-latitude and low-latitude regions when reared at 20°C or 24°C in a common-garden experiment, and estimated thermal performance curves for a set of behavioural, physiological and performance traits. Our results confirm a faster pace-of-life (i.e. faster growth and metabolic rate, more active and bold behaviour) in the low-latitude and in warm-reared larvae, and reveal increased maximum performance, R_{max} , but not thermal optimum T_{opt} , in low-latitude larvae. Besides a clear pace-of-life syndrome integration at the individual level, larvae also aligned along a 'cold-hot' axis. Importantly, a faster pace-of-life correlated negatively with a high thermal performance (i.e. higher T_{opt} for swimming speed, metabolic rate, activity and boldness), which was consistent across latitudes and rearing temperatures. This trade-off, potentially driven by the energetically costly maintenance of a fast pace-of-life, may be an alternative mechanism contributing to the maintenance of variation in pace-of-life within populations." (Authors) [Address: Tüzün, N., Lab. of Evolutionary Stress Ecology & Ecotoxicology, KU Leuven, Charles Deberiotstraat 32, 3000 Leuven, Belgium Email: ndmtzn@gmail.com

20785. van Ekström-Ahlby, M.; Svensson, S. (2022): Which ecological drivers affect species turnover? Odonata communities in 16 lakes and ponds in Southern Sweden over a twenty-year period. BcS thesis, Halmstad Univ., School of Business, Innovation & Sustainability: 15 pp- ["Long-term data sets are needed to understand what causes changes in species communities. Odonata communities provide a variety of ecosystem services, for example being biological indicators in freshwater environment to indicate the water quality. Therefore, it is important to understand what is contributing to the species turnover that occurring in lakes on the west coast of Sweden, Halland. We collected and obtained long data sets from 16 lakes in Halland during 2002 to 2022 has been collected and analyzed. Our result shows that the colonization rate is more abun-

dant than the disappearance rate and that there is an ongoing species turnover, where more generalists inhabit the chosen lakes. Due to increased temperature and precipitation as a result of climate change, but also anthropogenic factors, southern species move more northwards. Another result due to climate change is changes in habitat structures. This is some of the reasons that contribute to species turnover in the lakes in Halland. Another driver can be how well species adapt to change overall. In this report we have contributed with new environmental data from 2022, but also long-term data sets, which is highly recommended to use for future research to understand species turnover in Odonata communities and why species are moving northwards." (Authors)] Address: van Ekström-Ahlby, Marianne, Halmstad Univ., School of Business, Innovation & Sustainability

20786. Vilenica, M.; Mihaljevic, Z. (2022): Odonata assemblages in anthropogenically impacted habitats in the Drava River — A long-term study. *Water* 2022, 14(19), 3119; <https://doi.org/10.3390/w14193119>. 12 pp. (in English). ["Lotic freshwater ecosystems are among the most threatened ecosystems worldwide due to the effects of multiple stressors, such as intensive land use in their catchments, morphological alterations, flow regulation, pollution, and climate change. Odonata are often used as valuable indicators of ecological integrity and anthropogenic disturbance of freshwater habitats. Here, we present the results of a study on Odonata assemblages in anthropogenically impacted habitats (hydropower plant reservoirs, tailrace canals, drainage ditches, and old river channels) conducted over a nine-year period. The negative impacts of anthropogenic activities on inhabiting biota were confirmed—with only 11 species recorded, the Odonata assemblages were species-poor and had low population densities. Although most species recorded were generalists, some species of national conservation concern were detected. Among the physico-chemical water parameters, the concentrations of ammonium, orthophosphates, nitrates, and mineral oils in the water were found to be the most important determinants of Odonata assemblages. The preservation of near-natural sites in the vicinity of anthropogenically impacted and man-made habitats is important for maintaining the local Odonata fauna and for the preservation of rare species. Our results highlight the importance of long-term data for determining the occurrence of Odonata species and monitoring their population dynamics." (Authors)] Address: Vilenica, Marina, Fac. Teacher Education, Univ. of Zagreb, Trg Matice Hrvatske 12, 44250 Petrinja, Croatia. Email: marina.vilenica@ufzg.hr

20787. Watanabe, R.; Ohba, S.-y. (2022): Comparison of the community composition of aquatic insects between wetlands with and without the presence of *Procambarus clarkii*: a case study from Japanese wetlands. *Biological Invasions* 24: 1033-1047. (in English) ["The red swamp crayfish *Procambarus clarkii* (Cambaridae) has been introduced globally and has caused enormous biodiversity losses in freshwater ecosystems. Recently, this invasive species has been acknowledged as factor causing the decline of aquatic insect populations (Odonata, Hemiptera, and Coleoptera) in Japan. Although the negative impacts of *P. clarkii* on aquatic insect communities have been validated by observational studies and laboratory experiments, field studies have not yet been performed. In this study, we investigated whether the presence of *P. clarkii* was a significant factor influencing the community composition of aquatic insects and identified

vulnerable taxa by comparing the aquatic insect communities in wetlands invaded by *P. clarkii* and uninvaded wetlands. We recorded a total of 52 species and 2721 individuals: 50 species and 2405 individuals in non-invaded wetlands, and 23 species and 316 individuals in invaded wetlands. This indicates that the aquatic insect diversity of non-invaded wetlands was higher than that of invaded wetlands. The composition of aquatic insect communities differed between the invaded and non-invaded wetlands. The effect of *P. clarkii* on aquatic insects differed according to their habitat-related traits: species that utilize on the water surface and float near the water surface was less vulnerable than those that utilize aquatic plants as food, oviposition substrates, and perches and hide in the bottom substrate. The eradication of *P. clarkii* at the early stages of invasion, as well as the prevention of its spread in invaded ecosystems is essential to prevent negative impacts on aquatic insects." (Authors)] Address: Watanabe, R., Environmental Technology Division, Institute of Environmental Informatics, IDEA Consultants, Inc., 2-2-2 Hayabuchi, Tsuzuki-ku, Yokohama, Kanagawa 224-0025, Japan. E-mail: watanabe.reiya.sw@alumni.tsukuba.ac.jp

20788. Wijesooriya, M.M.; Jayalath, M.J.; Perera, S.J.; Samanmali, C. (2022): The Odonate fauna (Insecta: Odonata) of Belihuloya, Southern Intermediate zone of Sri Lanka: a preliminary assessment and conservation implications. *Journal of Asia-Pacific Biodiversity* 15(3): 311-328. (in English) ["Highlights: • Odonate fauna from Belihuloya, Sri Lanka includes 36 species (22 in Anisoptera and 14 in Zygoptera). • This includes 12 nationally threatened species (2 CR, 1 EN and 9 VU). • The larval morphology of *Anax indicus* and *Gynacantha dravida* are described for the first time in Sri Lanka. Abstract: Belihuloya situated in a biogeographical transition zone in south-central Sri Lanka is being threatened by land-use changes. Establishing baseline biodiversity knowledge of an indicator taxa within this lesser explored area, the present study systematically assessed Odonates fauna in different habitat types through a transect survey supplemented with incidental observations. Further, the morphology of larvae and exuvia of some Odonates were opportunistically documented from selected water bodies. Transect survey and opportunistic observations identified 36 species of Odonates (22 dragonflies and 14 damselflies) representing ten families, with ten Sri Lankan endemics. Four species of dragonflies and eight damselflies are nationally threatened, including critically endangered *Elattonura centralis* and endangered *Libellago greeni*. The calculated species richness (R), Shannon-Wiener diversity (H'), evenness (E) and Simpson's diversity (1/D) values were, 3.51, 2.40, 0.85 & 7.90, and 2.85, 2.36, 0.92 & 8.68 respectively for dragonflies and damselflies, while two groups show vertical niche segregation. Low Odonate community similarity coefficients among habitat types indicate they are complementary for conservation planning. Out of ten Odonate species for which larval stages were recorded, the larval morphology of *Anax indicus* and *Gynacantha dravida* are described for the first time in Sri Lanka. Baseline data herein are used for evidence-based conservation recommendations." (Authors)] Address: Perera, S.J., Department of Natural Resources, Faculty of Applied Sciences, Sabaragamuwa Univ., 8 P.O. Box 02, Belihuloya, 70140, Sri Lanka. Email: sandun.perera@appsc.sab.ac.lk

20789. Zaika, V.V.; Zabelin, V.I.; Archimaeva, T.P. (2022): Trophic relationship between populations of insects and birds of the River Uyuk (Tava Republic). *Natural Resources, Environment and Society* 3(15): 20-30. (in Russian, with

English summary) ["This paper discusses the interaction of the animal population of aquatic and terrestrial parts of the basin complexes of ecosystems of water flows, using the mountain-taiga river Uyuk, a tributary of the Bolshoi Yenisei, located on the southern macro slope of the Western Sayan. As a result of the studies, the species diversity and features of the distribution of the predominant groups of amphibious insects and birds of the wetland complex were revealed depending on the natural conditions of different parts of the river, and the amount of food resources presented along the river continuum. In total, 52 taxa of aquatic invertebrates were found in the Uyuk River basin, where 26 species of mayflies (Ephemeroptera), 24 species of stoneflies (Plecoptera), 17 species of caddis flies (Trichoptera), and 6 species of dragonflies (Odonata). Diptera species are represented by 6 families. Birds, related to amphibians, are represented by 47 species from 11 families. A small number of species of both was noted in the upper reaches and the mouth part, and the maximum biodiversity in the middle rithral zone. A clear correlation was revealed between the natural conditions of different zones of the river continuum, the number of species and the abundance of invertebrates, near-aquatic and waterfowl: low species diversity and population in the crenal and hyporythral and maximum biodiversity and abundance in the metarithral part of the river channel." (Authors) Coenagrion lanceolatum, Ischnura elegans, Lestes sponsa., Leucorrhinia intermedia., Ophiogomphus cecilia, Sympetrum flaveolum.] Address: Zaika, V.V., Tuvinian Institute for Exploration of Natural Resources of SB RAS, Kyzyl, Russia

20790. Zouaimia, A.; Zebza, R.; Bensakhri, Z.; Youcefi, A.; Bensouilah, S.; Amari, H.; Ouakid, M.-L.; Houhamdi, M.; Khelifa, R. (2022): Update on the geographic distribution of the critically endangered *Urothemis edwardsii* (Selys, 1849) (Odonata: Libellulidae) in northeastern Algeria. *Annales de la Société entomologique de France* (N.S.) 58(4): 366-372. (in English, with French summary) ["Assessing temporal changes of the distribution of threatened species is paramount for effective management. Threatened species are sensitive to environmental changes and can be extirpated rapidly due to climatic and anthropogenic effects. Here, we monitor the distribution of the locally critically endangered *Urothemis edwardsii* in northeastern Algeria where the species has been recovering during the last decade after being restricted to a single locality since the 1990s. During the flight seasons in 2018, 2019, and 2021, we conducted field surveys recording the number of males, females, and breeding pairs across 15 sites in northeast Algeria (El Taref province). We found the species at seven sites; reproduction was confirmed at four. In two of the sites, the species was newly recorded but showed no signs of reproduction. We confirmed the maintenance of the reproductive populations that were recently discovered. While the local conservation status of the species is better than that in the 1990s, there are still different threats that need to be addressed and conservation measures that should be implemented or reinforced to ensure maintenance as well as future expansion of the species." (Authors)] Address: Zouaimia, A., Laboratory of Marine and Coastal Environments Ecobiology, Dept of Biology, Badji Mokhtar Univ., BP 12, 23000, Annaba, Algeria. Email: zouaimia.abdelheq@gmail.com