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17192. Kim, I.; Su, Y.J.; Min, J.K. (2019): Complete mitochondrial genome sequence of Bekko Tombo Libellula angelina Selys, 1883 (Odonata: Libellulidae). Mitochondrial DNA Part B 4(2): 2201-2203. (in English) ["L. angelina has been listed as a critically endangered species by the International Union for Conservation of Nature and is also an endangered insect in South Korea. We sequenced the whole genome (15,233 bp) of L. angelina species, which included a set of typical genes and one major non-coding AT-rich region with an arrangement identical to that observed in most insect genomes. The A + T-rich region harbored one identical repeat composed of 65 bp and two tRNA-like structures (trnF and trnK-like sequences) with proper anticodon and clover-leaf structures. Phylogenetic reconstruction using the concatenated sequences of 13 protein-coding genes (PCGs) and two rRNAs of the representative odonate mitogenomes utilizing both Bayesian inference and maximum-likelihood methods revealed a strong support for the monophyletic Zygoptera and a moderate to high support for the monophyletic Anisoptera suborders. Unlike that in conventional phylogenetic analysis, a relatively strong sister relationship was revealed between the suborders of Anisozygoptera and Zygoptera." (Authors)] Address: Kim, I., Dept of Applied Biology, College of Agriculture and Life Sciences, Chonnam National University, Gwangju, Republic of Korea

17193. Kipping, J.; Clausnitzer, V.; Fernandes Elizalde, S.R. F.; Dijkstra, K.D.B. (2019): Chapter 9. The Dragonflies and Damselflies of Angola: An Updated Synthesis. In: B. J. Huntley et al. (eds.), Biodiversity of Angola: 141-165. (in English) ["Prior to 2012, only 158 species of Odonata were known from Angola. Surveys in 2012 and 2013 added 76 species and further additions in 2016 brought the national total to 236 species. This was published earlier in 2017 as the checklist of the dragonflies and damselflies (Odonata) of Angola by the same authors (Kipping et al. Afr Invertebr 58 (1):65-91) on which this chapter is based. Records obtained in 2017 and 2018 and a survey by two of the authors in December 2017 led to the discovery of 25 additional species, of which several are undescribed. We provide a revised checklist here comprising 260 species

and discuss the history of research, the biogeography of the fauna with endemism and the potential for further discoveries. The national total is likely to be above 300 species. This would make Angola one of the richest countries for Odonata in Africa." (Authors)] Address: Kipping, J., BioCart Ökologische Gutachten, Taucha/Leipzig, Germany. E-mail: biocartkipping@email.de

17194. Kloen, J.-F. (2019): Habitat preference of the Green Hawker (Aeshna viridis). Brachytron 20(2): 94-102. (in Dutch, with English summary) ["A. viridis has strict habitat requirements. In the Netherlands, this species only occurs in vegetations with Water Soldier (Stratiotes aloides) and a good water quality. The following habitat characteristics are important for Aeshna viridis. The water must be at least three meters wide; the vegetation in the water and on the banks should be rich in species; the water has to be sheltered by trees, bushes or reed; the water should be clear without many algae or rotting organic material. The S. aloides plants should be tall, with leaves reaching at least 19 centimeters above the surface, a total leaf length of at least 34 centimeters and the heart of the plant at least 19 centimeters below the surface." (Author)]

17195. Klymko, J.; Weigensberg, M.; Blaney, C.S. (2019): First records of the Lilypad Forktail (Ischnura kellicotti) (Odonata: Coenagrionidae) for the Canadian Maritimes and the Southern Pygmy Snaketail (Lanthus vernalis) (Odonata: Gomphidae) for Nova Scotia. J. Acad. Entomol. Soc. 15: 21-23. (in English) ["The Odonata fauna of the Canadian Maritime provinces has received much attention in recent years. A comprehensive overview was presented by Brunelle (2010), and additions to the Maritimes or individual provinces were reported by Klymko (2011), Klymko and Robinson (2013), McAlpine et al. (2017), and Makepeace et al. (2017). Here we add to this body of work with the first reports of I. kellicotti for the Canadian Maritime provinces and the first report of L. vernalis for Nova Scotia. Most of the occurrences documented in this note are based on specimens collected during a dragonfly exuvia survey of the St. Mary's River, Nova Scotia, in 2011 (Klymko & Robinson 2011) and a damselfly survey of south-western New Brunswick lakes done in 2017 (Klymko and

Weigensberg 2018). Voucher specimens have been deposited in the New Brunswick Museum (NBM) and the Canadian National Collection of Insect (CNCI)." (Authors)] Address: Klymko, J., Atlantic Canada Conservation Data Centre, PO Box 6416, Sackville, NB, Canada E4L 1G6. E-mail: jklymko@mta.ca

17196. Knight, S.M.; Pitman, G.M.; Flockhart, D.T.T.; Norris, D.R. (2019): Radio-tracking reveals how wind and temperature influence the pace of daytime insect migration. *Biology Letters* 15(7): 5 pp. (in English) ["Insects represent the most diverse and functionally important group of flying migratory animals around the globe, yet their small size makes tracking even large migratory species challenging. We attached miniaturized radio transmitters (less than 300 mg) to monarch butterflies (*Danaus plexippus*) and common green damer dragonflies (*Anax junius*) and tracked their autumn migratory movements through southern Ontario, Canada and into the United States using an automated array of over 100 telemetry towers. The farthest estimated distance a monarch travelled in a single day was 143 km at a wind-assisted ground-speed of 31 km h⁻¹ (8.7 m s⁻¹) and the farthest estimated distance a green damer travelled in a single day was 122 km with a wind-assisted groundspeed of up to 77 km h⁻¹ (21.5 m s⁻¹). For both species, increased temperature and wind assistance positively influenced the pace of migration, but there was no effect of precipitation. While limitations to tracking such small animals remain, our approach and results represent a fundamental advance in understanding the natural history of insect migration and environmental factors that govern their movements." (Authors)] Address: Knight, Samantha, Dept Integrative Biol., Univ. of Guelph, Guelph, Ontario, Canada N1G 2W1. E-mail: sknigh04@uoguelph.ca

17197. Kolar, V.; Boukal, D.S.; Sentsis, A. (2019): Predation risk and habitat complexity modify intermediate predator feeding rates and energetic efficiencies in a tri-trophic system. *Freshwater Biology* 64(8): 1480-1491. (in English) ["(1) To understand the effects of environmental changes on ecosystems, it is important to determine the factors and mechanisms influencing the strength of species interactions in food webs. However, joint effects of predation risk and additional environmental factors on species interaction strengths in multitrophic systems remain largely unexplored, leaving a substantial gap in our understanding of the links between local environmental characteristics and food web properties. (2) To fill this gap, we investigated the effects of habitat complexity and predation risk by top predatory dragonfly larvae (*Aeshna cyanea*) on feeding rates and energetic efficiency (i.e. the ratio of acquired and expended energy) of the larvae of three intermediate predatory odonate species (*Libellula quadrimaculata*, *Sympetrum sanguineum*, and *Ischnura elegans*) preying on cladocerans. (3) We hypothesised that predation risk would decrease the feeding rate, especially in the structurally simple habitat, and increase the metabolic rate of all intermediate predators. We also expected higher feeding rates of intermediate predators using aquatic vegetation as a perching site (i.e. *Sympetrum* and *Ischnura*) in the structurally complex habitat. Finally, we expected to observe habitat- and predation risk-dependent energetic efficiencies of

the intermediate predators driven by changes in feeding and metabolic rates. (4) The effect of predation risk on feeding rates was species specific and differed between the structurally simple and complex habitat. Habitat complexity increased feeding rates but only in the absence of predation risk. Moreover, predation risk signalled by chemical cues significantly increased *S. vulgatum* feeding rates but did not influence the feeding rates of the two other intermediate predators. (5) Metabolic rates varied among the three intermediate predators but were not affected by predation risk. Estimated energetic efficiency decreased with intermediate predator body mass and depended, to a lesser extent, on the interactive effect of habitat complexity and predation risk. (6) Our results imply that the effects of habitat complexity and predation risk on trophic interactions are likely to be determined by traits related to foraging and defence of the intermediate predators and their habitat domains, and that energetic efficiency is mainly determined by predator mass. Given that habitat complexity and predation risk can vary substantially across habitats, we conclude that it is important to consider habitat complexity and predation risk to better understand and predict the effects of environmentally driven variations on trophic interaction strength and metabolic rates that underlie the energetic efficiency of individual consumers. This has important implications for population and community dynamics as well as ecosystem functioning." (Authors)] Address: Kolar, V., Fac. of Science, Dept of Ecosystem Biology, Univ. of South Bohemia, Branišovská 1760, 370 05 České Budejovice, Czech Republic. E-mail: kolarvojta@seznam.cz

17198. Kompier, T.; Karube, H. (2019): A new species of *Heliogomphus* from Vietnam (Odonata: Gomphidae). *Zootaxa* 4555(1): 113-120. (in English) ["*Heliogomphus bidentatus* sp. nov. (holotype ♂: Tam Dao National Park, Vinh Phuc Prov., northern Vietnam) is described from north and central Vietnam. This new species is similar to *H. scorpio* (Ris, 1912), but can be separated by the coloration of the thorax and details of the male caudal appendages. Information on its biology and ecology is provided." (Authors)] Address: Kompier, T., Schoutenstraat 69, 2596 SK Den Haag, The Netherlands. E-mail: kompierintokyo@yahoo.com

17199. Koparde, P.; Dawn, P.; Darshetkar, A. (2019): Odonates across a tropical urbanization gradient (Mula River, Pune, Maharashtra, India). *International Dragonfly Fund Report* 128: 1-13. (in English) ["Globally urban wetlands are under high anthropogenic pressure of degradation. Urban wetlands are hotspots for species losses and rapid turnover in species assemblages. Therefore, studying such wetlands may provide an estimate of the pace of local extinction, concerning wetland-dependent species such as odonates. We undertook a study to document odonate species across a tropical urbanization gradient. We sampled six localities across the gradient across the Mula River that flows through the Pune City, India. We sampled adult odonates using a newly devised Halfcircle Point Count method from September 2016 to March 2017. We took multiple temporal replicates per site. We also sampled larvae across six sites once in November 2016. We measured site characteristics such as canopy cover, solid waste, and water turbidity to understand

the level of disturbance at each site. We recorded 41 odonates, six species (primarily Gomphidae members) exclusively from the larval sampling. We did not find the localization of species in a particular site across the urbanization gradient, possibly because we sampled a relatively short stretch of the river to capture the variation. Here, we update the Odonata list of Pune including data on larvae. We demonstrate that larval sampling complements Odonata surveys, especially in recording Gomphids. We recommend future research to include a longer timespan and extensive sampling area." (Authors)] Address: Koparde, P., Indian Institute of Science Education & Research Tirupati, Andhra Pradesh, India. E-mail: pankajkoparde@gmail.com

17200. Kosterin, O., & Gribkov, A. (2019): The first record of *Libellula depressa* Linnaeus, 1758 (Odonata: Libellulidae) in Siberia, Russia. *Acta Biologica Sibirica*, 5(2): 30-32. ["*L. depressa* was recorded from the NW foothills of Altai Mts. at the Inya River near the Chineta Village (51.34° N, 83.05° E) in Kranoshchekovo District of Altayskiy Kray Province, Russia. This record was made for the first time in the territory of Russia, eastward of Urals and in 150 km NNE of the closest locality in East Kazakhstan in Ust'-Kamenogorsk (Oskemen)."] (Authors)] Address: Kosterin, O.E., Institute of Cytology and Genetics, Siberian Branch, Russian Academy of Sciences, Lavrentiev Ave 10, RUS-630090 Novosibirsk, Russia. E-mail: kosterin@bionet.nsc.ru

17201. Kosterin, O.E.; Garrison, R.; Kompier, T.; Farrell, D. (2019): Taxonomic notes on *Indolestes Fraser*, 1922 (Lestidae, Zygoptera). 3. Male and clarified type locality of *Indolestes anomalus* Fraser, 1946. *Zootaxa* 4555(1): 67-78. (in English) ["The male of *Indolestes anomalus* Fraser, 1946 is described and the holotype female is depicted. Its occurrence in Vietnam, Thailand and Malaysia is discussed, and the type locality is clarified (South Vietnam, Đ.ng Nai River basin)."] (Authors)] Address: Kosterin, O.E., Institute of Cytology and Genetics, Siberian Branch, Russian Academy of Sciences, Lavrentiev Ave 10, RUS-630090 Novosibirsk, Russia. E-mail: kosterin@bionet.nsc.ru

17202. Krieger, A.; Fartmann, T.; Poniatoski, D. (2019): Restoration of raised bogs—Land-use history determines the composition of dragonfly assemblages. *Biological Conservation* 237: 291-298. (in English) ["Even though bogs function as the most important terrestrial carbon store on Earth and play a crucial role in the conservation of highly endangered species, the area covered by peatlands is declining globally. Consequently, numerous restoration efforts within degraded bogs have been realized. In many cases, however, it is unknown whether the conservation measures have been successful. We used Odonata (hereafter referred to as dragonflies) as ecological indicators to evaluate the restoration success of rewetting measures in central European degraded raised bogs. Depending on their land-use history (rewetted industrial peat cuts with and without former agricultural use), two types of bog restoration were compared with rural peat cuts (control). Our study demonstrated that restored bogs are important habitats for dragonfly conservation. Both types of restored bogs

were as diverse in overall species richness as the control plots. However, land-use history had a strong effect on restoration success. All raised-bog species of the study area were able to recolonize at least some of the nutrient-poor restored bogs. The situation was different for the nutrient-rich restored bogs. Due to the high nutrient content – caused by the former agricultural use – the characteristic dragonfly fauna of raised bogs will be unlikely to be able to recolonize in these locations in the long term. Nevertheless, the nutrient-rich restored bogs represent an important secondary habitat, especially for transition-bog species. In conclusion, the conducted restoration measures created a network of small oligo- to mesotrophic water bodies, which fosters aquatic macroinvertebrate diversity in bogs." (Authors)] Address: Fartmann, T., Dept Biodiversity & Landscape Ecology, Osnabrück Univ., Barbarastr. 11, 49076 Osnabrück, Germany

17203. Kumar, D.; Mohite, P.M.; Kamle, S. (2019): Dragonfly inspired nanocomposite flapping wing for Micro Air Vehicles. *Journal of Bionic Engineering* 16(5): 894-903. (in English) ["The current research is aimed towards the development of dragonfly inspired nanocomposite flapping wing for micro air vehicles (MAVs). The wing is designed by taking inspiration from the hind wing of *Anax parthenope julius*. Carbon nanotubes (CNTs)/polypropylene nanocomposite and low-density polyethylene are used as the wing materials. The nanocomposites are developed with varying CNTs' weight percentage (0% – 1%) and characterized for dynamic mechanical properties, which revealed that the 0.1 weight percentage case produces highest storage modulus values throughout the frequency range (1 Hz – 90 Hz). It is also observed that the storage modulus values are in the range of Young's modulus of veins and membrane of natural insect wings. This is useful to achieve true biomimicking. Advanced manufacturing technique such as photolithography is used for wing fabrication. The length, weight and average thickness of the fabricated wing are ~44 mm, 26.22 mg and 187 µm, respectively. The structural dynamic properties of the fabricated wing are obtained experimentally and computationally using DIC and ANSYS, respectively. The developed dragonfly inspired wing showed a natural frequency of 29.4 Hz with a bending mode shape which is close to the characteristic frequency of its natural counterpart." (Authors)] Address: Kumar, D., Dept of Aerospace Engineering, Indian Institute of Technology Kanpur, Kanpur, India. E-mail: david.kumar1988@gmail.com

17204. Lan, D.-Y.; Shen, S.-Q.; Cai, Y.-Y.; Wang, J.; Zhang, J.-Y.; Storey, K.B.; Yu, D.-A. (2019): The characteristics and phylogenetic relationship of two complete mitochondrial genomes of *Matrona basilaris* (Odonata: Zygoptera: Calopterygidae). *Mitochondrial DNA Part B* 4(1): 1745-1747. (in English) ["The relationship of *Matrona* and *Atrocalopteryx* is still unclear. To better understand the phylogenetic relationship of *Matrona* and *Atrocalopteryx*, we sequenced and annotated two complete mitochondrial genomes of *Matrona basilaris* sampled from two different locations. The length of the two complete mitochondrial genomes of *M. basilaris* is 16,149 bp and 15,893 bp for the specimens collected in

Jinhua, Zhejiang Province and Tianmushan, Zhejiang Province, China, respectively. The two mitochondrial genomes include the typical invertebrate set of 37 genes: 13 protein-coding genes (PGCs), 22 tRNA genes, and 2 rRNA genes. The nucleotide composition of the mitogenome is similar to other odonates with high content of A + T (68.9%) and all PCGs use ATN as the start codon. Tandem repeats were detected in the control regions of the two *M. basilaris* samples that accounted for the different sequence lengths of the mitochondrial genomes from the two locations. Finally, BI and ML phylogenetic analysis based on the concatenated nucleotide sequences of the 13 PCGs supported the conclusion that *M. basilaris* is a sister clade to *A. melli*." (Authors)] Address: Yu, D.-N. College of Chemistry & Life Science, Zhejiang Normal University, Jinhua, Zhejiang Province, 321004, China. E-mail: ydn@zjnu.cn

17205. Lee, S.-D. (2019): Proposition of dragonfly's appropriate survey period inhabited in temperate zone. *Korean Journal of Environment and Ecology* 33(1): 16-27. (in Korean, with English summary) ["This study was identified the survey period and emergence of main species of dragonfly species, an indicator species that can identify the characteristics of wetland ecosystem. I surveyed the species and population of dragonflies once every two weeks from May 2015 to October 2016 (29 times). From January to March, November and December were excluded from the cluster classification because the dragonflies were not observed. In April and October, the species was emerged but it was not suitable because it could not represent the time of the seasons. When we divide by month, it was able to judge from April to June as spring. Except the May, there were some changes due to rainfall and temperature, and sometimes June was included in the summer season. June, July and August correspond to summer, and September and October fall in autumn. In June and October, the change was expected due to the effects of temperature and so it was judged as a partial fit. Looking at the change of the species, *Coenagrion johanssoni* and *Paracercion calamorum* were increase at the spring, and then *Crocothemis servilia mariannae*, *P. calamorum*, *Anax nigrofasciatus*, *Lyriothemis pachygastra*, *Orthetrum melania* were abruptly enlarge in summer. At last, *Sympetrum kunckeli*, *Lestes temporaris* tended to be higher in autumn." (Author)] Address: Lee, S.-D., Dept. Landscape Archit., Gyeongnam Nat. Univ. Science & Technology, 52725, Korea

17206. Lim, D.; Lee, Y. (2019): Fish fauna and the population of a Korean endangered freshwater fish, *Brachymystax lenok tsinlingensis*, in Korea: Bonghwa Habitat. *Environ. Eng. Res.* 24(4): 638-645. (in English) ["This research was an evaluation of the fish fauna and the habitat for *B. lenok tsinlingensis* for 11 stations at the Bonghwa-gun sanctuary. The predominant species in this research area was *Zacco koreanus*. *B. lenok tsinlingensis*, which has been designated as an endangered freshwater fish in Korea, was found in the Bonghwa sanctuary zone, except at stations 5 and 6. The *B. lenok* individuals were shorter in length than 400 mm. In total, 13 endemic species were found, including *Coreoleuciscus splendidus* and *Iksookimia longicorpus*. Specimens of *Koreocobitis*

naktongensis, a first grade endangered species, were also collected. The benthic macroinvertebrates consisted of four divisions, four classes, seven orders, 30 families, 60 species, and 10,344 individuals and were distributed among the orders Ephemeroptera (55.9%), Diptera (18.2%), Trichoptera (12.4%), Plecoptera (2.1%), and Odonata (0.3%)." (Authors)] Address: Lee, Y., Dept General Education, Konyang Univ., Daejeon 35365, Republic of Korea. Email: leeyj@konyang.ac.kr

17207. Lin, C.-Y.; Hsu, Y.-H.; Wang, J.-F.; Lin, C.-P. (2019): New damselfly hosts and species identification of an aquatic parasitoid *Hydrophylita emporos* (Hymenoptera: Trichogrammatidae) in Taiwan. *Journal of Natural History* 53(35-36): 2195-2205. (in English) ["The host-parasitoid relationship and species identity of aquatic parasitoids of *Coeliccia cyanomelas* and *Psolodesmus mandarinus dorothea* from Fushan and Lienhuachih in Taiwan were studied using morphological characters and DNA barcoding sequences. The parasitoids reared from the damselflies' eggs, and the field-collected parasitoids, were morphologically identified as *H. emporos*, a recently described parasitoid of the damselfly *P. m. mandarinus* from Northern Taiwan. The CO1 (cytochrome c oxidase I) gene tree supported the identification as *H. emporos*, as well as all parasitoid samples from *C. cyanomelas*, *P. m. dorothea* and *P. m. mandarinus*. The sampled *H. emporos* populations did not differ genetically despite their different host associations. However, some genetic differences were found between *H. emporos* populations from Northern and Central Taiwan, indicating that the dispersal of *H. emporos* may be limited by geographical distances. Our results suggest that *H. emporos* can parasitise not only closely related sister subspecies, *P. m. mandarinus* and *P. m. dorothea*, but also phylogenetically distant species of another damselfly family, *C. cyanomelas*. This is the first record of multiple damselfly hosts for the aquatic parasitoid genus *Hydrophylita*. This finding implies that the host range of *H. emporos* and congeneric species may be broader than previously thought." (Authors)] Address: Lin, C.-Y., Dept of Life Science, Nat. Taiwan Normal Univ., Taipei, Taiwan. E-mail: treehopper@ntnu.edu.tw

17208. Liu, X.; Zhang, J.; Shi, W.; Wang, M.; Chen, K.; Wang, L. (2019): Priority pollutants in water and sediments of a River for Control Basing on benthic macroinvertebrate community structure. *Water* 2019, 11(6), 1267; <https://doi.org/10.3390/w11061267>: 16 pp. (in English) ["Understanding the drivers of macroinvertebrate community structure is fundamental for adequately controlling pollutants and managing ecosystems under global change. In this study, the abundance and diversity of benthic macroinvertebrates, as well as their chemical parameters, were investigated quarterly from August 2014 to April 2015 in four reaches of the Huai River basin (HRB). The self-organizing map (SOM) algorithm and canonical correspondence analysis (CCA) were simultaneously applied to identify the main factors structuring the benthic community. The results showed that the benthic community structure was always dominated by gastropoda and insecta over seasons and presented obvious spatial and temporal heterogeneity along different pollution levels. The insects were always the top contributors to number

density of the benthic community, except for the summer, and the biomass was mainly characterized by mollusca in all seasons. Statistical analysis indicated that TN and NH₃-N in water, as well as Hg, As, Cd, and Zn in sediments, were the dominant factors structuring the community, which determined the importance of sediment heavy metal concentrations in explaining the benthic community composition in comparison with other factors. These major factors should be given priority in the process of river pollutant control, which might be rated as a promising way to scientifically improve river health management and ecological restoration." (Authors)] Address: Liu, X., State Key Lab. Hydrology-Water Resources & Hydraulic Engineering, Nanjing 210029, China. E-mail: gclx_2007@126.com

17209. Lohr, M. (2019): Blaubereiftes Weibchen von *Crocothemis erythraea* (Odonata: Libellulidae). *Libellula Supplement* 15: 103-107. (in German, with English summary) ["Pruinescent-coloured female of *C. erythraea* – In August 2018 a pruinescent-coloured female of *C. erythraea* was observed in the alluvial floodplain of the Upper Weser near Höxter (North Rhine Westphalia, Germany). This is probably the first documented finding of a pruinose female of the species." (Author)] Address: Lohr, M., Technische Hochschule Ostwestfalen-Lippe, An der Wilhelmshöhe 44, 37691 Boffzen, Germany. E-mail: mathias.lohr@th-owl.de

17210. Luna-León, C.; Domínguez-Márquez, V.M.; Catalán-Heverástico, C. (2019): Libélulas (Insecta: Odonata) from Tecapulco, Guerrero, Mexico. *Entomología mexicana* 6: 434-437. (in Spanish, with English summary) ["The present investigation was carried out in the locality of Tecapulco, Municipality of Taxco de Alarcón, Guerrero, Mexico, with the purpose of knowing the odonatofauna and its seasonal fluctuation. The catches were made with an entomological network during September to December 2011, at different points where there are ponds. 307 adult specimens of dragonflies were collected, belonging to six families, 15 genera and 25 species. Of the total families identified, Libellulidae represented 52% of the species identified, while the species with the most specimens was *Orthemis ferruginea* with 14% of the individuals collected. The highest value of abundance was presented in the second week of October." (Authors)] Address: Luna-León, C., Integrantes del Cuerpo Académico Sistemas de Producción Agropecuaria de la Facultad de Ciencias Agropecuarias y Ambientales, Universidad Autónoma de Guerrero, Periférico Poniente S/N, Colonia Villa de Guadalupe, Iguala de la Independencia, C. P. 40010, Guerrero, México. E-mail: cluna63@hotmail.com

17211. Madruga, O.; de Armas, L.F. (2019): Luciémagas (Coleoptera: Lampyridae) capturadas por arañas y odonatos en Cuba. *Boletín de la Sociedad Entomológica Aragonesa* 65: 265-267. (in Spanish, with English summary) ["Fireflies (Coleoptera: Lampyridae) caught by spiders and dragonflies in Cuba. The Cuban fireflies *Photuris brunnipennis* Jacquelin Duval, 1856, *Robopus nefarius* (E. Olivier, 1912) and *Robopus* sp. are preyed upon by the spiders *Argiope trifasciata* (Förskal, 1775), *Neoscona moreli* (Vinson, 1863), *Eriophora ravilla* (C. L. Koch, 1844), and *Eustala fuscovittata*

(Keyserling, 1864) (Araneae: Araneidae). Two instances of attempted predation (grasping and subsequent release) are also recorded: (1) of *Alecton discoidalis* Laporte, 1833, by a female *Progomphus integer*, and (2) of *Robopus* sp. by the synanthropic spider *Physocyclus globosus* (Taczanowski, 1874) (Pholcidae)." (Authors)] Address: Madruga, O., Museo Nacional de Historia Natural de Cuba, Obispo No. 61, Plaza de Armas, Habana Vieja, CP 10100, La Habana, Cuba. E-mail: ormaily@gmail.com

17212. Mangahas, R.S.; Murray, R.L.; McCauley, S.J. (2019): Chronic exposure to high concentrations of road salt decreases the immune response of dragonfly larvae. *Front. Ecol. Evol.* | doi: 10.3389/fevo.2019.00376: 6 pp. (in English) ["Salinization of freshwater ecosystems, due to the application of road salts, is recognized as a potential threat to aquatic communities. Much of the research on the impact of salinity has focused on performance metrics in vertebrates, including respiration and osmoregulation. Here we focus on immune function in of the dragonfly *Anax junius*, a top predator in fishless aquatic habitats. Impacts on this top predator have the potential to cascade through the community, and immune function is known to be both plastic and sensitive to stress. We injected larvae with monofilaments (simulating a parasite) and placed them in one of three environmentally relevant concentrations of deicing road salt: control (dechlorinated tap water with no added salt), low (1000 mgL⁻¹), or high salt (3000 mgL⁻¹), for either acute (24hr) chronic or (96hr) exposures. We hypothesized that elevated salinity would suppress the immune response and that longer exposure magnifies this effect. As predicted, chronic exposure to high salt concentrations resulted in a significantly reduced larval immune response, however, there was no detectable treatment effects in larvae exposed to low concentrations of road salt or to acute high concentrations. Our results demonstrate that prolonged exposure to high levels of road salt can compromise the immune response of dragonfly larvae. Our findings suggest that insects in aquatic environments that experience sustained environmental salt pollution will be more susceptible to parasites and pathogens, which in turn may affect the impact of this major predator on aquatic community dynamics." (Authors)] Address: Murray, Rosalind L., Univ. Toronto Mississauga, Canada. E-mail: rosalind.murray@utoronto.ca

17213. Manger, R. (2019): New population of Dark Whiteface (*Leucorrhinia albifrons*) in 2019 in the Netherlands. *Brachytron* 20(2): 71-77. (in Dutch, with English summary) ["From 2016 to 2018, *L. albifrons* was observed at various locations in the Netherlands. In 2019 the species was no longer observed at those locations. On 20 June a new population of *Leucorrhinia albifrons* was discovered in Overijssel. A maximum of some ten teneral and imagines were observed per visit. The bog pool has a sandy bottom, circumneutral water and clear sight down to the bottom. The riparian zone is relatively narrow and the vegetation is low and not very diverse. *Potamogeton* sp. are present in the centre. After the population in Friesland in the period 2005-2013, this is the second location in the Netherlands where teneral have been observed. The question is whether this

picky dragonfly will be able to maintain a continued presence in the Netherlands." (Authors)] Address: Manger, R., Stoepveldsingel 55, 9403 SM Assen. The Netherlands. E-mail: rene@mangereco.nl

17214. Marinov, M. (2019): Description of *Hemicordulia tuiwawai* sp. nov. from Kadavu Island, Fiji (Odonata: Corduliidae). International Dragonfly Fund - Report 138: 1-9. (in English) ["*Hemicordulia tuiwawai* sp. nov. (Odonata: Corduliidae) is described and diagnosed based on material collected from Kadavu Island, Fiji; holotype: Wainitayuki River about 750 m above Baidamudamu village, 19.0916, 178.1038; 37 m a.s.l., 06 June 2016, M. Marinov leg. This species is distinguished from its congeners in the field by the contrasting colouration – dark green metallic body with bright yellow spots on the synthorax and base of the abdomen. This pattern is comparable to *H. pacifica* Selys, 1871. However, *Hemicordulia tuiwawai* sp. nov. can be recognised by the larger size and unique shape of the caudal appendages and genital hamule (in males) and vulvar scale (in females)."] (Authors)] Address: Marinov, M., Biosecurity Surveillance & Incursion Investigation Plant Health Team, Ministry for Primary Industries, 14 Sir William Pickering Drive, Christchurch 8544, New Zealand. E-mail: milen.marinov@mpi.govt.nz

17215. Marinov, M.; Jacq, F.A.; Ramage, T.; Doscher, C. (2019): Contribution to the Odonata fauna of the Society Islands, French Polynesia (Insecta: Odonata). Faunistic Studies in South East Asian and Pacific Island Odonata 28: 1-37. (in English) ["Following field studies in 2018 the Odonata fauna of Society Islands, French Polynesia is reviewed and the validity of all records analysed. An updated species list is provided, bringing the number of breeding species recorded from this island group to ten. Field studies targeted *Hemicordulia* Selys, 1870 specimens for inclusion in the revision of the Pacific representatives of the genus. Samples were taken mainly from Tahiti and Raiatea, with some additional specimens collected from Bora Bora and Huahine. Only the Society Islands endemic *H. oceanica* Selys, 1871 was encountered on all four islands, being recorded from Bora Bora for the first time. At least one new species of *Hemicordulia* has been reported from the high mountain areas of Tahiti (Jacq et al. 2009, 2014). The present study also emphasises the need for a revision of Zygoptera records from the French Polynesia and the rest of the Pacific. Presently, about 25 endemic species provisionally assigned to *Ischnura* Charpentier, 1840 and *Hivaagrion* Hämäläinen & Marinov, 2014 are known from the Society, Austral and Marquesas island groups (R. Englund, J. Jacq, T. Ramage, D. Polhemus, per. comm.). Only seven of them have been described so far. Detailed morphological and molecular analyses will likely prove the separate generic status of some of the species presently included under *Ischnura*." (Authors)] Address: Marinov, M., Plant Health & Environment Lab., Diagnostic and Surveillance Services, Ministry for Primary Industries, 231 Morrin Rd, 1072 Auckland, New Zealand. E-mail: milen.marinov@mpi.govt.nz

17216. Marinov, M.; Bybee, S.; Doscher, C.; Kalfatakmlis, D. (2019): Faunistic studies on Odonata of the Republic of

Vanuatu (Insecta: Odonata). Faunistic Studies in Southeast Asian and Pacific Island Odonata 26: 1-46. (in English, with Bislama summary) ["This study investigates the history of Odonata studies in the Republic of Vanuatu and presents results from a two week field sampling mainly on three islands – Efate, Aneityum and Malekula. A total of 32 species are recognised as currently valid names for the country. Three new species have been collected and will be described elsewhere. Various taxonomic, faunistic and biogeographic issues are discussed in the light of the new material collected during the current study in comparison to already published research. The general conclusion is that provisional species checklist is far from complete. The territory of Vanuatu is still highly insufficiently studied for its Odonata fauna. The local endemic genus *Vanuatubasis* Ober & Staniczek, 2009 is believed to be far more diverse than currently known with three described and three new species collected during the present study." (Authors)] Address: Marinov, M., Investigation & Diagnostic Centres & Response, Operations Branch, Ministry for Primary Industries, 231 Morrin Rd, Auckland 1072 New Zealand. E-mail: Milen.Marinov@mpi.govt.nz

17217. Marquez-Rodríguez, J. (2019): New records of *Tricacanthagyna trifida* (Odonata: Aeshnidae) from La Altagracia, Punta Cana, Dominican Republic. Revista Chilena de Entomología 45(3): 359-361. (in English, with Spanish summary) ["On September 02, 2010, we observed seven specimen of *T. trifida* active around a pond and perched on the vegetation of a tourist resort at sunset; Barceló Bávaro Palace (18°39'37,4" N, 68°23'43,3" W)" (Author)] Address: Márquez-Rodríguez, J., Zoology. Dept Physical, Chemical & Natural Systems, Fac. of Experimental Sciences, Univ. Pablo de Olavide, A-376, Km 1, 41013 Seville, Spain. E-mail: jmarrod1@upo.es

17218. Martens, A. (2019): Vogelfedern und Libellen: ein Blick auf biotische Wechselwirkungen. Libellula Supplement 15: 109-112. (in German, with English summary) ["Bird feathers and Odonata: a first approach on biotic interactions – Biotic interactions also include indirect ones. The cases described here focus on lost bird feathers and their effects on odonates. A feather of the greylag goose *Anser anser* was found attached to a wing of a *Trithemis annulata* male at a man-made dam near Chania, Crete, Greece on 6 September 2015. In the second case, a feather of the mute swan *Cygnus olor* was used as substrate by an emerging *Ischnura elegans* on 4 August 2013 in the harbour of Karlsruhe, Germany." (Author)] Address: Andreas Martens, A., Inst. für Biologie & Schulgartenentwicklung, Pädagogische Hochschule Karlsruhe, Bismarckstr. 10, 76133 Karlsruhe, Germany. E-mail: martens@ph-karlsruhe.de

17219. Mellal, M.K.; Bensouilah, M.; Houhamdi, M.; Khelifa, R. (2019): Reproductive habitat provisioning promotes survival and reproduction of the endangered endemic damselfly *Calopteryx exul*. Journal of Insect Conservation 22(3-4): 563-570. (in English) ["Effective habitat management is predicted to have positive effects on populations and species of conservation concern. Although studies have shown that

ecological processes such as colonization can be promoted after habitat management, we still need more information on the survival and reproductive consequences at the individual level in order to reach positive conservation outcome. Here we assess the effects of reproductive habitat supplementation (host oviposition plant) on survival and mating success of *C. exul*, using capture-mark-recapture data. We first determined that the species prefer to oviposit on floating leaves of *Potamogeton* spp. Based on Cormack-Jolly-Seber modeling, we found that recapture and survival probabilities were positively affected by the number of the host oviposition patches of the host plant. Moreover, we showed a strong positive relationship between adult lifespan and lifetime mating success. Our results suggest that host-plant provisioning for reproduction not only increases the survival of individuals, but also increases the number of matings per lifetime. The procedure of supplying reproductive sites may enhance population growth of threatened odonates and other aquatic insects." (Authors)] Address: Mellal, M.K., Lab. Marine & Coastal Environments Ecobiology, Dept of Biology, Badji Mokhtar University, Annaba, Algeria

17220. Mezquita-Aranburu, I. (2019): Primera cita de *Lestes dryas* Kirby, 1890 (Odonata, Lestidae) para Gipuzkoa (País Vasco, España). First record of *L. dryas* from Gipuzkoa (Basque Country, Spain). *Munibe, Cienc. nat.* 67: 4 pp. (in Spanish, with English and Euskarian summaries) [The first record of *L. dryas* in Gipuzkoa (Basque Country, Spain) is reported: 11-VI-2017, Alabita (UTM 30TWN4057, 940 m.a.s.l).] Address: Mezquita-Aranburu, I., Depto de Entomología, Soc. Ciencias Aranzadi Zientzia Elkarte, Zorroagagaina 11, 20004 Donostia-San Sebastián, Spain). E-mail: mezquitaaranburu@gmail.com

17221. Minot, M.; Le Gall, M.; Husté, A. (2019): Biometry of the large dragonfly *Anax imperator* (Odonata: Aeshnidae): A study of traits from larval development to adults. *Eur. J. Entomol.* 116: 269-280. (in English) ["Insect larval development affects adult traits but the biometric relationships are usually poorly understood, including large odonates. In this study, measurements of morphological traits of larvae, exuviae and adults of *A. imperator* were recorded. They were used to investigate the effects of early development on adult morphology. Results showed an increase in larval length during the final instar and the length of its exuviae significantly exceeded that of the larva. Length and body mass of teneral adults were strongly related to the length of their exuviae. Adult males were significantly longer than adult females, while both had the same body mass at emergence. Length of teneral adults was negatively related to the date of emergence in both sexes. During maturation, body mass of males only increased slightly whereas that of females increased greatly. Mature specimens were also significantly longer than teneral individuals. Body mass of mature males and length of mature females were both associated with the date of capture. Wing length did not differ between sexes or from data available from Great Britain. This study underscores the importance of taking into account larval growth in order to better understand the adult traits of odonates." (Authors)] Address: Minot, M., Université de Rouen - ECO-DIV, Bat Blondel, Place Emile Blondel, Mont-Saint-Aignan 76821, France. E-mails: marceau.minot1@univ-rouen.fr

(Authors)] Address: Minot, M., Université de Rouen - ECO-DIV, Bat Blondel, Place Emile Blondel, Mont-Saint-Aignan 76821, France. E-mails: marceau.minot1@univ-rouen.fr

17222. Miralles-Núñez, A.; Muñoz-Cabrera, M.A. (2019): Primera cita de *Sympetrum sinaiticum* Dumont, 1977 (Odonata: Libellulidae) de la provincia de Guadalajara (Castilla-La Mancha, España). *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)* 65: 225-226. (in Spanish, with English summary) [Male, Fuentenovilla, Guadalajara (Castilla-La Mancha). 23-10-2018.] Address: Miralles-Núñez, A., Grup d'Estudi dels Odonats de Catalunya (Oxygastra-GEOC), Institució Catalana d'Història Natural, Carrer del Carme, 47, 08001 Barcelona, Spain. E-mail: amiralles10@gmail.com

17223. Mishra, D.; Sharma, V.K.; Pal, A. (2019): Diversity of odonata at Sirpur pond, Indore. *International Journal of Zoology and Applied Biosciences* 4(1): 1-4. (in English) ["Thus a study has been done on the diversity of odonates at Sirpur Pond in Indore district of Madhya Pradesh, India. A total of 16 species of Odonates were recorded from the study area from January 2016 to June 2017. Out of 16 species, 8 species were among the Anisoptera and 8 species were among the Zygoptera. Among the 8 species of Anisoptera, 7 were of family Libellulidae while 1 of family Gomphidae. Among the 8 species of Zygoptera, 7 were of family Coenagrionidae and 1 of family Lestidae." (Authors)] Address: Mishra, D., Department of Zoology, Government Holkar Science College, Near Bhawarkua, Indore, Madhya Pradesh 452017, India. E-mail: devendra2490@gmail.com

17224. Mitra, B.; Panja, B.; Chakraborti, U.; Roy, S.; Biswas, O. (2019): First exploration on the insect faunal diversity of Haliday Wildlife Sanctuary, Indian Sundarban. *Research Journal of Life Sciences, Bioinformatics, Pharmaceutical and Chemical Sciences* 5(6): 11-19. (in English) ["Present paper reports 19 species of insects from different orders like Diptera (6 species), Hymenoptera (5 species), Lepidoptera (3 species), Odonata (4 species) and Hemiptera (1 species) from a very small island namely Haliday island (Local name: Zinjira Dwip) of Sundarban Biosphere Reserve, India." (Authors) *Orthetrum sabina*, *Crocothemis servilia*, *Rhyothemis variegata*, *Brachythemis contaminata*] Address: Mitra, B., Ramkrishna Mission Vivekananda Centenary College, Rahara, Kolkata. E-mail: bulganinmitra@gmail.com

17225. Moore, M.P.; Lis, C.; Gherghel, I.; Martin, R.A. (2019): Temperature shapes the costs, benefits and geographic diversification of sexual coloration in a dragonfly. *Ecology Letters* 22(3): 437-446. (in English) ["The environment shapes the evolution of secondary sexual traits by determining how their costs and benefits vary across the landscape. Given the thermal properties of dark coloration generally, temperature should crucially influence the costs, benefits and geographic diversification of many secondary sexual colour patterns. We tested this hypothesis using sexually selected wing coloration in a dragonfly. We find that greater wing coloration heats males – the magnitude of which improves flight performance under cool conditions but dramatically reduces it

under warm conditions. In a colder region of the species' range, behavioural observations of a wild population show that these thermal effects translate into greater territorial acquisition on thermally variable days. Finally, geo-referenced photographs taken by citizen scientists reveal that this sexually selected wing coloration is dramatically reduced in the hottest portions of the species' range. Collectively, our results underscore temperature's capacity to promote and constrain the evolution of sexual coloration." (Authors)] Address: Moore, M.P., Dept Biology Case Western Reserve Univ. Cleveland, OH 44106, USA. E-mail: mpm116@case.edu

17226. Moskowitz, D.; May, M.L. (2019): Nymph ecology, habitat, and emergence-site selection of *Cordulegaster erronea* Hagen (Tiger Spiketail Dragonfly) in New Jersey with implications for conservation. *Northeastern Naturalist* 26(1): 141-154. (in English) ["*C. erronea* is of conservation concern throughout much of its range; yet only a single study on the nymphs has been conducted, and many aspects of the species' life-history are poorly understood. The present study evaluated the size, age structure, and density of Tiger Spiketail nymphs at a stream on the Schiff Reservation Natural Lands Trust (Schiff) in Mendham Township, Morris County, NJ. We investigated the habitat and surrounding landscape characteristics of this stream and a second stream containing Tiger Spiketails at Schiff. We collected and measured 137 Tiger Spiketail nymphs during this study—82 in the spring and 55 in the fall—representing pre- and postadult emergence. We found 24 exuviae along both study streams and an additional 8 exuviae along 3 other streams in New Jersey, Connecticut, and Delaware. We are aware of only 1 other published report of Tiger Spiketail exuvia, which documented a single specimen. Our data and habitat assessment indicate that the Tiger Spiketail has a long nymphal stage and may be dependent upon high quality, fish-free, perennial headwater streams flowing through extensive forests. This information may assist resource managers in developing conservation strategies and habitat-protection measures for this species." (Authors)] Address: Moskowitz, D., EcolSciences, Inc., 75 Fleetwood Drive, Suite 250, Rockaway, NJ 07866, USA. E-mail: dmoskowitz@ecolsciences.com.

17227. Müller, O.; Schumann, V.-F. (2019): Terrestrische Migration der Larven von *Stylurus flavipes* (Odonata: Gomphidae). *Libellula Supplement* 15: 113-120. (in German, with English summary) [Terrestrial Migration of Larvae of *S. flavipes* – *S. flavipes* is a character species of lowland rivers. Its larvae inhabit shallow river banks that contain fine-grain sediments. Though most of these rivers are radically regulated in Europe, there are some less regulated ones, such as the River Elbe or the River Oder, that were able to sustain relatively natural tide dynamics. In summer, the water levels often decrease drastically with the impact on the shallow parts of the river banks drying out within a few hours. Emerging pools that are swiftly separated from the river can become traps for larvae. Would larvae be able to leave the pools if these pools were completely separated from the river? The paper at hand describes the phenomenon of terrestrial migration of larvae for the first time. In our

experiment, some of the larvae left the artificial pools. There seemed to be a specific adaptive behaviour between different instars. Whereas larvae ready to emerge tended to move ashore, the younger ones tended to move towards the river.] Address: Müller, O., Städtisches Gymnasium Carl Friedrich Gauß, Mathematisch-naturwissenschaftlich-technische Spezialschule, Friedrich-Ebert-Str. 52, 5234 Frankfurt (Oder), Germany. E-mail: mueller.ole@gmail.com

17228. Müller, R.; Eggers, T.O. (2019): Erstnachweis von *Oecetis tripunctata* (Fabricius, 1793) (Trichoptera, Leptoceridae) in Niedersachsen. *Lauterbornia* 86: 125-129. (in German, with English summary) ["In the lower reaches of the Fuhse, a small lowland river, a larva of the rare caddis fly *O. tripunctata* was found near the village of Wathlingen on 27.09.2018. This is the first find of the species in Lower Saxony and at the same time in North-West Germany." Records of *Calopteryx splendens*, *Gomphus vulgatissimus*, *Ophiogomphus cecilia*, *Ischnura elegans*, *Platycnemis pennipes* and *Somatochlora metallica* are documented too.] (Authors)] Address: Eggers, T.O., NLWKN Verden, Bürgermeister-Münchmeyer-Str. 6, 27283 Verden, Germany. E-mail: thomas-ols.eggers@nlwkn-ver.niedersachsen.de

17229. Mukherjee, S.; Blaustein, L. (2019): Effects of predator type and alternative prey on mosquito egg raft predation and destruction. *Hydrobiologia* 846: 215-221. (in English) [oas 47 "For a vector species, understanding their egg raft predation (consumption) or destruction is essential for both ecological and human health reasons since it directly influences its fitness. In a mesocosm experiment, we assessed differences in *Culiseta longiareolata* egg raft predation/destruction by three aquatic predators *Notonecta maculata* (backswimmers), *Sympetrum fonscolombii* and *Ommatotriton vittatus* (newts), both in the presence and absence of an alternate prey (*Culex* larva). Egg raft predation and destruction significantly differed between predators types, and strongly influenced by the presence of alternate prey. Backswimmers attacked and destroyed (broke down) all egg rafts until they disintegrated and sank in water regardless of whether an alternate prey was present. Egg raft predation by dragonflies was common in the absence of alternative prey, but rare when alternative prey was present. Predation by newts was rare regardless of whether there was an alternative prey. The number of alternate prey consumed also significantly differed between predators ($P < 0.001$) with backswimmers being the most effective predator. Relatively few studies have tested for egg raft predation/destruction. Hence it is crucial that we conduct similar trials in other landscapes since such predators can prove to be key agents for the biological control of mosquitoes." (Authors)] Address: Institute of Evolution & Dept of Evolutionary & Environmental Biology, Fac. Natural Sciences, University of Haifa, Haifa, Israel

17230. Murwitaningsih, S.; Dharma; A.P.; Setyaningsih, M. (2019): Dragonfly diversity in Cibodas Botanical Garden in West Java. *Biopic Tahun* 3(1): 62-67. (in English) ["This study is aimed to investigate the level of dragonfly diversity in Cibodas Botanical Garden, West Java. The method used

in this research was direct observation using catch and re-release technique. The research was carried out from May to July 2018. A total of 1,510 individuals belonging to eight dragonfly species were found in the four sampling locations. Anisoptera: *Pantala flavescens*, *Orthetrum pruinosum*, *O. sabina*, *O. glaucum*, *Neurothemis fluctuans*, *N. terminata*; Zygoptera: *Ischnura senegalensis*, *Coeliccia membranipes*. The highest values of species diversity index (H') and evenness index (E) were found in Ciismun Waterfall (1,45 and 0,88, respectively). The dominance index (D) in the four sampling sites ranged between 0.25 - 0.32. The highest species richness index (R) was found in Sakura Garden (0,99)." (Authors)] Address: Murwitaningsih, Susanti, Univ. Muhammadiyah Prof. Dr. Hamka, Jakarta, Indonesia. E-mail: murwitaningsih@yahoo.com

17231. Naraoka, H. (2019): Daily activity and reproductive behavior of adult *Coenagrion ecornutum* (Selys, 1872) at and around a small pond in Kushiro-marsh, Hokkaido prefecture (Odonata: Coenagrionidae). Tombo 61: 33-40. (in Japanese, with English summary) ["Diurnal activity and reproductive behavior of *C. ecornutum* was investigated at a small pond in Kushiro Marsh, Hokkaido, Japan. Males searching for females was seen from as early as 5 a.m. until 2 p.m. Earliest tandem pairing was seen at around 5 a.m. Nevertheless, copulation was seen only from 9 a.m. until 4 p.m. Tandem oviposition was seen from 10 a.m. to 4 p.m. Total flight time per 5 minutes was longer between 10 and 11 a.m. in males than at other times of the day, while it was longest between 1 and 2 p.m. in females. Copulation can be divided into three stages. Stage I was longer than Stages II and III. Stage II can be further subdivided into two sub-stages (IIa and IIb). Finally, the daily activity of this species is discussed in regard to sex ratio in the rendezvous site." (Authors)] Address: Naraoka, H., 36-71, Aza-Motoizumi, Fukunoda, Itayanagi-cho, Kita-gun, Aomori Prefecture, 038-3661, Japan

17232. Natsume, H. (2019): An adult male of *Stylogomphus suzukii* (Oguma, 1926) with unusual blackish thorax. Tombo 61: 44-45. (in Japanese, with English summary) ["An adult male of *S. suzukii* with an unusual blackish thorax is reported. This specimen was collected in Toyohashi city, Aichi Prefecture, on September 24, 1971. Unlike usual specimens, this one is lacking the yellow band on the mesepimeron, and the triangular yellow marking on the upper end of the metepisternum is almost vanished." (Authors)] Address: E-mail: romluna@y4.dion.ne.jp

17233. Nel, A.; Roques, P.; Prokop, J.; Garrouste, R. (2019): A new, extraordinary 'damselfly-like' Odonatoptera from the Pennsylvanian of the Avion locality in Pas-de-Calais, France (Insecta: 'Exopterygota'). *Alcheringa* 43(2): 241-245. (in English) ["*Enigmaptera magnifica* gen. et sp. nov., type genus and species of the new odonatopteran family *Enigmapteridae*, is described from the Moscovian of Avion (northern France). It is the sister group of the major clade Neodonatoptera, placed together in the new clade Paneodonatoptera. Its wing venation has characters never found in other Odonatoptera. It is a further case of convergent wing petiolation in this superorder. *E. magnifica*, like the protozygopteran *Jacquesoudardia*

magnifica from the same outcrop, probably lived like the extant damselflies along the shores of lakes and rivers, hunting the small insects found in the same deposits. These discoveries show that very small insects were significant elements of the entomofaunal diversity and trophic chains of the Late Carboniferous ecosystems." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, 75005 Paris, France. E-mail: anel@cimrs1.mnhn.fr

17234. Ng, M.F.C. (2019): The bombardier dragonfly, *Lyriothemis cleis*, at Dairy Farm Nature Park. Singapore Biodiversity Records 2019: 43. (in English) [Singapore Island, Bukit Timah, Dairy Farm Nature Park, Wallace Trail; 2 February 2019, around 1200 hrs.] Address: thebudak@gmail.com

17235. Ngo, Q.P.; Phan, Q.T.; To, V.Q. (2019): Description of the female of *Davidius monastyrskii* Do, 2005 from the Central Highlands of Vietnam (Odonata: Gomphidae). *International Dragonfly Fund Report* 139: 1-6. (in English) ["The first description of the female of *D. monastyrskii* is made, based on a specimen from the Central Highlands of Vietnam (Mang Yang District, Gia Lai Province)." (Authors)] Address: Phan, Q.T., Center Ento. & Parasit. Res., Inst. Res. & Training of Medicine, Biology & Pharmacy, Duy Tan Univ., 3 Quang Trung, Da Nang city, Vietnam. E-mail: pqtoan84@gmail.com

17236. Novelo-Gutierrez, R.; Sites, R.W. (2019): The probable larva of *Anotogaster gregoryi* Fraser, 1923, with new distributional records of the genus from northern Thailand (Odonata: Cordulegastridae). *Zootaxa* 4565(1): 138-144. (in English) ["The probable larva of *A. gregoryi* is described for the first time by supposition based upon four F-0 larvae collected in the provinces of Loei and Phitsanulok, which are new province records for *Anotogaster* in Thailand." (Authors)] Address: Novelo-Gutierrez, R., Inst. de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera Antigua a Coatepec 351, El Haya, 91070 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.mx

17237. Novelo-Gutierrez, R.; Gomez-Anaya, J.A. (2019): The larva of *Phyllogomphoides pugnifer* Donnelly, 1979 (Odonata: Gomphidae). *Zootaxa* 4688(4): 578-584. (in English, with Spanish summary) ["The larva of *P. pugnifer* is described for the first time based on reared specimens to emergence, and several F-0 larvae collected in Chiapas and Veracruz states, Mexico. The larva of *P. pugnifer* can be separated from other larvae of the genus by the length/width proportion of structures such as prementum, ligula, and abdominal segment 10, as well as length of cercus relative to epiproct." (Authors)] Address: Novelo-Gutierrez, R., Inst. de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera Antigua a Coatepec 351, El Haya, 91073 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.mx

17238. Novelo-Gutiérrez, R.; Sites, R.W. (2019): The larvae of *Phaenandrogomphus Lieftinck*, 1964 in Thailand, including the description of *P. tonkinicus* (Fraser, 1926) with a larval diagnosis and new province records of *P. asthenes* Lieftinck, 1964 (Odonata: Gomphidae). *Zootaxa* 4700(3): 377-

384. (in English) ["The larva of *P. tonkinicus* is described for the first time based on several F-0 larvae collected in Chiang Mai and Nan provinces of Thailand. The larva of *P. tonkinicus* differs from that of *P. asthenes* Lieftinck, 1964 by having the 3rd antennomere mesal margin strongly convex, 4th antennomere vestigial and dome-like, postclypeus thick and shelf-like, S8 lacking a posterolateral spine, and cerci usually shorter than the epiproct. New Thailand province records of *P. asthenes* also are provided." (Authors)] Address: Novelo-Gutiérrez, R., Instituto de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera Antigua a Coatepec 351, El Haya, 91070 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.mx

17239. Novelo-Gutiérrez, R.; Sites, R.W. (2019): The larva of *Amphigomphus somnuki* Hämäläinen, 1996 and the first records of the genus *Stylogomphus* Fraser, 1922 for Thailand (Odonata: Gomphidae). *Zootaxa* 4555(1): 121-126. (in English) ["The larva of *A. somnuki* is described for the first time based on an emerged male specimen from Chiang Mai Province, and several F-0 larvae collected in other provinces of Thailand. The larva of *A. somnuki* is the smallest and differs from *A. nakamurai* Karube, 2001 by the caudal appendages densely covered with minute spiniform setae, and from *A. hansonii* Chao, 1954 by the male epiproct with the dorsal tubercles at 0.65 the length of the epiproct. New province records for *A. somnuki* and the first records of *Stylogomphus* Fraser, 1922 for Thailand are provided." (Authors)] Address: Novelo-Gutiérrez, R., Inst. de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera Antigua a Coatepec 351, El Haya, 91070 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.mx

17240. Ohtsu, K. (2019): Acute toxicity test method, dragonfly, Fipronil, Imidacloprid, Japanese common meadowhawk, Paddy field nursery bed insecticides, Pesticide sensibility, *Sympetrum frequens*. *Jpn. J. Environ. Toxicol.* 22(2): 31-40. (in Japanese, with English summary) ["*Akiakane* (*S. frequens*), a Japanese common meadowhawk, is widely distributed in Japan. The larvae hatch in paddy water in a season of rice planting. In recent years in Japan, insecticides for nursery-box application are widely used. As these insecticides include a long-acting type, it is concerned about affecting the growth of *S. frequens* larvae. The objective of this study is to develop acute toxicity test method for 2nd instar larvae of *S. frequens* to some typical insecticides for nursery-box application (Fipronil, Imidacloprid) and compare the sensitivity of these insecticides. A 48-hour acute toxicity test method using a 48-well plate was established. Susceptibility to 2nd instar larvae of *S. frequens* was 48 times higher for fipronil than for imidacloprid. For effective hatching of larvae, it was necessary to treat the eggs at low temperature for at least 4 weeks. The temperature during the acute toxicity test was preferably 21°C. rather than 26°C." (Author)] Address: Ohtsu, K., Institute for Agro-Environmental Sciences, NARO / 3-1-3 Kannondai, Tsukuba City, Ibaraki 305-8604, Japan. Email: kazu02@affrc.go.jp

17241. Okuyama, H.; Kiyoshi, T.; Takahashi, J.-I.; Tsubaki, Y. (2019): Complete mitochondrial genome sequence of the broad-winged damselfly, *Mnais pruinosa* Selys, 1853 (Odonata:

Calopterygidae). *Mitochondrial DNA Part B* 4(2): 3101-3103. (in English) ["The mitochondrial genome of *M. pruinosa* was identified as a circular molecule of 15,494 bp, and was found to be similar to that of other damselfly species. It was predicted to contain 13 protein-coding (PCG), 22 tRNA, and two rRNA genes, as well as one A+T-rich control region. The genes ATP8 and ATP6 shared seven nucleotides, ATP6 and COIII shared one nucleotide, ND4 and ND4L shared seven nucleotides, and ND6 and Cytb shared one nucleotide. The initiation codon ATG was found in eight genes, ATC in four, and ATT in one; the termination codons TAA, TAG, incomplete TA, and single T were observed in seven, one, two, and three genes, respectively. All the tRNA genes possessed a cloverleaf secondary structure, except for tRNA-His that lacks the TWC loop. The average AT content of mitochondrial genome was 66.18%." (Authors)] Address: Okuyama, H., Fac. Life Sciences, Kyoto Sangyo Univ., Kamigamo, Motoyama, Kita-ku, Kyoto, Japan. E-mail: k5533@cc.kyoto-su.ac.jp

17242. Okuyama, H.; Kiyoshi, T.; Takahashi, J.-I.; Tsubaki, Y. (2019): A comparison of complete mitochondrial DNA sequences of *Mnais costalis* Selys, 1869 (Odonata: Calopterygidae) from three different populations (one allopatric and two sympatric). *Mitochondrial DNA Part B* 4(2): 3104-3105. (in English) ["In Japan, two closely-related damselflies, *Mnais costalis* and *M. pruinosa* Selys-Longchamps, 1853, coexist, and they exhibit geographic variations in wing color, body size, and habitat preference. In this study, we analyzed the complete mitochondrial genome of *M. costalis* from Saga Prefecture, Japan (sympatric populations that exhibit wing color polymorphism), and compared the genome with *M. costalis* that exhibit monomorphic orange wing color. The mitochondrial genome of *M. costalis* from Saga Prefecture was identified as a circular molecule of 15,488 bp, similar to that found in other *M. costalis* populations. It was predicted to contain 13 protein-coding (PCG), 22 tRNA, and two rRNA genes, along with one A + T-rich control region. Among the PCGs, ATP8 and ATP6, ATP6 and COIII, ND4 and ND4L, and ND6 and Cytb shared seven, one, seven, and one nucleotides, respectively. The initiation codon ATG was found in eight genes, ATC in four, and ATT in one, while the termination codons TAA, TAG, TA, and T were observed in seven, one, two, and three genes, respectively. All the tRNA genes possessed a cloverleaf secondary structure, except for tRNA-His that lacks the T C loop. The average AT content of mitochondrial genome was 66.06%. From a phylogenetic analysis, the loss of wing color polymorphism in monomorphic sympatric populations is likely to occur with the coexistence of two *Mnais* species." (Authors)] Address: Okuyama, H., Faculty of Life Sciences, Kyoto Sangyo Univ., Kamigamo, Motoyama, Kita-ku, Kyoto, Japan. E-mail: k5533@cc.kyoto-su.ac.jp

17243. Olumukoro, J.O.; Anani, O.A. (2019): Evaluation of aquatic macro-invertebrate populations: a model for emergent bio-monitoring guide for quantifying uncleanness of some Rivers in Northern Central Nigeria. *Nigerian Journal of Technological Research* 14(2): 54-62. (in English) ["The objectives of this study are to examine the composition, abundance and distribution of benthic macroinvertebrate

communities, assess the health status and evaluate the spatial relationships of some selected Rivers. A total of 1251 individuals of macroinvertebrate taxa was recorded in this study. The percentage composition of the taxonomic groups obtained from the 22 stations were: Chironomidae (Diptera) (40.85%), Ephemeroptera (14.95%), Oligochaeta (9.83%), Amphibian (7.99%), Ceratopogonidae (Diptera) (7.11%), Mollusca (4.00%), Hemiptera (3.44%), Coleoptera (2.56%), Ostracoda (2.24%), Zygoptera (1.44%), Nematoda (1.12%), Decapoda (0.80%), Trichoptera (0.56%), Anisoptera (Odonata) (0.48%), Polychaeta (0.32%), Lipdoptera (0.08%) and Hydrachnidae (0.08%). The findings of this study indicated that Omeme, Kpansi Afara and Etsu rivers were classified as very poor category; exceeding the set benchmark. Etsu 11 and Afara Rivers were within the fair category. The Bray-Curtis indices revealed that there was similarity in all the stations Sustainable anthropogenic activities are recommended to avoid displacement of benthic communities." (Authors)] Address: Olomukoro, J.O., Dept of Animal & Environmental Biology, Faculty of Life Science, University of Benin, Benin City, PMB 1154, Nigeria

17244. Ong'wen, F. (2019): Additive effects of dragonfly (*Pantala flavescens*) nymph and fungus (*Beauveria bassiana*) on development and survival of Malaria Mosquito (*Anopheles gambiae*). Thesis, Maseno University: (in English) ["Malaria continues to be a world-wide human health problem. Insecticide resistance challenge efficacy and sustainability of malaria control programs and therefore call for sustainable malaria control strategies. Environmental factors affect mosquito development and survival and should be considered when designing these strategies. However, there is limited knowledge on mosquito ecology, especially on interactions with predator such as *P. flavescens* nymph and parasite such as *B. bassiana* fungus across stages. This study focused on investigating additive effects of *P. flavescens* and *B. bassiana* on *Anopheles gambiae*. Specific objectives were to determine: predation efficacy of *P. flavescens* nymph against *A. gambiae* larvae; development rate of *A. gambiae* larvae reared in presence of varying densities of *P. flavescens* nymphs; efficacy of *B. bassiana* against *A. gambiae* larvae; and survival of adult mosquitoes exposed to fungus after predator and/or parasite pre-exposure at larval stage. All experiments consisted of survival bioassays quantified either as pupation day or dead larvae and adults. Mosquito eggs were obtained from The Center for Global Health Research, KEMRI; dragonfly nymphs from Ahero Irrigation Scheme, Kenya; and *B. bassiana* spores (IMI- 391510) provided by IN2CARE®, The Netherlands. Predation efficacy investigation involved four replicates of 30 larvae exposed to 1 dragonfly nymph. Development rate investigation involved exposing four replicates of 30 larvae to varying numbers (0-4) of constrained dragonfly nymphs. Four replicates of 30 larvae were exposed to varying spore concentration (0-12 mg) to determine fungal efficacy. Three replicates of 30 adults pre-exposed to predator and/or fungus were exposed to same fungus for adult survival. Predation efficacy test showed significant difference in mean number of dead larvae ($Z=-12.667$, $P<0.001$). Development rate test showed significant difference ($P<0.001$) for groups exposed to 1 or 2 nymphs but

group exposed to 4 nymphs ($P=0.227$) was not significantly different. Fungal efficacy test showed that larvae exposed to 3, 6 and 12 mg of fungus had HR, 2.0, 2.5 and 3.5, respectively. In adult survival test, adults not pre-exposed to any factor, those pre-exposed to predator, parasite or both predator and parasite had HR of 45.8, 67.4, 50.9 and 112.0, respectively. It is clear that single and additive effects of the predator and/or parasite affect mosquito development and survival, because it affects mosquito physiology and immunity. However, field studies should be done to prove consistency in the field. The knowledge can then be employed by Ministry of Health for malaria control in areas with *P. flavescens*." (Author)] Address: not stated

17245. Onishko, V.V. (2019): New records of dragonflies (Odonata) for Russia, with notes on the distribution and habitats of rare species. *Eurasian Entomological Journal* 18(3): 222-230. (in Russian, with English summary) ["29 dragonfly species from 8 regions of Russia are reviewed, of which two species, *Sympecma gobica* and *Gomphus schneiderii*, are recorded from the Russian Federation for the first time. Several species are newly recorded for the regions, namely: *Coenagrion ornatum*, *Aeshna crenata*, *A. subarctica*, *Somatochlora arctica*, *Libellula fulva*, *Sympetrum fonscolombii* and *S. striolatum* for Moskovskaya Oblast; *A. subarctica* and *Leucorrhinia caudalis* for Vladimirskaya Oblast; *Anax imperator* for Tverskaya Oblast; *A. ephippiger*, *Brachytron pratense* and *L. fulva* for Rostovskaya Oblast; *Coenagrion ponticum* and *G. schneiderii* for Krasnodarskii Krai and Republic of Adyghe; and *S. fonscolombii* for the Russian Far East." (Authors)] Address: Onishko, V.V., GAU Moscow Zoo, Dept of Herpetology, Bolshaya Gruzinskaya Str. 1, Moscow 123242 Russia. E-mail: wervolf999@yandex.ru.

17246. Orr, A.G.; Richards, S.J.; Toko, P.S. (2019): *Rhyacocnemis gassmanni* sp.n. (Odonata: Platycnemididae), a new idicnemidine damselfly from Papua New Guinea. *Australian Entomologist* 46(1): 33-42. (in English) ["A new species of *Rhyacocnemis gassmanni* sp. n. from Papua New Guinea, is described and illustrated from both sexes with notes on its habitat and habits. It represents the fourth species of an enigmatic genus, known from only a handful of specimens. The placement of the new species is problematical and is discussed." (Authors)] Address: Orr, A.G., Cooperative Research Centre for Tropical Rainforest Ecology & Management, Environmental Sciences, Griffith Univ., Nathan, Q 4111, Australia. E-mail: agorr@universal.net.au

17247. Ortega-Salas, H.; González-Soriano, E. (2019): Odonata of the Cuatro Ciénegas Basin. In: Álvarez F. & M. Ojeda (eds) *Animal Diversity and Biogeography of the Cuatro Ciénegas Basin. Cuatro Ciénegas Basin: An Endangered Hyperdiverse Oasis*. Springer, Cham: 117-128. (in English) ["A summary of the present knowledge on the diversity of Odonata occurring in the Cuatro Ciénegas Basin (CCB) is presented. The work is based on published records, and the results from samplings are carried out between the years 2009 and 2013 in 23 sites. A list of the 67 Odonata species from the CCB is provided including 19 new state records.

Finally, the biogeographic affinities, conservation status, and major threats are discussed." (Authors)] Address: Ortega-Salas, H., Posgrado en Ciencias Biológicas, Univ. Nacional Autónoma de México Ciudad de México, Mexico. E-mail: hector_os@ciencias.unam.mx

17248. Oteman, B.; de Vries, H.H. (2019): Beoordeling van habitatkwaliteit op basis van satellietdata: een pilot met de groene glazenmaker. Rapport VS2019.029, De Vlinderstichting, Wageningen: 30 pp. (in Dutch) ["The rare *Aeshna viridis*, is strongly dependent on the water plant, crabbush. In order to gain more insight into the availability of suitable habitat for the green hawkler, this pilot project analyses satellite images for two South Holland polders: Polder Kromme, Geer and Zijde and Polder Nesse. In different satellite images, from 2014, 2017 and 2019, a search for crabgrass was carried out. For this purpose, a spectral profile of crabgrass was drawn up through fieldwork. This profile was then applied to the satellite images. The prediction based on the 2019 satellite image was then validated in the field. This showed that crabgrass, under favourable conditions, can be determined with a 93% accuracy. The best period to use satellite images to detect crabgrass is June-July. For brown crabgrass this is the first half of September. Applying the calculated spectral profile to other satellite images showed that depending on the sensor of the satellite an additional calculation step might be necessary (further calibration). The method with a spectral analysis seems to offer more than enough perspective to be applied in other areas. However, this will require some calibration, possibly through additional field visits. The spatial comparison between 2014, 2017 and 2019 shows that the decline in crabgrass is not spatially clustered. The problem is not limited to a few watercourses or plots, the decline is area-wide." (Authors) Translated with www.DeepL.com/Translator (free version)] Address: not stated

17249. Ott, J. (2019): Libellen als Indikatoren für eine Flussrenaturierung – Ergebnisse der dritten Erfolgskontrolle an der Oster (Insecta: Odonata). *Libellula Supplement* 15: 147-162. (in German, with English summary) ["Dragonflies as indicators of the restoration of the river Oster – results of the third success-control-study (Insecta: Odonata) – After 1991, 1996, and 2003, a 4 km long restored stretch of the river Oster (German federal state "Saarland") was investigated for a third time in 2017 and 2018 regarding the dragonfly fauna. This study was part of a so called "Entwicklungs- und Erprobungsvorhaben" (Development and testing project) of the German Federal Agency for Nature Conservation (BfN). The increase of dragonfly diversity and abundances in 1996 and 2003, which was regarded as a success of the restoration project although typical anisopteran species of running waters had not yet appeared, could not be confirmed in the more recent study. *Calopteryx virgo* was the only species of running waters present in a considerable population. The reasons for the present deficiency is the still existing waste water pollution, the impact of fine organic material, as well as the lack of morphodynamics, the effects of the dense riparian alder vegetation, and the immigration of the invasive signal crayfish. Finally, measures for ecological improvement are proposed." (Author) Address: Ott, J.,

L.U.P.O. GmbH, Friedhofstr. 28, 67705 Trippstadt, Germany. E-mail: ott@lupogmbh.de

17250. Ožana, S.; Burda, M.; Hykel, M.; Malina, M.; Prášek, M.; Bárta, D.; Dolný, A. (2019): Dragonfly Hunter CZ: Mobile application for biological species recognition in citizen science. *PLoS ONE* 14(1): e0210370. <https://doi.org/10.1371/journal.pone.0210370>: 13 pp. (in English) ["Citizen science and data collected from various volunteers have an interesting potential in aiding the understanding of many biological and ecological processes. We describe a mobile application that allows the public to map and report occurrences of the Odonata species found in the Czech Republic. The application also helps in species classification based on observation details such as date, GPS coordinates, and the altitude, biotope, suborder, and colour. Dragonfly Hunter CZ is a free Android application built on the open-source framework NativeScript using the JavaScript programming language which is now fully available on Google Play. The server side is powered by Apache Server with PHP and MariaDB SQL database. A mobile application is a fast and accurate way to obtain data pertaining to the Odonata species, which can be used after expert verification for ecological studies and conservation basis like Red Lists and policy instruments. We expect it to be effective in encouraging Citizen Science and in promoting the proactive reporting of odonates. It can also be extended to the reporting and monitoring of other plant and animal species." (Authors)] Address: Dolný, A., Dept of Biology & Ecology, Faculty of Science, Univ. of Ostrava, Ostrava, Czech Republic. E-mail: ales.dolny@osu.cz

17251. Pahari, P.R.; Mandal, S.S.; Maiti, S.; Bhattacharya, T. (2019): Diversity and community structure of Odonata (Insecta) in two land use types in Purba Medinipur District, West Bengal, India. *Journal of Threatened Taxa* 11(6): 13748-13755. (in English) ["The present study recorded a total of 45 species of Odonata, of which one species, *Ischnura mildredae*, was recorded for the first time from West Bengal in India. 38 species were found in Tamluk Municipality as compared to 21 species in Haldia Industrial Belt (IB), with 14 species common to both the localities. Index of similarity revealed that the two localities were slightly dissimilar in odonate faunal composition as only 47% of species were shared. In both the localities, Anisoptera was more abundant, comprising over 69% of the total odonates. Libellulidae was the most abundant Anisopteran family in both the localities, comprising over 66% of the total odonates. Coenagrionidae was the most abundant Zygopteran family in both the localities. 13 species of Anisoptera and 11 species of Zygoptera were found only in Tamluk whereas two species of Anisoptera and five species of Zygoptera were found only in Haldia IB. *Crocothemis servilia*, *Pantala flavescens*, and *Ceriagrion coromandelianum* were the dominant species in Tamluk while *Brachythemis contaminata* and *Orthetrum sabina* were the dominant species in Haldia IB. Based on the values of Shannon index, Tamluk was considered unpolluted ($=3.16$) and Haldia IB moderately polluted ($=2.43$). Higher equitability index ($J=0.87$) and very low dominance index (0.06) in Tamluk indicated homogeneity in community composition and relatively

stress-free equitable environment. The present investigation suggests that Odonata can be used as bioindicators of industrial pollution." (Authors)] Address: Pahari, P.R., Dept Zoology, Tamralipta Mahavidyalaya, Tamluk, Purba Medinipur, West Bengal 721636, India

17252. Palacino-Rodriguez, F.; Rache Rodríguez, L.; Castillo, D.R. (2019): Description of the last stadium larva of *Erythrodiplax abjecta* (Anisoptera: Libellulidae) from the eastern Colombian Andes. *Zootaxa* 4545(1): 139-145. (in English) ["The final stadium larva of *E. abjecta* is described and illustrated based on reared and field collected specimens from Colombia." (Authors)] Address: Palacino-Rodriguez, F., Grupo de Investi. en Biología (GRIB), Depto Biol., Univ. El Bosque Av. Cra. 9 No. 131^a-02, Colombia. E-mail: odonata17@hotmail.com

17253. Parr, A. (2019): Migrant and dispersive dragonflies in Britain during 2018. *J. Br. Dragonfly Society* 35(2): 48-60. (in English) ["In the UK, 2018 will go down as one of the most spectacular years in modern history for migrant and dispersive dragonflies. *Somatochlora flavomaculata* was recorded as new to Britain when a male was photographed at Carton Marshes near the Suffolk coast on 2 July, while only the fourth ever record of *Leucorrhinia pectoralis* was made elsewhere in Suffolk on 27 May. As well as these great rarities, large scale arrivals of many of the currently less unusual migrant species were also reported, though *Sympetrum fonscolombii* had a rather more low-key year. *Anax ephippiger* appeared in numbers during October and was even seen ovipositing, while it was the second best year ever for *Anax parthenope* in the UK with records from over 40 sites. A substantial arrival of *Aeshna affinis* was noted in southern England during July and early August, and *A. isoceles* also produced a number of unexpected sightings away from breeding sites. Most notable of these was a record from the Exminster Marshes, Devon, on 12 July. In addition to these migratory movements, significant internal dispersal by species such as *Orthemtrum caerulescens* was seen during the year. Many of our recent colonist damselflies also had a productive season. *Erythromma viridulum* was noted on the Lizard Peninsula in Cornwall during early July, some 100 km away from previously known UK sites for the species and thus perhaps indicative of a fresh immigration event. Continued immigration by *Lestes barbarus* was also detected during 2018, while the first ever inland breeding site for the species was discovered in Buckinghamshire." (Author)] Address: Parr, A.J., 10 Orchard Way, Barrow, Bury St Edmunds, Suffolk, IP29 5BX, UK

17254. Pastorino, P.; Bertolia, M.; Squadrone, S.; Brizio, P.; Piazza, G.; Oss Noser, A.G.; Prearo, M.; Cesarin, M.; Pizzul, A.E. (2019): Detection of trace elements in freshwater macrobenthic invertebrates of different functional feeding guilds: A case study in Northeast Italy. *Ecohydrology & Hydrobiology* 19(3): 428-440. (in English) ["Trace elements are common contaminants in aquatic ecosystems; their detection in biota yields information on their availability in the environment and provides an indirect indication of freshwater ecological status. We analyzed samples of freshwater macrobenthic invertebrates from six watercourses in Friuli Venezia-Giulia

(Northeast Italy) to verify whether trace elements accumulation is related to their ecological status sensu Water Framework Directive (WFD), and to determine tropic level influences on the accumulation of 18 trace elements in macrobenthic communities. Observed concentrations could be in line with results of ecological status assessment defined by the WFD, in fact two sites classified as "Moderate" had the highest trace elements content. The genus *Calopteryx* (predator) was positively correlated with Be, Cr, Fe, Mn, Mo, Ni, Sn, and V (S range 0.777–0.844). Positive correlations were also determined for the genus *Rhyacophila* (Trichoptera, predator) with Cu (?S = 0.757), suggesting bioaccumulation in macroinvertebrate tissue. Ephemeroptera of the genus *Caenis* (collector-gatherers) were positively correlated with Be, Fe, Mn, Pb, Sb, and V (ps range 0.757–0.802), indicating that ingestion of sediment is the most effective uptake of these metals. Results of this study, albeit preliminary, showed that trace elements detection in aquatic macrobenthic invertebrates is a useful analysis for obtaining information about the status of freshwater course. Our study provides evidence for a greater accumulation of trace elements in predators and collector-gatherers, suggesting that the tropic level of macrobenthic communities influence the accumulation of trace elements." (Authors)] Address: Pastorino, P., Istituto Zooprofilattico Sperimentale del Piemonte, Liguria e Valle d'Aosta, via Bologna 148, 10154 Torino, Italy. E-mail: paolo.pastorino@izsto.it

17255. Patel, S. (2019): Proteins: Sustainable source, processing and applications. Chapter 2 - Insects as a Source of Sustainable Proteins: 41-61. (in English) ["Ensuring nutritious food for the ever-growing world population is one of the foremost challenges. As pressure on land and water is mounting, these resources are getting depleted in alarming manner. So, energy and resource-efficient ways of food productions are being searched for. In this regard, insects, the members of phylum Arthropoda, appear very promising as their life cycle is short while turnover rate and biomass conversion rate are high. Entomophagy, the practice of ingesting insects, is an ancient way of feeding but it has mostly been confined to poorer economic strata. Not all, but certain insects such as bees, termites, ants, caterpillars, water bugs, flies, beetle larvae, crickets, grasshoppers, katydids, cicadas, and dragonflies are rich in proteins, fat, and minerals, are nontoxic, and are free of offensive aftertaste. These insect members are candidates for staple human foods. However, food neophobia and the lack of safety assurance are barriers that need to be surmounted before insects become a popular food item. Adequate research and public perception change regarding entomophagy can eradicate food insecurity, while causing a low ecological footprint. This chapter reviews the available literature on edible insects, presents the latest developments in this field, discusses their scope to food security, and proposes the pros and cons of this emerging food trend." (Author)] Address: Patel, Seema, Bioinformatics & Medical Informatics Research Center, San Diego State Univ., San Diego, CA, USA

17256. Pattanayak, A.; Pahari, P.R.; Deen, S.Y. (2019): Diversity and abundance of Odonata larvae in a fresh water lentic system of Purba Medinipur District, West Bengal, India.

Journal of Pharmacognosy and Phytochemistry 2019; SP5: 32-36. (in English) ["In total 19 species of Odonata larva have been recorded from a weed infested manmade Freshwater large lentic system near Tamluk, West Bengal (22017'52.56"N, 87055'16.72"E), India. Libellulidae were numerically the most abundant group comprising 66.04 % of the total Odonata larva followed by Coenagrionidae (31.92%) and Gomphidae (2.04%) respectively. Libellulidae represented by 12 species while Coenagrionidae represented by only 6 species and Gomphidae was represented by only one species. Urothemis and Rhodothemis were largest and lowest number of individuals recorded respectively. The water quality was fairly good during the 11 month study period of 2017-18. Various diversity indices were calculated in different seasons and the result shows maximum diversity and abundance during post-monsoon and minimum was in pre-monsoon. Diversity and evenness indices were fluctuated during study period due to seasonal changes of environmental conditions." (Authors)] Address: Pattanayak, A., PG, Dept Zool., Magadh Univ. Bodh-Gaya, Gaya, Bihar, India

17257. Pawlak, S. (2019): New habitats of the Green Hawker *Aeshna viridis* EVERSMANN, 1836 (Odonata: Aeshnidae) in the Upper Proсна Valley (Wieruszów Upland). *Odonatrix* 15_6 (2019): 7 pp. (in Polish, with English summary) ["The article describes hitherto unrecorded habitats of *A. viridis*. This species, strictly protected in Poland, is observed mainly in the northern part of the country. The two new localities – a peat pool (UTM: CB07) and an oxbow (CB16) – are in the Upper Proсна Valley near Łubnice (Łódź Province); they were recorded in 2018. Both support a great abundance of Water Soldier *Stratiotes aloides*. Two-three territorial males and one-two ovipositing females were observed at each site; one exuvium was found by the peat pool. These are the first records of this species in central Poland. All the photographs of the sites and species are by the author." (Author)] Address: Pawlak, S., ul.Konopnickiej 15, 98-400 Wieruszów, Poland. E-mail: slawieru@in-tertia.pl

17258. Payra, A.; Dash, S.K.; Udgata, G.; Pati, N.N.; Mishra, R.K.; Sahu, H.K.; Patra, B.K. (2019): A preliminary investigation on Odonata fauna in Sunabeda Wildlife Sanctuary, Nua-pada, Odisha, India. *NeBio* 10(1): 17-22. (in English) ["The first faunistic record of Odonata in Sunabeda Wildlife Sanctuary is being presented here. 8 days of opportunistic sampling and photo documentation were conducted, in selected areas of SWLS during March 2016. The present inventory yielded a total of 38 odonate species belonging to 29 genera and 6 families. Libellulidae, with 22 species was found to be dominated. Records of *Agriocnemis kalinga* Nair & Subramanian, 2015; *Elatoneura nigerima* Laidlaw, 1917 and *Gomphidia t-nigrum* Selys, 1854 were significant as far as their distribution concerned." (Authors)] Address: Payra, A., Dept of Wildlife & Biodiversity conservation, North Orissa University, Odisha, India. E-mail: arajushpayra@gmail.com

17259. Payra, A. (2019): New record of andromorphic *Urothemis signata* Rambur (Odonata: Libellulidae) from India. *Revista Chilena de Entomología* 45(4): 643-645. (in English, with Spanish summary) ["First case of an andromorphic

female of *U. signata* from eastern India is presented. Detail comparisons of the andromorphic female with mature male and female of this species are given." (Author)] Address: Payra, A., Dept of Wildlife & Biodiversity Conservation, North Orissa University, Mayurbhanj, Odisha, India. E-mail: arajush-payra@gmail.com

17260. Payra, A.; Tiple, A. D. (2019): Odonata fauna in adjoining coastal areas of Purba Medinipur District, West Bengal, India. *Munis Entomology & Zoology* 14(2): 358-367. (in English) ["The Present study was carried out to reveal the odonate diversity in adjoining coastal areas of Purba Medinipur District, West Bengal, India. Study was carried out from January 2014 to January 2018. During the study period a total of 49 species belonging to 35 genera and 7 families were recorded, including addition of 24 species representing 20 genera and 6 families for the district. The maximum number of odonates were found in Libellulidae (n=27 species), followed by Coenagrionidae (n=12), Aeshnidae (n=4), Lestidae (n=2), Platycnemididae (n=2), Gomphidae (n=1) and Macromiidae (n=1). Among the 4 selected study sites, the highest number of odonate species was observed in S3 (n= 39) and lowest in S1 (n= 21). Out of the 49 Odonates recorded from the district, 48 species come under the IUCN Red List of Threatened Category. Among them 45 species come under Least Concern (LC) Category, three species under Data Deficient (DD) and one species Not evaluated... Expansion of urbanization in such adjacent coastal areas is a matter of concern. As expansion of urbanization causing loss of natural and semi natural habitats of odonates, as well as the residual habitat quality may have adversely affected by various forms of pollutants..." (Authors)] Address: Payra, A., Dept of Wildlife & Biodiversity Conservation, North Orissa University, Takatpur, Baripada-757003, Odisha, India. E-mail: arajushpayra@gmail.com

17261. Payra, A. (2019): Andromorphic *Crocothemis servilia* (Drury) (Odonata: Libellulidae): new records from India. *Revista Chilena de Entomología* 45(4): 699-703. (in English, with Spanish summary) ["Six new records of andromorphic *C. servilia* from Eastern India are described here. Detail comparisons of the andromorphic female with mature male and female of this species are given." (Author)] Address: Payra, A., Dept of Wildlife & Biodiversity Conservation, North Orissa University, Mayurbhanj, Odisha, India. E-mail: arajush-payra@gmail.com

17262. Perez-Gutierrez, L.A. (2019): *Dactylobasis* gen. nov. from Colombia, a new genus of Zygoptera with *Teinobasini* affinities (Odonata: Coenagrionidae). *Zootaxa* 4656(2): 232-242. (in English) ["A new monobasic genus *Dactylobasis* is erected for *D. demarmelsi* sp. nov. (Holotype ♂, COLOMBIA, Chocó Department, Salero 05°19'01" N 76°36'52" W, alt. 129m, 10 VIII 2005. L. A. Pérez leg. UARC), is described and illustrated. The new genus is considered a member of the *Teinobasini* by the presence of an articulated ventral spur at the base of cercus in male. Generic characters are: mesanepisternum entirely metallic green, each with a horn in both sexes, propleuron laterally swollen with a spinulose

conical posterior projection; male paraproct long with ventral branch at half of its length. *Dactylobasis demarmelsi* is probably endemic to the Biogeographic province of Chocó." (Author)] Address: Perez-Gutierrez, L.A., Lab. de Sistemática de Insetos Aquáticos (LABSIA), Univ. Federal do Paraná, Jardim das Américas, Curitiba, PR, Brasil. E-mail: leonperez@mail.uniatlantico.edu.co

17263. Petzold, F. (2019): Die Kleine Zangenlibelle (*Onychogomphus forcipatus*) und die Pokaljungfer (*Erythromma lindenii*) an der Oberen Saale (Insecta: Odonata). Thüringer Faunistische Abhandlungen 24: 73-80. (in German, with English summary) ["The current state of knowledge on the occurrence of *O. forcipatus* in Thuringia is briefly described, the occurrence of this species together with *E. lindenii* on the Upper Saale river is reported. Exuviae of *O. forcipatus* found at this river section in 2019 provide the first evidence of the successful development of this species in Thuringia. Based on an increasing number of observations of imagoes in recent years in different regions of Thuringia, it can be assumed that *O. forcipatus* is currently in a phase of expansion." (Author)] Address: Petzold, F., Pappelallee 73, 10437 Berlin, Germany. E-mail: falk_petzold@web.de

17264. Phan, Q.T.; To, V.D.; Trinh, D.M.; Dinh, V.K. (2019): Description of *Protosticta binhi* sp. n. from the Central Highlands of Vietnam (Odonata: Zygoptera: Platystictidae). International Journal of Odonatology 22(3-4): 199-206. (in English) ["*Protosticta binhi* sp. n. is described from the Central Highlands of Vietnam (holotype ♂: Vietnam, Gia Lai Province, K'Bang District, Dak Roong Commune, Dak Hro village, 14.36611° N, 108.4103° E, 1130 m asl, 22 May 2018, T.odo. 22051810, Zoological Collection of Duy Tan University). The new species can be easily distinguished from all other *Protosticta* species by the combination of huge body size, birdhead shape of cerci and paraprocts broad and apically armed with several sharp subapical projections in the male, and the anterior pronotal lobe of the prothorax well developed in the female." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Institute of Research & Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang City, Vietnam. E-mail: pqtoan84@gmail.com

17265. Phan, Q.T.; To, V.Q.; Payra, A. (2019): First record of *Indolestes cyaneus* (Selys, 1862) from Vietnam and notes on its color variation (Odonata: Zygoptera: Lestidae). Zootaxa 4571(3): 409-416. (in English) ["First record of *I. cyaneus* from Vietnam with providing illustrations of its detailed structures, as well as notes on the coloration of the populations from Taiwan, Nepal and India." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Inst. Res. & Training of Medicine, Biol. & Pharmacy, Duy Tan Univ., 3 Quang Trung, Da Nang, Vietnam. E-mail: pqtoan84@gmail.com

17266. Phan, Q.T. (2019): *Coeliccia lecongcoi* sp. nov., a new damselfly from the Central Highlands of Vietnam (Odonata: Zygoptera: Platycnemididae). Zootaxa 4551(4): 471-478. (in English) ["*Coeliccia lecongcoi* sp. nov. (holotype ♂, 15.147 N, 107.752 E, Ngoc Linh Nature Reserve, Kon Tum

Province, the Vietnamese Central Highlands) is described and illustrated from both sexes. The new species is allied to *C. duytan* Phan, 2017 and *C. hayashii* Phan & Kompier, 2016 but differs by the synthoracic pattern and structure of the appendages and genital ligula of the male and the posterior pronotal lobe of the prothorax of the female." (Author)] Address: Phan, Q.T., Center for Entomology & Parasitology Res., Institute of Research & Training of Medicine, Biology & Pharmacy, Duy Tan Univ., 3 Quang Trung, Da Nang city, Vietnam. E-mail: pqtoan84@gmail.com

17267. Phan, Q.T.; To, V.Q. (2019): Description of new damselfly *Coeliccia schorri* sp. n. (Odonata: Zygoptera: Platycnemididae) with a discussion of the *Coeliccia hayashii*-group in Vietnam. International Journal of Odonatology 22(1): 11-20. (in English) ["*Coeliccia schorri* sp. n. is described based on both sexes (holotype male from Dak Roong Commune, K'bang district, Gia Lai province, central highlands of Vietnam). The combination of the characters of a large pruinose spot on the synthorax, blue abdominal tip, and white appendages in the male and a long spine on the posterior pronotal lobe of the prothorax in the female help distinguish it from all other *Coeliccia* species. The *Coeliccia hayashii*-group, remarkable for the pruinose markings on the male prothorax and synthorax in combination with the structure of the genital ligula which is bifurcated from the base into two long flagella, is discussed." (Authors)] Address: Phan, Q.T., Center for Entomology & Parasitology Research, Institute of Research & Training of Medicine, Biology & Pharmacy, Duy Tan University, Da Nang, Vietnam. E-mail: pqtoan84@gmail.com

17268. Pineiro Alvarez, X. (2019): Primera cita de *Paragomphus genei* (Selys, 1841) (Odonata, Gomphidae) para la provincia de Ciudad Real (Castilla-La Mancha, España). Boletín de la Sociedad Entomológica Aragonesa 65: 231-232. (in Spanish, with English summary) ["The first record of *P. genei* from Ciudad Real province and second from Castilla-La Mancha region (Spain) is provided." 9-VI-2019, Villarrubia de los Ojos (Ciudad Real) (30S VJ44 y 30S VJ43, a 610 msnm)] Address: Piñeiro Álvarez, X., Revolta 2, Noalla. 36990 Sanxenxo. Pontevedra, Spain. E-mail: xurxolusitanica@gmail.com

17269. Piretta, L.; Assandri, G. (2019): First record of the migrant dragonfly *Pantala flavescens* for mainland Italy (Insecta: Odonata). Fragmenta entomologica 51(2): 247-250. (in English) ["In this contribution we report the observation of an individual of the migrant dragonfly *P. flavescens* found at Montanaro (Piemonte, Italy) on 14 Aug 2019. This represents the first record of the species for mainland Italy and one of the very few available for Western and Central Europe before 2019. We discuss two hypotheses on the origin of this individual integrating available literature with very recent records retrieved from citizen science faunistic platforms." (Authors)] Address: Piretta, Lorenza, 1 Via Valle Balbiana 33/1, I-10025, Pino Torinese (TO), Italy. E-mail: lo-renza.piretta@gmail.com

17270. Polovic, L.; Miliša, M.; Dražina, T.; Špoljar, M. (2019): The role of dragonflies as the peak predators and indicators

of the health of the Mediterranean ponds. Simpozij o biologiji slatkih voda (SOBS). Zagreb, Hrvatska, 15.02.2019: (in English) [Verbatim: Mediterranean freshwater ponds are specific, sometimes man-made freshwater habitats on islands and coast. Since they're mainly isolated freshwater habitats in the arid and marine environment, they represent precious habitats with high freshwater species diversity. They are sensitive to weather and detrimental human effects due to their properties (e.g. small volume, low depth, karst base, proximity to the sea). These ponds undergo washing of nutrients, toxins and soil from surrounding areas, salinization, water level fluctuations and are often semi-permanent or temporary. Benthic macroinvertebrates are sentinel indicators of water ecological state as well as changes therein. Thus, across the Dugi otok island macroinvertebrates in 10 ponds were sampled. For productivity assessment, head capsule width was measured and 13 instars were distinguished and separated. Benthic community was comprised of 41 taxa of which the top predators - dragonflies were dominant, in biomass and in abundance. Therefore, further research was focused on dragonflies, specifically genera *Sympetrum* and *Anax*. Their presence differed among ponds, depending on the macrophyte coverage, salinity and the dragonfly prey size in the pond. *Sympetrum fonscolombii* was the most abundant species, with the highest biomass and thus it was the best choice for life cycle study. Taking into account the broad taxonomic structure of the benthic community, its trophic composition, and standing stock biomass of the top predator these habitats (although in a rather high trophic state) indicated healthy and stabile ecosystems. Hence, we encourage further protection and research of these curious and precious habitats.] Address: Maria Špoljar: maria.spoljar@biol.pmf.hr

17271. Poma, G.; Liu, Y.; Cuykx, M.; Tang, B.; Luo, X.-J.; Covaci, A. (2019): Occurrence of organophosphorus flame retardants and plasticizers in wild insects from a former e-waste recycling site in the Guangdong province, South China. *Science of The Total Environment* 650: 709-712. (in English) ["Highlights: •Large quantities of e-waste are generated worldwide and often inappropriately dismantled. •Occurrence of PFRs was investigated in wild insects from an e-waste recycling site (China). •TEHP was the most abundant PFR, followed by TPHP, TCIPP, TCEP, EHDPHP and TCP. •Odonata were more contaminated, followed by Lepidoptera, Orthoptera, Hemiptera, Coleoptera. •PFR contamination patterns could be explained by insect habitats and feeding habits. Abstract: Due to the fast growth of the electronic industry, a large quantity of electronic waste (e-waste) is generated worldwide and then often inappropriately dismantled and disposed of. In a pilot study, the occurrence of organophosphorus flame retardants and plasticizers (PFRs) was investigated for the first time in several wild insect species collected from a former e-waste recycling site in the Guangdong province, South China. TEHP was the most abundant PFR (average concentration of 5.8 ng/g ww), followed by TPHP (2.5 ng/g ww), TCIPP (2.2 ng/g ww), TCEP (0.8 ng/g ww), EHDPHP and TCP (both 0.1 ng/g ww). Dragonfly nymphs were the most contaminated insects, with total PFR concentrations of 68 ng/g ww, followed by moth adults (26? g/g ww) and terrestrial stinkbug (17 ng/g ww). The different contamination patterns observed in the analyzed insects could

be explained by their different habitats and feeding habits. This study shows that e-waste recycling areas can be an important local source of contamination with PFRs, mainly caused by inadequate recycling activities." (Authors)] Address: Covaci, A., Toxicol. Center, Univ. Antwerp, Universiteitsplein 1, 2610 Wilrijk, Belgium. E-mail: adrian.covaci@uantwerpen.be

17272. Poschmann, M.; Nel, A.; Schindler, T. (2019): Erster Nachweis von Riesen-Urilibellen (Odonatoptera: Meganisoptera: Meganeuridae) im Permokarbon des Saar-Nahe-Beckens (Rheinland-Pfalz, SW-Deutschland). *Mainzer naturwissenschaftliches Archiv* 56: 71-86. (in German, with English summary) [First record of giant griffenflies (Odonatoptera: Meganisoptera: Meganeuridae) in the Permocarboniferous of the Saar-Nahe Basin (Rhineland-Palatinate, SW-Germany). A wing fragment from lake deposits of the Meisenheim Formation (Lower Rotliegend, Autunian) near Obermoschel is the first record of giant griffenflies for the Permo-Carboniferous of the Saar-Nahe Basin. With a reconstructed wing span of at least 60 centimetres the animal was comparable in size to the iconic *Meganeura monyi* from the Stephanian of Commeny/France and is currently the largest known insect from Germany. The increased partial pressure of oxygen in the Upper Carboniferous to mid-Permian is discussed as a possible factor controlling the maximum size of griffenflies. The palaeoenvironment of Lake Obermoschel was characterized by large lakes and fluvial systems that provided the open spaces preferred by meganeurids, which were probably agile hawk predator." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@cimrns1.mnhn.fr

17273. Prabhakaran, P.V.; Aravindan, T. (2019): Influence of water on Odonates in the paddy fields of Kannur district, Kerala. *International Journal of Advance Research, Ideas and Innovations in Technology* 5(4): 268-271. (in English) ["3 rice fields in Kannur district were selected for the Odonate study: (1) Okra Vayal at Cheruthazham (FWPF), (2) Munda-puram Vayal at Cherukunnu (CPF), and (3) Hariitha Sangam Paddy field at Madayippara (MLHPF)."] Address: Prabhakaran, P.V., Sree Narayana College, Kannur, Kerala, India. E-mail: prabharamanthali@gmail.com

17274. Rae, J.; Murray, D. (2019): Pathogen vs. predator: ranavirus exposure dampens tadpole responses to perceived predation risk. *Oecologia* 191(2): 325-334. (in English) ["There is increasing interest in how animals respond to multiple stressors, including potential synergistic or antagonistic interaction between pathogens and perceived predation risk (PPR). For prey that exhibit phenotypic plasticity, it is unclear whether infection and PPR affect behaviour and morphology independently, or in an antagonistic or synergistic manner. Using a 2 × 2 factorial experiment involving green frog (*Lithobates clamitans*) tadpoles exposed to ranavirus (FV3) and larval *Anax* spp., we assessed whether anti-predator responses were affected by infection. We found that activity and feeding were reduced additively by both stressors. Body mass of tadpoles from FV3-exposed tanks was lighter relative to control and PPR-only tanks, while metabolism was comparable

across treatments. We found that FV3 exposure compromised morphometric responses to PPR in an antagonistic manner: tadpoles exposed to both treatments had restricted changes in tail depth compared to those receiving singular treatment. We conclude that multiple stressors can have complex and substantive effects on organisms, and that interactions between stressors may yield a range of responses depending on the level of exposure and sensitivity of the organism. Additional work should more fully determine mechanisms underlying the complex interplay between infection and predation risk, across a range of environmental conditions." (Authors)] Address: Rae, J., Environmental & Life Sciences Program, Trent Univ., Peterborough, Canada

17275. Rahman, T.; Shoma, S.F.; Feeroz, M.M.; Hasan, K. (2019): Food and feeding behaviour of Chestnut-tailed Starling, *Stumia malabarica* at Jahangirnagar University Campus, Bangladesh. *Jahangirnagar University Journal of Biological Sciences* 8(1): 17-23. (in English) ["Food and feeding behaviour of Chestnut-tailed Starling, *Stumia malabarica* were studied at Jahangirnagar University Campus, Bangladesh, from August 2016 to March 2017. A total of 414 observations were made on the feeding maneuver and it was noted that they were omnivorous consuming 67.15% animal diet compared to 20.53% plant diet. They predominantly consumed insect larvae (39%) followed by beetles (16%), nectar (14%), food wastes (12%), fruits (7%), dragonflies (7%), damselflies (3%), and worms (2%). (Authors)] Address: Rahman, T., Dept of Zool., Jahangirnagar Univ., Savar, Dhaka-1342, Bangladesh

17276. Rajapaksha, S.; Kandambi, H.K.D.; Dayawansa, P.N. (2019): Comparison of Faunal Wealth of a Selected Oil Palm Plantation and a Rubber Plantation in the Wet Zone of Sri Lanka. *Proceedings of the 24th International Forestry and Environment Symposium 2019 of the Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka*: 61. (in English) ["A rapid increase in oil palm plantations has been evident in the low country wet zone of Sri Lanka as it is an economically profitable crop. Nevertheless, oil palm receives an immense resistance by the public claiming diminution of the water table and biodiversity wealth. Rubber plantations, which are often replaced by oil palm are claimed to be more environmentally friendly than oil palm plantations. The current study was designed to reveal the faunal wealth of selected oil palm plantations (OPP) and rubber plantations (RP) with reference to microclimatic conditions. It was hypothesized that there is no difference in faunal wealth of OPP and RP as measured by species richness, abundance and diversity indices. Three OPP and two RP in Agalawatta (N 6° 32' 50" E 80° 14' 01"-N 6° 32' 50" E 80° 13' 55") were selected for the study. Species richness and abundance of selected faunal groups were determined with reference to environmental factors (ambient temperature, relative humidity, soil moisture, litter depth, light intensity and canopy cover) from March to September 2018. Species richness and abundance of invertebrates (butterflies and dragonflies) and vertebrates (amphibians, reptiles, birds and mammals) were studied using line transects, circular plot counts, visual encounter survey technique, quadrat cleaning technique, live trapping

and hair tube sampling. Shannon-Weiner Diversity Index (H) was determined for different faunal groups inhabiting OPP and RP. Soil moisture content in OPP was significantly higher than that of RP (t-test $p < 0.05$) while litter depth was significantly higher in RP ($p < 0.05$). Ambient temperature, relative humidity, light intensity and canopy cover did not differ significantly between the two plantations. Species richness of fauna of OPP and RP were 54 (Endemic 16) and 30 (Endemic 5) respectively. Vertebrate diversity did not differ significantly between OPP ($H = 2.68$) and RP ($H = 2.53$), however, invertebrate diversity of OPP ($H = 2.26$) was significantly higher than that of RP ($H = 0.95$) (t-test $p < 0.05$). Diversity of birds and reptiles were higher in RP than OPP while diversity of amphibians and small mammals were higher in OPP. Rare point endemic bush frog *Polypedates ranwellai* was found in oil palm plantations, which is considered as a range extension. This preliminary study revealed that overall faunal wealth of oil palm plantations is slightly higher than that of rubber plantations and this could be attributed to the availability of microhabitats." (Authors)] Address: not stated

17277. Reels, G.T. (2019): An annotated check list of Hong Kong dragonflies and assessment of their local conservation significance. *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 30: 1-49. (in English) ["Dragonflies were surveyed at 33 sites across the territory of Hong Kong Special Administrative Region over the period 2016-2017. Surveys included identification of larvae, exuviae and adults, and involved 92 separate site visits. The chosen sites covered the whole spectrum of dragonfly habitats in Hong Kong, with the exception of actively managed fish ponds and reservoirs. 22 of the study locations had been identified as key dragonfly sites by Wilson (1997a). An annotated check list of Hong Kong Odonata was compiled, listing 128 taxa. Comparison of local distribution of dragonflies during the present study with that recorded by Wilson (1997a) indicated that only three species had undergone significant decline in the intervening two decades, while several others (including the conservation significant *Mortonagrion hirosei* Asahina, 1972 and *Orthetrum poecilops* Ris, 1919) had considerably extended local distributions. 28 species of particular conservation importance for Hong Kong were identified and ranked, using a species conservation value assessment metric." (Author)] Address: Reels, G.T., 31 St Anne's Close, Winchester, SO22 4LQ, UK. Email: greels@gmail.com

17278. Rehage, H.-O.; Rudolph, R. (2019): Ein weiterer Fund der Sibirischen Winterlibelle (*Sympecma paedisca*) aus Westfalen. *Natur und Heimat* 79(1): 40. (in German) [*S. paedisca*, ♀, NSG Großes Heiliges Meer (bei Hopsten), Nordrhein-Westfalen, Germany, leg. H.J. Reichling, 27.5.1953] Address: Rehage, H.-O., Rinkerodeweg 31, 48135 Münster, Germany

17279. Rehman, A.; Ahmad, S.; Zia, A.; Latif, A.; Khan, T.; Afzaal, M.; Kamal, W.; Khan, S.; Tariq, H. (2019): Damselflies (Odonata: Zygoptera) fauna of district Swabi Khyber Pakhtunkhwa, Pakistan. *Journal of Entomology and Zoology Studies* 7(2): 190-193. (in English) ["Study was conducted to explore the damselflies fauna of District Swabi KP (Khyber

Pakhtunkhwa) Pakistan. A total of 238 adult damselflies were collected from 19 localities of the district during the summer seasons of 2015 and 2016. The result revealed 13 species, 10 genera under 5 families. The abundant family was recorded as Coenagrionidae with 7 species and 5 genera viz, *Rhode Ischnura* Morton, *Ischnura aurora rubilio* Selys, *Ischnura forcipata* Morton, *Ceriagrion coromandelianum* Fabricius, *Pseudagrion rubriceps* Selys, *Pseudagrion hypermelas* Selys, *Agriocnemis pygmaea* Rambur, followed by Family Chlorocyphidae with 3 species and 2 genera viz, *Libellago lineata lineata* Burmeister, *Rhinocypha trifasciata* Selys, *R. quadrimaculata* Selys while other families i.e Calopterygidae, Protoneuridae and Euphaeidae were represented by single species and single genera each viz, *Neurobasis chinensis* Linnaeus, *Elatoneura souteri* Fraser, *Bayadera longicauda* Fraser. Details showing valid names, collection localities, number of individual male/female collected are provided for each species." (Authors)] Address: Zia, A., National Insect Museum, National Agriculture Research Centre, Islamabad, Pakistan

17280. Reid, D.J.; Tippler, C. (2019): Access to natural substrates in urban streams does not counter impoverishment of macroinvertebrate communities: a comparison of engineered and non-engineered reaches. *Water Air Soil Pollut.* (2019) 230:8: 15 pp. (in English) ["Urban streams are degraded through multiple mechanisms, including severely altered flow regimes, elevated concentrations of waterborne contaminants, removal of riparian vegetation and the loss of a mosaic of heterogeneous aquatic habitats. Engineering of urban stream reaches using concrete is a widespread and extreme case of deliberate alteration of flow regimes and concomitant habitat simplification. To assess the effect of such engineering practices on stream ecosystems, we compared aquatic macroinvertebrate communities from concrete-lined engineered urban reaches, nonengineered urban reaches with natural substrates and reference reaches flowing through minimally disturbed forested subcatchments and with natural substrates, in the Sydney metropolitan region, Australia. The communities from all urban reaches were impoverished and distinctly different from more diverse communities in forested reference reaches. Despite low aquatic habitat heterogeneity, engineered urban reaches had very high abundances of Diptera and some other tolerant taxa. Diptera and/or Gastropoda were dominant in nonengineered urban reaches. Multivariate community structures were dissimilar between the urban reaches and forested reference reaches and between nonengineered and engineered urban reaches. However, the low family-level richness and SIGNAL scores in both urban reach types indicated they were severely ecologically impaired, whether engineered or not. Most macroinvertebrate taxa in the regional pool that were hardy enough to inhabit urban reaches with natural substrates were also present in nearby concreted reaches. The results add weight to the growing evidence that in urban landscapes, regional-scale changes in water quality and flow regimes limit the establishment of diverse macroinvertebrate communities, which cannot be addressed through the provision of increased reachscale habitat heterogeneity." (Authors)] Address: Reid, D.J., Georges Riverkeeper, Hurstville, NSW, Australia. E-mail: davidreid@georgesriver.nsw.gov.au

17281. Reis, K.S.S. (2019): Atividade predatória de insetos aquáticos (Odonata: Libellulidae e Coleóptera: Hydrophilidae) sobre girinos (*Rhinella* sp. e *Physalaemus* sp.) na cidade de Capitão Poço, Nordeste Paraense. *Bacharelado em Ciências Biológicas, Universidade Federal Rural da Amazônia*: 41 pp. (in Portuguese, with English summary) ["The predation event regulates the functioning of communities and directly affects the population dynamics of organisms in the environment. Among the predators present in aquatic environments are invertebrates, especially Insecta, which feed on various organisms, whether vertebrates or invertebrates. Tadpoles are one of the food items most consumed by these invertebrates. This experiment studied the predatory activity of two families of aquatic insects (Odonata: Libellulidae and Coleoptera: Hydrophilidae) in relation to the species of tadpoles *Rhinella* sp. and *Physalaemus* sp. in the city of Captain Poço, north-east of Para. The experiment had six treatments performed in two phases (day and night). One-way and factorial ANOVA were observed, with significant differences only observed between treatments 1 (control) and 2 (Libellulidae) ($F = 7.21$, $p = 0.00$), but this family showed no food preference for any of the treatments. species of tadpoles. On the other hand, Hydrophilidae consumed more tadpoles of *Physalaemus* sp., Being the species most consumed in the given experiment ($F = 4.73$, $p = 0.03$). The predatory activity of the insects was performed in both study periods (day and night), with no significant differences ($F = 1.33$, $p = 0.26$)." (Authors)] Address: not stated.

17282. Rodrigues, M.; Madhava, M. (2019): A preliminary survey on odonates of Kidoor, Kasaragod. *Piculet* 2(1&2): 28-30. (in English) [Kidoor (12.63°N, 74.98°E); 12th July 2019] Address: Maxim Rodrigues. E-mail: maximrodrigues@gmail.com

17283. Roman-Heracleo, J.; Springer, M.; Novelo-Gutierrez, R. (2019): Descriptions of the larvae of *Acanthagrion speculum* and *A. trilobatum* from Costa Rica (Odonata: Coenagrionidae). *Zootaxa* 4624(2): 219-229. (in English, with Spanish summary) ["Description of the final instar of *Acanthagrion trilobatum* Leonard, 1977 and *A. speculum* Garrison, 1985 is based on associated specimens from San José, Turrialba and Sarapiquí Provinces, Costa Rica. Illustrations of these two species and a comparative table summarizing the main features of all larvae of *Acanthagrion* described to date are provided. The larva of *A. trilobatum* is distinguished from that of *A. speculum* by shorter lateral caudal lamellae (length 7 mm vs. 8.2 mm), lateral carina of abdominal segments 2–8 with spiniform setae on posterior 1/3 (lateral carinae of only S6–8 with spiniform setae in *A. speculum*), and male gonapophyses incurved (straight in *A. speculum*)." (Authors)] Address: Novelo-Gutierrez, R., Instituto de Ecología, A.C. Red de Biodiversidad y Sistemática. Carretera Antigua a Coatepec 351, El Haya, 91070 Xalapa, Veracruz, Mexico. E-mail: rodolfo.novelo@inecol.mx

17284. Romero-Lebrón, E.; Gleiser, R.M.; Petrulevicius, J.F. (2019): Geometric morphometrics to interpret the endophytic egg-laying behavior of Odonata (Insecta) from the

Eocene of Patagonia, Argentina. *Journal of Paleontology* 93(6): 1126-1136. (in English) ["Although the order Odonata has a rich fossil record, many questions about its reproductive biology remain unanswered. There are two strategies of egg laying among odonates, exophytic and endophytic, the latter being one of the most revealing vestiges of plant–insect association in the fossil record. We assessed whether geometric morphometrics based on elliptical series of Fourier allow expression of variability of shape in traces of Odonata eggs within a leaf of *Eucalyptus chubutensis* (Berry) González (in part), González, 2009 (Myrtaceae) from Laguna del Hunco (Chubut, Argentina) (early Eocene) and whether this variability is consistent with the ichnotaxonomy of this material. We found that the largest variation corresponds to the compression of the shape while the remaining two components reflect variations in the apex position and its curvature, which changed according to the relative position of the traces in the leaf. There was no evidence that the hardness of the leaf would affect the shape of the egg trace. We postulate that these traces could have been produced by one single female: Variations in the pattern observable in the fossil of an originally three-dimensional structure are consistent with differences in the position of the eggs inserted by a single female who has flexed her abdomen to insert the eggs as she approaches the apex of the leaf (behavior observed also in extant dragonflies). For the first time, endophytic egg traces are analyzed with geometrical morphometrics, and this allows us to make inferences on the oviposition behavior of a female that lived around 52 million years ago." (Authors)] Address: Petrulevicius, J.F., División Paleozoología Invertebrados, Fac. de Ciencias Naturales y Museo, Univ. Nacional de La Plata, Paseo del Bosque s/n, (1900) La Plata, Argentina. E-mail: leVICIUS@fcnym.unlp.edu.ar

17285. Rowe, R.J. (2019): *Hemicordulia armstrongi* sp. n. (Odonata: Anisoptera: Corduliidae) from New Zealand. *Australian Entomologist* 46(4): 179-188. (in English) ["The dragonfly previously recognised from New Zealand under the name *Hemicordulia australiae* (Rambur, 1842) is described as a new taxon, *Hemicordulia armstrongi* sp. n. on the basis of morphological differences in both adults and larvae, as well as adult behavioural differences. Photographic evidence requiring confirmation is presented suggesting that the species might co-occur with *H. australiae* in Australia and that *H. australiae* also might occur in New Zealand." (Author)] Address: Rowe, R.J., Res. School of Biology, Evolution, Ecology & Genetics, Australian National University, Canberra, 0200, Australia. E-mail: richard.rowe.dragonflies@gmail.com

17286. Sakai, M.; Suda, S.-i.; Okeda, T.; Nomura, R.; Washitani, I.; (2019): The importance of riparian subtropical lucidophyllous forest to odonate conservation. *Aquatic Conservation. Marine and Freshwater Ecosystems* 29(5): 682-692. (in English) ["(1) Glossy, broad-leaved, evergreen (lucidophyllous) forests are found mainly in humid subtropical regions of East Asia and are recognized as a biodiverse biome harbouring numerous endemic species. To date, however, few studies have considered the conservation importance of rivers draining these unique environments. In this study, lotic Odonata were used as indicators to examine factors affecting riparian forest–stream

linkages in a lucidophyllous forest in south-western Japan. (2) Lotic odonates of 10 species, including seven endemic species, and their habitats were studied along 30 stream reaches with varying environmental characteristics. (3) Odonate species richness was greatest in shadier reaches as well as in heterogeneous locations in larger streams. In contrast, larger streams modified by channel enlargement for flood control had few or no odonate species. (4) Protecting larger streams with less human impact and streams in dense riparian forest are the best options for conserving lotic odonates and their habitats in this globally unique forest type. [...] The most common species recorded was *Matrona japonica*, which inhabited most of the study reaches (28 reaches). *M. japonica*, *Coelliccia ryukyensis amamii* (15 reaches), and *Chlorogomphus brunneus costalis* (15 reaches) were classified as common species; *Asiagomphus a. amamiensis* (nine reaches), *Planaeschna milnei naica* (eight reaches), and *Hemicordulia okinawensis* (seven reaches) were classified as uncommon species; and *Anotogaster sieboldii*, *Planaeschna ishigakiana nagaminei*, *Rhipidolestes amamiensis*, and *Stylogomphus ryukyuanus ryukyuanus*, all occurring in one reach, were classified as rare species" (Authors)] Address: Sakai, M., Fac. Science & Engineering, Chuo Univ., 1-13-27 Kasuga, Bunkyo-ku, Tokyo 112-8551, Japan. Email: boundary.0008@gmail.com

17287. Salami, E.; Ward, T.A.; Montazer, E.; Ghazali, N.N.N. (2019): A review of aerodynamic studies on dragonfly flight. *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science* 233(18): 6519-6537. (in English) ["In the recent decades, the design and development of biomimetic micro air vehicles have gained increased interest by the global scientific and engineering communities. This has given greater motivation to study and understand the aerodynamics involved with winged insects. Dragonflies demonstrate unique and superior flight performance than most of the other insect species and birds. They are capable of sustained gliding flight as well as hovering and able to change direction very rapidly. Pairs of independently controlled forewings and hindwings give them an agile flying ability. This article presents a review of all published journal articles, listed in the Thomson-Reuters Web-of-Science database (1985–2018), that are related to the flight aerodynamics of dragonflies or micro air vehicles that biomimic them. The effects of dragonfly wing motions and interactions (between forewing and hindwing) that are necessary to generate the appropriate aerodynamic forces in different flight modes are described. The associated power requirements of these modes are also addressed. This article aims to provide a valuable reference to the aerodynamic design and control of dragonfly-inspired biomimetic micro air vehicles." (Authors)] Address: Salami, E., Dept Mechanical Engineering, Univ. Malaya, Kuala Lumpur, KL 50603, Malaysia. Email: erfansalami@hotmail.com

17288. Sampa, T. (2019): The first larval record of *Sympetrum fonscolombii* from Kawasaki city, Kanagawa Prefecture. *Tombo* 61: 51-52. (in Japanese, with English summary) ["In 2018, a larva of *S. fonscolombii* was collected from an elementary school's swimming pool in Kawasaki city, Kanagawa Prefecture. The larva of this species is here recorded

for the first time from Kanagawa Prefecture. It is suggested that this species chooses not only natural water areas but artificial water areas such as swimming pools for an oviposition site. In addition, it is shown that the larva of this species is able to pass the winter in Kawasaki city." (Author)] Address: not stated in English

17289. Samraoui, B.; Touati, L.; Samraoui, F. (2019): Slow and steady wins the race: Life cycle and seasonal regulation of *Gomphus lucasii* (Odonata: Gomphidae). *Odonatologica* 48(3/4): 229-246. (in English) ["We investigated the emergence and life cycle of the endangered Maghrebian endemic *G. lucasii* at the Seybouse River in north-eastern Algeria. Starting in mid-April, their emergence, typical of spring species, was highly synchronized and was achieved within two to three weeks. EM50 was reached in three days. Larval sampling indicated that the synchrony was achieved through larvae overwintering in the F-0 stage. Noteworthy was the concomitant presence of a junior cohort throughout the year demonstrating that the species completes a generation in two years. Thus, contrary to what has been reported previously, we argue that *G. lucasii* is a semivoltine species with a 'slow' developmental rate congruent with its distribution in high-risk permanent habitats. This finding has important conservation implications for this threatened endemic species which is facing severe anthropogenic pressures in the context of global changes." (Authors)] Address: Samraoui, B., Laboratoire de Conservation des Zones Humides, Université 8 Mai 1945 Guelma, Algeria. E-mail: bsamraoui@gmail.com

17290. Sánchez-Bayoa, F.; Wyckhuys, K.A.G. (2019): Worldwide decline of the entomofauna: A review of its drivers. *Biological Conservation* 232: 8-27. (in English) ["Biodiversity of insects is threatened worldwide. Here, we present a comprehensive review of 73 historical reports of insect declines from across the globe, and systematically assess the underlying drivers. Our work reveals dramatic rates of decline that may lead to the extinction of 40% of the world's insect species over the next few decades. In terrestrial ecosystems, Lepidoptera, Hymenoptera and dung beetles (Coleoptera) appear to be the taxa most affected, whereas four major aquatic taxa (Odonata, Plecoptera, Trichoptera and Ephemeroptera) have already lost a considerable proportion of species. Affected insect groups not only include specialists that occupy particular ecological niches, but also many common and generalist species. Concurrently, the abundance of a small number of species is increasing; these are all adaptable, generalist species that are occupying the vacant niches left by the ones declining. Among aquatic insects, habitat and dietary generalists, and pollutant-tolerant species are replacing the large biodiversity losses experienced in waters within agricultural and urban settings. The main drivers of species declines appear to be in order of importance: i) habitat loss and conversion to intensive agriculture and urbanisation; ii) pollution, mainly that by synthetic pesticides and fertilisers; iii) biological factors, including pathogens and introduced species; and iv) climate change. The latter factor is particularly important in tropical regions, but only affects a minority of species in colder climates and mountain settings of temperate zones. A rethinking of current

agricultural practices, in particular a serious reduction in pesticide usage and its substitution with more sustainable, ecologically-based practices, is urgently needed to slow or reverse current trends, allow the recovery of declining insect populations and safeguard the vital ecosystem services they provide. In addition, effective remediation technologies should be applied to clean polluted waters in both agricultural and urban environments. ... Odonata comprise a relatively small order of insects that depend on water bodies for their larval development. Both nymphs and imagoes are predators of aquatic organisms and flying insects respectively, and they play an important role in controlling nuisance mosquitoes and agricultural pests, e.g. of rice. Of the 118 aquatic species of endangered insects listed by the IUCN, 106 are Odonata, although it is clear that other aquatic taxa are underrepresented due to insufficient knowledge. A recent IUCN assessment indicates that 10% of the world's Odonata are threatened with extinction, although that study only covered a quarter of all species known and acknowledged data gaps for 35% of species, particularly those from tropical and Australasian regions. Given the above, 15% of all species may be threatened. In the USA, recent surveys at 45 sites across California and Nevada were compared to historical records from 1914 to 1915. Occurrence rates of 52 species of Odonata (65% of all recorded) have declined over the 98-year period while those of 29 species have increased. Two generalist and pollution-tolerant species that were not recorded in 1914–1915 greatly expanded their range into California and became common, particularly in urban areas. At least nine species declined significantly, including four species (*Sympetrum danae*, *S. costiferum*, *Ophiogomphus occidentis* and *Libellula nodisticta*) that were also rare in early surveys. Declines occurred mostly among habitat specialists, whereas increases were recorded for generalist and migratory species that replaced the losses at the same sites. Specialist species included those with overwintering diapause, which appear to have declined due to an increase of minimum temperature over the period. While species richness has not declined, Odonata assemblages have become more homogeneous in species composition, which is typically an effect of urbanisation. In Europe, 15% of the 138 Odonata species are currently threatened, with two damselflies (*Ceriatagrion georgifreyi* and *Pyrrhosoma elisabethae*) and one dragonfly (*Cordulegaster helladica* sp. *kastalia*) critically endangered in the Balkan Peninsula. A quarter of all species (33) are declining in population numbers and distribution, whereas 10% of them are increasing and about half remain stable. Major declines took place during post-1960 agricultural intensification, with canalisation of rivers for irrigation and water pollution by urban runoff, pesticides and fertilisers (i.e. eutrophication) being the main drivers of population extinctions over large areas. Ubiquitous species such as *Coenagrion puella* and *Sympetrum striolatum*, however, increased and shifted their range some 300 km northwards in Britain between 1960 and 1970 and 1985–1995. In central Finland, populations of 20 common species of Odonata were surveyed at 34 small creeks over 1995–1996, and their distribution patterns were compared with historic records from 1930 to 1975. Two specialist and lentic dragonflies, *Coenagrion johanssoni* and *Aeshna caerulea* have disappeared

from streams, and 45% of the 219 surveyed populations vanished. Local extinctions occurred in peat bogs and dynamic waters upstream, which are habitats for lentic-specialist species, whereas downstream water bodies had lower losses. Generalist species (i.e., those that breed in both lentic and lotic waters) were less likely to become locally extinct. The construction of agricultural ditches and habitat fragmentation from forestry further impacted on populations of rare species. In Japan, 57 out of 200 Odonata species are declining, with 23 being vulnerable and 19 endangered. The largest drops in abundance and distribution are among lentic species once common in rice paddy fields (e.g., *Lestes japonicus*, *Libellula angelina*, *Sympetrum maculatum* and *S. uniforme*). Island endemics are next in the extinction list, whereas those of lotic habitats of mountain streams are the least affected. The sharp decline in populations of red dragonflies (*Sympetrum* spp.) since the mid-1990s has been linked to the use of fipronil and neonicotinoid insecticides, which affect the aquatic nymphal stages by curtailing the emergence of adults. Of the 155 Odonata species recorded in South Africa, 13 are declining and four are extinct. The protection of rare species in nature reserves of that country does not necessarily guarantee their survival, as current livestock management and other human activities negatively impact on these aquatic insects." (Authors)] Address: Sánchez-Bayo, F., School of Life & Environmental Sciences, Sydney Institute of Agriculture, The University of Sydney, Eveleigh, NSW 2015, Australia

17291. Sano, S.; Yamada, Y. (2019): Records of adult *Aeschnophlebia anisoptera* Selys, 1883 and larval *Gynacantha japonica* Bartenef, 1909 from Izu Oshima Island. *Tombo* 61: 49-50. (in Japanese, with English summary) ["A survey of dragonflies was made in Izu-Oshima Island, Tokyo Prefecture, on October 16, 2018. *A. anisoptera* and larva of *G. japonica* Bartenef, 1909 are recorded from the island for the first time." (Author)] Address: not stated in English

17292. Sanz Sanz, T.; Pomedá Maestre, N.A.; Arriola González, J.A.; Montoya Jiménez, M. (2019): Nuevos datos sobre la distribución de *Sympetrum flaveolum* (Linnaeus, 1758) (Odonata: Libellulidae) en la provincia de León (Norte de España). *Archivos Entomológicos* 21: 151-156. (in Spanish, with English summary) ["14 new locations of *S. flaveolum* in the province of León (Northern Spain) are presented, which increase its distribution known so far in this territory from 4 to 15 UTM squares of 10x10 km." (Authors)] Address: Sanz Sanz, T., c/ El Esguilo, 4. E-24878 Fresnedo de Valdellorma (León). E-mail: donguillos@hotmail.com

17293. Sasamoto, A.; Yokoi, N.; Souphanthong, V.; Phan, Q.T.; Futahashi, R. (2019): Discovery of a third species of the genus *Noguchiphaea* Asahina, 1976 – *Noguchiphaea laotica* sp. n. from Laos (Odonata: Calopterygidae). *International Journal of Odonatology* 22(1): 59-71. (in English) ["*N. laotica*, is described based on specimens from Lon San, Saysomboun Province, Laos. The holotype ♂ and a paratype ♀ are deposited in the National Museum of Nature and Science, Tokyo. This new species is allied to *N. yoshikoae* from northern Thailand, but differs from it in the morphology of the male cercus

which is depressed centrally apically in dorsal view, and with a more robust dorsal spine at about one-third from its base. In addition, DNA analyses confirm that there are genetic differences between *N. laotica* and *N. yoshikoae*. Some observations on the ecology and behavior of *N. laotica* are briefly reported." (Authors)] Address: Sasamoto, A., Oh 531-3, Tawaramoto-cho, Shiki-gun, Japan. E-mail: akssmt@sea.plala.or.jp

17294. Schädler, M.; Nicolai, B.; Schäfer, B.; Schulze, M. (2019): Aktuelle Funde südlich verbreiteter Insektenarten (Blattodea, Mantodea, Orthoptera, Odonata) in Mittel- und Ostdeutschland (Sachsen-Anhalt, Sachsen, Brandenburg, Thüringen). *Entomologische Nachrichten und Berichte* 63(3): 269-279. (in German, with English summary) ["Current finds of insect species widespread in the south (Blattodea, Mantodea, Orthoptera, Odonata) in Central and Eastern Germany (Saxony-Anhalt, Saxony, Brandenburg, Thuringia)." Authors]. Records of *Erythromma lindenii*, *Orthetrum brunneum* and *Sympetrum meridionale* are documented. Address: Schulze, M., RANA, Mühlweg 39, 06114 Halle, Germany. E-mail: martin.schulze@rana-halle.de

17295. Scheurer, S. (2019): Einfluss von polarisiertem Licht auf Insekten und ihr Eiablageverhalten in der Landwirtschaft. Bachelor thesis, ZHAW Zürcher Hochschule für Angewandte Wissenschaften: 45 pp. ["Linearly polarized light provides crucial visual information to water-seeking insects. Normally, the light reflected off water surfaces is polarized and can therefore be used to recognise the surface as water. At present more and more man-made artificial surfaces with similar reflective properties can be found, which can lead to fatal decisions by insects. In agriculture, for example, woven polypropylene mulch is used, which has corresponding properties. In a pumpkin field in Bütschwil, in the Bernese Seeland, as well as another in Steffisburg near Thun, this mulch is used in the cultivation process. As such, these fields were able to serve as location for field observations. With a focus on Odonata, several field surveys were carried out during the 2019 season and the behaviour of the dragonflies and their species was recorded. Furthermore, a theoretical background for these dragonfly species and the polarization of light is provided. In addition, measurements of different woven polypropylene products with respect to their polarization properties were performed and further possible sources for linearly polarized light were investigated. In both study areas, various dragonflies with species-specific behaviour could be observed, which is typically seen in their reproductive waters. These measurements on the aforementioned ribbon fabrics showed very similar reflective properties to those on water surfaces and only one white fabric had a limited polarizing effect. In addition, research revealed many other possible sources of polarized light, some of which are presented, and possible solutions are discussed. Further study approaches are recommended and a proposal for the introduction of the topic into the study of environmental engineering at the ZHAW is made." (Author)] Address: not stated

17296. Schneider, B.; Wildermuth, H. (2019): How do emerging damselflies cope with predator attacks? (Odonata: Zygoptera). *Notulae odonatologicae* 9(4): 152-157. (in English)

["Emerging damselflies are vulnerable to predator attacks and considered to be at high risk at this stage of their life cycle. We filmed bird and frog attacks on damselflies ready to emerge in slow motion and analysed their reactions. Pharate damselfly larvae that had left the water reacted to approaching wagtails and frogs by disengaging from the substrate, dropping with flipping movements back into the water and trying to swim away rapidly thus escaping these predators. It is inferred that until immediately before eclosion, pharate larvae that have left the water are able to recognize approaching predators and to react adaptively. Death feigning only occurs after physical contact with the predator." (Authors)] Address: Schneider, B., Wolfbühlstr. 34A, 8408 Winterthur, Switzerland. E-mail: beatsch@bluemail.ch

17297. Schreier, A.L.; Schlaht, R.M.; Swedell, L. (2019): Meat eating in wild hamadryas baboons: Opportunistic trade-offs between insects and vertebrates. *American Journal of Primatology* 2019; e23029: 12 pp. (in English) ["Insects made up 0.5% of the baboons' annual diet, ranging from 0% to 2% of monthly diets (Figure 2). The baboons' insect consumption consisted primarily of locusts and dragonflies). Most of this feeding occurred when swarms of these organisms passed through the Filoha region. In almost all of these cases, most members of the band simultaneously fed on these insects, chasing and jumping up to capture and eat them. Predation success was high with the baboons catching an insect during the majority of attempts; the very large numbers of these insects during outbreaks allowed the baboons to repeatedly catch insects over a period of time generally lasting from 30 min to 1 hr. Almost all insect eating occurred in Acacia scrubland habitat where they spent almost half of their time, although the baboons fed on dragonflies a few times when a swarm passed through their sleeping cliff. (Authors)] Address: Schreier, Amy, Dept Biol., Regis Univ., 3333 Regis Blvd. D 18, Denver, CO, USA. E-mail: aschreier@regis.edu

17298. Seehausen, M. (2019): Zur Geschichte und Bedeutung der Libellensammlungen in Institutionen Deutschlands, Österreichs und der Schweiz (Odonata). *Libellula* 38(1/2): 29-70. (in German, with English summary) ["About the history and significance of Odonata collections of institutions in Germany, Austria, and Switzerland – The history and significance of Odonata collections of institutions in Germany, Austria, and Switzerland were examined. Altogether > 236.480 specimens were localized in 103 of about 140 requested institutions. Of these, 76 institutions were in Germany with > 176.480 specimens, eight institutions were in Austria with > 32.300 specimens, and 19 institutions were in Switzerland with > 27.700 specimens. Listed are 49 species and subspecies described on the basis of material from Germany, Austria, and Switzerland. Up to date 13 of these species are valid names within the native fauna. The deposition of the type material is denoted as far as it is known. Some lost collections are specified and difficulties in handling with historical collections are discussed. The potential for further information about distribution and occurrence of the species is considered to be important and revision of the collections suggested." (Author)] Address: Seehausen, M., Museum Wiesbaden, Landesmuseum für Kunst und Natur,

Friedrich-Ebert-Allee 2, D-65185 Wiesbaden, Germany. E-mail: malte.seehausen@museum-wiesbaden.de

17299. Seehausen, M.; Kunz, B.; Havelka, P.; Martens, A. (2019): An ectoparasite of caterpillars, *Forcipomyia fuliginosa* (Diptera: Ceratopogonidae), recorded sucking haemolymph from an *Aeshna juncea* just before maiden flight (Odonata: Aeshnidae). *Notulae odonatologicae* 9(4): 169-172. (in English) ["In June 2014, in a mire near Nadibani, Georgia, a female biting midge of *F. (Microhelea) fuliginosa* was found parasitizing a female of *A. juncea* just before its maiden flight. The midge was observed sucking at a soft area of the mesothorax. *F. fuliginosa* is well known as an ectoparasite of caterpillars and sawfly larvae." (Authors)] Address: Seehausen, M., Museum Wiesbaden, Friedrich-Ebert-Allee 2, 65462 Wiesbaden, Germany. E-mail: malte.seehausen@museum-wiesbaden.de

17300. Selvarasu, P.; Gunasekaran, C.; Agnes Deepa, A.; Mohana, P.; Raj Kumar, V. Chinnaraj, P. (2019): Diversity of odonates (Insecta: Odonata) in different habitats of Vellore District, Tamil Nadu, India in eastern Ghats. *International Journal of Recent Scientific Research* 10(4): 32127-32130. (in English) ["The objective of the preliminary study of Odonates is to explore the diversity of Odonata in different habitats are Amirthi streams, Mordhana dam and Pulliyanthangal Lake in Vellore district. Totally the 30 species of Odonates including 17 species under 2 families of Anisoptera and 13 species under 2 families of Zygoptera were recorded from June 2017 to May 2018. The 26 species of Odonates were documented in habitats near Mordhana dam reservoir, 25 species from near Amirthi streams and 16 species were recorded from Pulliyanthangal Lake. 30 species were recorded in all the three different habitats. Among these species, Libellulidae and Coenagrionidae were the dominant families with maximum number of species abundance in the study area. The most abundant Anisopteran species in Amirthi falls are *Diplacodes trivialis* and *Pantala flavescens*, and in Mordhana dam and Pulliyanthangal Lake were encompass with *Brachythemis contaminata*. Among the Zygopteran species the most abundant species are *Ceriatagrion coromandelianum* in all habitats. These data will be useful in future studies and conservation of biodiversity in the studied habitats." (Authors)] Address: Selvarasu, P., Unit of Conservation Biol., Dept Zool., Bharathiar Univ., Coimbatore- 641 046, India

17301. Shabani, E.I.; Liu, M.H.; Yu, H.X., Muhigwa, J.-B.; Geng, F.F. (2019): Benthic macroinvertebrate diversity and functional feeding groups in relation to physicochemical factors in Sanjiang plain wetlands, northeast China. *Applied Ecology and Environmental Research* 17(2): 3387-3402. (in English) ["Sanjiang plain wetland is the largest freshwater ecosystem in northeast China, and with its richness in animal and plant species, it displays a high biodiversity. This study provides information about benthic macroinvertebrate diversity and functional groups in association with physicochemical parameters in wetland habitats of Sanjiang plain. Benthic macroinvertebrate samples were collected using a D-frame aquatic net. Shannon-Wiener, Simpson and Pileou's evenness indices were calculated in terms of abundance. The relationship between measured physicochemical variables and benthic

macroinvertebrate functional feeding groups (FFGs) was explored using CCA. A total of 57 macroinvertebrate taxa were collected from the 16 sampling sites. Aquatic insects were the most abundant with 11 families, Dytiscidae, Chironomidae, Leptophlebiidae, Belostomatidae, Corixidae, Geridae, Corduliidae, Gomphidae, Macromiinae, Libellulidae and Phryganeidae. Chironomids were the most diverse and abundant with 26 taxa. The metrics of abundance, Shannon-Wiener, Simpson and Pileou's evenness indices differed significantly among the 16 sampling sites ($p = 0.0163$, $p = 0.0092$, $p = 0.0474$, $p = 0.0222$, respectively). The findings showed that these 57 benthic macroinvertebrate taxa were categorized in six functional feeding groups, including 19 predators, 15 gathering-collectors, 7 scrapers, 6 filtering-collectors, 5 omnivores and 5 shredders. CCA results displayed that benthic macroinvertebrate functional feeding groups had strong relationships with the physicochemical characteristics in the wetlands of Sanjiang plain." (Authors)] Address: Liu, M.H., Lab. Hydrobiol., College of Wildlife Resource, Northeast Forestry Univ. Harbin P.O. Box 150040, China. E-mail: manhong@nefu.edu.cn

17302. Shaikh, J.; Baloch, N.; Bughio, B.A.; Ashfaque Ahmed, A.; Mutha, S.T.; Kalhor, A.S.; Ali, S. (2019): Distribution of dragonflies and damselflies (Arthropoda: Odonata) from district Jamshoro Sindh. *Journal of Entomology and Zoology Studies* 7(3): 394-396. (in English) [Odonata in district Jamshoro (Almanzar, Kotri, Sehwan, Manjhand and Thano Boola Khan) during year 2017-2018 were studied resulting in 350 specimens: *Crocothemis servilia*, *Orthetrum sabina*, *Bradinopyga geminata*, *Ischnura elegans*, *I. ramburii*, *I. verticalis* [sic].] Address: Shaikh, Jaweria, Dept Zool., Univ. Sindh Jamshoro, Pakistan

17303. Shaish, R. (2019): Rediscovery of *Agriocnemis sania* in northern Israel (Odonata: Coenagrionidae). *Notulae odonatologicae* 9(3): 109-112. (in English) ["*A. sania* is an Afro-Sudanese damselfly which was common in northern Israel until the early 1970s and was last recorded in 1986. In October 2014 ca 15 individuals of this species were found at Nahal Zavitan, Golan Heights, northern Israel, suggesting that this species persists in that country." (Author)] Address: Shaish, R., Vardon 71a, 79437, Israel. E-mail: Ficedulars@gmail.com

17304. Shapovalov, M.I.; Korotkov, E.A. (2019): Fauna of Odonata of the Adygheya Republic (North-Western Caucasus). *Russian Entomol. J.* 28(4): 341-349. (in English, with Russian summary) ["An annotated checklist of Odonata of the Adygheya Republic (Russia) is given. It includes 43 species of eight families: Calopterygidae (2 species), Coenagrionidae (10), Platynemididae (1), Lestidae (6), Aeshnidae (8), Corduliidae (1), Gomphidae (3) and Libellulidae (12). New collecting sites are given for 39 species. *Coenagrion scitulum*, *Erythromma najas najas*, *Pyrrhosoma nymphula*, *Onychogomphus flexuosus*, *Cordulia aenea*, *Orthetrum cancellatum*, *O. coerulescens anceps*, *Sympetrum fonscolombii* and *Crocothemis erythraea* are described for the first time for the Republic of Adygheya." (Authors)] Address: Shapovalov, M.I., Lab. for Bioecological Monitoring of the Invertebrate Animals of Adygheya, Res. Inst. of Complex Problems, Adyghe State Univ., Gagarina

str. 13, Maykop 385000, Adygheya Republic, Russia. E-mail: shapmaksim2017@yandex.ru

17305. Sharma, G. (2019): Studies on the reproductive behaviour of *Ischnura nursei* Morton (Odonata: Insecta) at Asan reservoir, District Dehradun, Uttarakhand, India. *Bio Bulletin* 5(2): 14-17. (in English) ["The reproductive behaviour of *I. nursei* was studied four times at Asan Reservoir, District Dehradun, Uttarakhand during June-July, 2019. Courtship is well marked and male demonstrate a circular territory with a radius of about 0.5-1 meter and defended it from the intruding intra or some inter specific male by warning signals like wing vibration or abdomen raising. As female entered into the territory, the male starts following her and forms a tandem link, catching hold of her prothorax by his anal appendages. The before wheel tandem lasted for 5-8 minutes and during this period intramale sperm translocation from the gonopore to the vesicular spermalis took place 2-3 times of 30-50 seconds duration. The courtship wheel lasts for about 6-10 minutes and is performed of perching on vegetation near the reservoir. After wheel tandem lasted for 5-8 minutes. Oviposition is endophytic among the aquatic vegetation and lasts for 7-12 minutes. The female in tandem climbs down underwater and uses her ovipositor to deposit eggs in the submerged vegetation. During oviposition the male in tandem and after release of grip hovers around the female, to defend her from intruding intra- or inter-specific males. The duration of reproductive behaviour lasts for 22-38 minutes." (Authors)] Address: Sharma, G., Zoological Survey of India, Northern Regional Centre, Kaulagarh Road, Dehradun-248195, Uttarakhand, India

17306. Shome, A.R.; Rahman, M.; Alam, M. (2019): An unusual case of gynandromorphism in *Neurothemis tullia* (Odonata: Libellulidae). *Notulae odonatologicae* 9(3): 96-102. (in English) ["An unusual gynandromorphic individual of *N. tullia* is reported from Faridpur District in Bangladesh. The head and thorax, including wings, are clearly bilaterally gynandromorphic. The abdomen is entirely pruinose androchromic with very few light spots left, however the abdominal tip bears female appendages. This unusual combination of gynandromorphism and androchromy is discussed in respect of its possible origin." (Authors)] Address: Alam, M., Dept Zool., Univ. Dhaka, BD-Dhaka 1000, Bangladesh. E-mail: mahabub.zoo@du.ac.bd

17307. Shumway, N.; Laurence, S.J. (2019): The impact of deformation on the aerodynamics of flapping dragonfly wings. *AIAA Scitech 2019 Forum, AIAA SciTech Forum*, (AIAA 2019-1378), <https://doi.org/10.2514/6.2019-1378>: 18 pp. (in English) ["As unmanned aerial vehicles continue to decrease in size, the use of flexible wings, imitating those found in nature, is becoming more prevalent. In order to better understand the effects of flexibility 011 the aerodynamics of dragonfly wings, measurements of wing deformations during the free flight of dragonfly specimens were conducted. The OVER-TURNS CFD solver was then modified to simulate the motion of both rigid and deforming wings, following the same bulk kinematics, so that the associated forces and flow fields produced could be compared. The deformation for both fore-

and hindwings resulted in camber during the body-relative downstroke and twist during the upstroke. This pattern of deformation was consistent even when the dragonflies were flying while inverted. Comparing the forces from the simulations revealed that deforming wings produce more lift and a comparable amount of thrust at a much higher efficiency than the rigid wings. This indicates that wings on the MAV scale can have improved efficiency if they are designed to allow a particular deformation pattern." (Authors)] Address: Shumway, N., Univ. Maryland, College Park; Stuart J. Laurence, Univ. of Maryland, College Park

17308. Shumway, N.M. (2019): Wing kinematics, deformations, and aerodynamics of dragonflies in free flight. Ph.D. thesis, Faculty of the Graduate School, University of Maryland, College Park: 131 pp. (in English) ["The development of Micro Aerial Vehicles (MAVs) has led researchers to study insects in order to better understand aerodynamic mechanisms and wing kinematics that achieve high performance flight at small scales. Dragonflies in particular are a good candidate for study, as their size is comparable to the target size of MAVs and they are able remain stable while flying in highly variable conditions. To better understand undisturbed steady flight and gust response of dragonflies, experiments were conducted to measure detailed wing kinematics and deformations in free flight both through a quiescent environment and when encountering a lateral gust. A custom testing environment was developed in which dragonflies would fly through an enclosed area with high-speed cameras capturing both their body motion and that of markers placed on their wings. Due to the nature of the setup and how the dragonflies were released, they would frequently fly while inverted rather than upright and a comparison between upright and inverted flight is included in this work. During inverted flight the tested specimens flew in such a way that their wings had a similar orientation in the global reference frame to that of the wings in the upright flights. The two primary kinematic variables that were changed to produce this result were the wing pitch angle and the body elevation angle. In addition, the dragonflies modulated the amount of time spent in the downstroke versus the upstroke so that in either case their wings spent more time moving down in the global frame. When dragonflies encountered a lateral gust, they increased the pitching of their windward wings, using left-right asymmetric kinematics to maintain a straight flight path through the disturbance. From these experimental data, models were developed for both the wing kinematics and the wing deformations, and these were incorporated into flapping wing simulations using the OVERTURNS computational fluid dynamics (CFD) code. Two sets of such CFD simulations were run: one of rigid wings and the other of deforming wings. For both rigid and deforming wings, the interaction between the fore- and hindwing increased the force production on both wings when compared to fore- and hindwings in isolation. The largest differences between isolated and tandem wings were seen for the hindwing as it passed through the wake of the forewing. The wing deformations slightly decreased the total force production, compared to the rigid wings, by reducing the amount of flow separation on the bottom of the wing during the upstroke. The impact of the camber deformation, during the body-relative downstroke, was

dependent on the specific wing kinematics. Though the total force produced decreased, the wing deformations substantially increased the efficiency for both wings." (Author)] Address: not stated

17309. Sibley, F.; Paseka, J.; Beckemeyer, R (2019): The Dragonflies and Damselflies of Nebraska. Zea E-Books. 78: III, 95 pp. (in English) ["The Nebraska odonate list has 109 species in Zygoptera with 47 species and Anisoptera with 62 species. Nebraska had been very poorly surveyed prior to 2005 and 63 counties had fewer than 10 records. By 2017 the number of county records had nearly quadrupled, to over 3000 records, the average county total had increased from 9 to 33 and all counties had at least 21 records. An effort was made to collect data more or less uniformly from all 93 Nebraska counties. The areas with intense corn and soybean farming, eastern and southcentral areas, are low in diversity (21-30 species per county), the southeast and western half of the state are higher (31-40 species) and the northwestern and northern Sandhill counties are the richest with more than 50 species per county. The present state list of 109 species represents 12 additions since 1998. Eleven additional species have been reported from the state, but are considered invalid or have been re-identified. This paper presents a short history of odonate study in Nebraska and an analysis of the data for the 109 species recorded in Nebraska to date. Distribution maps by county are included for each identified species." (Authors)] Address: Fred Sibley: fcsibley@empacc.net

17310. Šiblova, Z.; Moyzeova, M. (2019): Výskum vážok (Odonata) mokradí Borskej nížiny - Dragonflies and Damselflies (Odonata) research of wetlands in the area of Borska Nižina. *Ekologické štúdie* 10(1): 119-126. (in Slovakian, with English summary) ["The Borská nížina lowland is an important area in terms of the occurrence of rare wetland habitats, to which important dragonfly species with high conservation value are bound. Research was conducted in 2018 during the season from May to August. Together 9 sites were visited, on which 38 species, 7 taxa on genus level (*Cordulegaster* sp.) and 3657 individuals of dragonflies were confirmed. The individual sites were compared based on the dominance calculation and Menhinick's species richness index. For each site the risk factors were evaluated and possible management measures suggested." (Authors) *Anaciaeschna isosceles*, *Anax imperator*, *Brachytron pratense*, *Libellula fulva*, *Orthetrum coerulescens*, *O. brunneum*, *Somatochlora flavomaculata*, *Sympecma fusca*, *Leucorrhinia pectoralis*] Address: Šiblová, Zuzana, Katedra ekológie a environmentalistiky, Fakulta prírodných vied, Univerzita Konštantína Filozofa v Nitre, Trieda A. Hlinku 1, 949 74 Nitra, Slovakia. E-mail: zuzana.siblova@savba.sk

17311. Simon, E.; Tóthmérész, B.; Kis, O.; Jakab, T.; Szalay, P.E.; Vincze, A.; Baranyai, E.; Harangi, S.; Miskolczi, M.; Dévai, G. (2019): Environmental-friendly contamination assessment of habitats based on the trace element content of dragonfly exuviae. *Water* 2019, 11(11), 2200; 10 pp. (in English) ["We tested the usefulness of exuviae as an environmentally friendly method for exploring the variability of the trace element contents of protected insect populations without killing specimens. It

is a notable characteristic of dragonflies that they are good ecological indicators for both aquatic and terrestrial habitat quality. Thus, we investigated the trace element accumulation in different stages of dragonflies: larva, exuvia, and adult. Using microwave plasma atomic emission spectrometry (MP-AES), we analysed the concentrations of Al, Ba, Cr, Cu, Fe, Mn, Pb, Sr and Zn. We found that the trace element contents of exuviae are a good proxy of the trace element contents of both the larvae and the adults. We conclude that exuvia is useful for assessing the environmental health of aquatic ecosystems. It is an environmentally friendly method and it can be used even in the case of protected dragonfly species." (Authors)] Address: Simon, Edina, Dept of Ecology, Univ. of Debrecen, Egyetem sq. 1, H-4032 Debrecen, Hungary

17312. Sivtseva, L.V.; Davydova, N.G. (2019): First record of *Somatochlora alpestris* (Selys, 1840) (Odonata, Corduliidae) in Yakutia, Russia. *Eurasian Entomological Journal* 18(3): 175-176. (in Russian, with English summary) ["*S. alpestris* S. is newly recorded from Yakutia in the middle course of the river Indigirka near Kulun-Elbut village, 66°49'03" N, 142°43'59" E." (Authors)] Address: Sivtseva, L.V., Inst. Biological Problems of Cryolithozone SB RAS, Prosp. Leninà 41, Yakutsk 677980 Russia. E-mail: sivtseva_l@mail.ru

17313. Slimani, N.; Sánchez-Fernández, D.; Guilbert, E.; Boumaïza, M.; Guareschi, S.; Thioulouse, J. (2019): Assessing potential surrogates of macroinvertebrate diversity in North-African Mediterranean aquatic ecosystems. *Ecological Indicators* 101: 324-329. (in English) ["Highlights: •Macroinvertebrate taxa are assessed as surrogates of aquatic biodiversity in Africa. •We found congruence among their patterns of species richness and composition. •Higher-taxa (mainly genus) can be used to predict species diversity. •We propose the use of Ephemeroptera and Coleoptera at genus level as surrogates. Abstract: The need to use surrogates of biodiversity is quite relevant in threatened habitats harboring high values of biodiversity, such as the Mediterranean aquatic ecosystems. In this study, we assess the performance of eight macroinvertebrate groups (Coleoptera, Heteroptera, Odonata, Trichoptera, Plecoptera, Ephemeroptera, Crustacea, and Mollusca) as surrogates of the whole aquatic macroinvertebrate assemblage in 49 localities from Northern Africa (Tunisia). Specifically, we aimed to test i) the congruence of the patterns of species richness and composition among these eight groups (at species level) in order to propose which groups could be accurate as indicators of diversity of the whole community, and ii) if higher-taxon levels (genera or families) are suitable for predicting overall species richness and composition in these ecosystems. In total, we found 72 families, 157 genera and 280 species. Our results show a high congruence between the patterns of species richness and composition of Ephemeroptera, Coleoptera (even at higher taxonomic levels, especially genus) and the whole community. Thus, we recommend the use of these two groups as surrogates of macroinvertebrate diversity in inland aquatic ecosystem in the study area. They can be used for both i) the rapid and inexpensive monitoring of biodiversity in aquatic ecosystems and ii) conservational studies in order to identify areas

with the highest values of freshwater biodiversity in Mediterranean areas. Finally, high values of congruence among taxonomic levels were found suggesting that, in general, higher taxa can be used as biodiversity surrogates for cost-effective practical survey in Mediterranean aquatic ecosystems from Northern Africa." (Authors)] Address: Slimania, Noura, UMR7179 CNRS/MNHN, Muséum National d'Histoire Naturelle, CP 50, 57 rue Cuvier, 75005 Paris, France. E-mail: noura.slimani@edu.mnhn.fr

17314. Smith, G.R.; Harmon, J.J. (2019): Differential oviposition and offspring success of gray treefrogs in the presence of an invasive fish. *Ecosphere* 10(2). Article e02612: 9 pp. (in English) ["Females often decide where to place their eggs or offspring based on the relative risks and benefits of a location. One trade-off may be between ovipositing with predators and ovipositing with competitors. Many amphibians show risk-sensitive oviposition and select oviposition sites based on offspring performance. We examined differential oviposition and offspring success by gray treefrogs (*Hyla versicolor*) in response to the presence of caged or free-ranging invasive western mosquitofish (*Gambusia affinis*) using cattletank mesocosms as experimental ponds. Our experiment sought to answer these questions by comparing the number of eggs laid and tadpoles produced among the experimental treatments: (1) Do gray treefrogs exhibit risk-sensitive oviposition? and (2) What is the relative importance of pre-colonization and post-colonization consumptive and trait-mediated effects of western mosquitofish? Gray treefrogs laid more eggs in control and caged predator mesocosms than in free-ranging predator mesocosms. At the end of the experiment, there were more tadpoles in control and caged predator mesocosms than in free-ranging predator mesocosms. Proportional yield was lower in free-ranging predator mesocosms than control and caged predator mesocosms. Eggs were laid 7.8 d earlier in control mesocosms than caged and free-ranging predator mesocosms. Western mosquitofish therefore had a negative effect on the successful colonization of experimental ponds by gray treefrogs, most likely through direct physical interactions. Our results also suggest gray treefrogs shift oviposition preferences as the number of conspecifics reaches a threshold where competition risk outweighs predation risk. Western mosquitofish therefore have great potential to affect the distribution of gray treefrogs through pre- and post-colonization effects." (Authors)] Address: Smith, G.R., Dept of Biol., Denison Univ., Granville, Ohio 43023 USA. E-mail: smithg@denison.edu

17315. Sniegula, S.; Nsanzimana, J.; Johansson, F. (2019): Predation risk affects egg mortality and carry over effects in the larval stages in damselflies. *Freshwater Biology* 64(4): 778-786. (in English) ["1. The non-consumptive predator effect may incur physiological costs that affect growth and development and ultimately survival. While studies have shown that the effect can affect development and growth in organisms with complex life cycles, we have limited knowledge on the effect in the egg and early larval stage. 2. Here, we used a laboratory experiment to examine how the presence of chemical cues, a non-consumptive predator effect, from an aquatic predator,

perch, affected hatching success of larvae in three species of damselfly, *Ischnura elegans*, *Coenagrion pulchellum*, and *Enallagma cyathigerum*. In addition, we examined how exposure to predation risk in the early larval stages affected growth in the late larval stages of *I. elegans*. 3. We found that the presence of chemical predator cues (1) increased egg mortality in all three species, (2) caused earlier hatching of eggs in one species, no change in a second species and a delay in egg hatching in a third species. We also found that predator cues have the potential to cause a carryover effect from early larval stages to late larval stages in terms of larval growth rate. 4. The addition of non-consumptive predator cues in the form of fish water caused higher algal growth than in the control experimental containers, and we suggest that this algal growth has the potential to confound predator stress cues. 5. Our results show that the non-consumptive predator effects affect survival and growth, and hence they have the potential to affect predator-prey dynamics in natural systems. Future studies on such effects in aquatic systems should consider confounding stressors, such as algae, fungi, oxygen, and nutrients levels, that might come with the addition of predation cues in water and thus add additional stress." (Authors)] Address: Sniegula, S., Dept Ecosystem Conserv., Inst. Nature Conservation, Polish Acad. Sciences, Krakow, Poland. Email: szymon.sniegula@gmail.com

17316. Solis, M.; Arias, M.; Fanelli, S.; Bonetto, C.; Mugni, H. (2019): Agrochemicals' effects on functional feeding groups of macroinvertebrates in Pampas streams. *Ecological Indicators* 101(6): 373-379. (in English) ["Highlights: • Nutrients and endosulfan concentrations were higher in streams adjacent to crops. • Total invertebrate abundance and taxonomic richness were lower in cropped sites. • Shredders were dominant at the reserve and livestock streams. • Scrapers and predators were dominant at the cultivated sites. • Land use is causing change in functional feeding groups' composition. Abstract: The use of agrochemicals in Argentina has increased over the last decades and may represent an environmental risk for adjacent water bodies. In this work we study the invertebrate assemblages in nine streams sampled at 11 sites with different land use on the adjacent plots in the years 2011–2014. Four sites were located inside a biosphere reserve, 4 sites were located adjacent to livestock plots and the other 3 sites were adjacent to cropped plots. The taxa composition was assessed and sorted into functional feeding groups: shredders, gatherers, filterers, scrapers and predators. Significant differences were detected among the functional feeding groups according to the use given to the adjacent land. Total density and taxonomic richness were significantly higher in the streams next to the reserve and livestock sites than in those adjacent to cropped plots; there were no differences between the first two. Gatherers and shredders density was significantly higher in the reserve and livestock than in the cropped sites. Scrapers and predators were the best represented at the cropped sites. Nutrient concentrations in water and endosulfan concentrations in the bottom sediments were also higher at the cultivated sites, suggesting that agrochemical loads from land cultivation caused the observed differences in composition." (Authors)] Address: Solis, Marina, ILPLA Instituto de Limnología Dr. Raúl A. Ringuelet, CONICET

– UNLP, Boulevard 120 y 62. La Plata, 1900 Buenos Aires, Argentina. E-mail: marinasolis@ilpla.edu.ar

17317. Spyra, A.; Strzelec, M. (2019): The implications of the impact of the recreational use of forest mining ponds on benthic invertebrates with special emphasis on gastropods. *Biologia* 74: 981-992. (in English) ["The relationships between the distribution and diversity patterns of benthic invertebrates in forest ponds used for different recreational activities were examined in this study. The study was based on sampling of benthic invertebrates, plant coverage, physical and chemical analysis of water samples and multivariate species analysis. Mining ponds varied in their solution chemistry and plant cover, with those used for recreation having significantly lower invertebrate occurrences (755 ind. m⁻²) compared to ponds with no recreational use (2629 ind. m⁻²). Statistically significant differences were also observed in the density of Oligochaeta, Hirudinea, Coleoptera, Trichoptera and Diptera between the two types of ponds. Overall, gastropods were more diverse and abundant in ponds not used for recreation. This appeared to relate strongly to plant cover, since cover was greatly reduced in recreational ponds, although plant diversity was enhanced. Density and diversity of benthic invertebrates was also observed to differ in relation to the kind of recreational use involved (recreational angling, swimming, power boating) although this was not quantified. The occurrence of freshwater snails primarily depended on the Ca concentration, the conductivity of the water and plant cover, but recreational disturbance appeared to reduce abundance where it occurred and was related to a reduction in overall plant cover." (Authors)] Address: Spyra, Aneta, Dept Hydrobiol. Fac. Biol. & Environmental Protection, Univ. of Silesia, ul. Bankowa 9, 40-007 Katowice, Poland. E-mail: aneta.spyra@us.edu.pl

17318. Sreelekshmi, S.; Abhilash, R. (2019): A preliminary study on the odonate diversity of Randapuncha wetland, Kulanada, Patanamthitta district, Kerala. *Science Chronicle* 8 (1&2): 1-8. (in English) ["A study was carried out to assess the Odonata fauna of Randam Puncha wetland near Kulanada in Pathanamthitta district from the first week of April to second week of June 2016. A total of 18 species of Odonates representing 3 families (Libellulidae, Gomphidae, Coenagrionidae) were recorded from Randam Puncha, Kulanada during the study period. *Acisoma panorpoides*, *Aethrimanta brevipennis*, *Brachydiplax chalybea*, *Rhyothemis variegata* and *Orthetrum sabina* were the common dragonflies spotted on the site. On the basis of total number of individuals recorded, Libellulidae was the most dominant family. The Shannon-Weiner diversity index recorded a higher value of 2.405 in Randam Puncha and the Margalef species richness was 2.409. The values of Pielou's evenness index 0.652 showed medium even distribution of species; the dominance index recorded was 0.895. Even though any rare or endangered species were not recorded in the present study, the Randam Puncha wetland showed rich odonate diversity and abundance." (Authors)] Address: Abhilash, R., Dept Zool., Christian College, Chengannur, Kerala, India. E-mail: greenabilash@gmail.com

17319. Stand-Perez, M.A.; Bota-Sierra, C.A.; Pérez-Gutiérrez, L.A. (2019): *Heteragrion demarmelsi* sp. nov., with taxonomic notes on Colombian *Heteragrion* species (Odonata: Heteragrionidae). *Zootaxa* 4623(1): 90-112. (in English, with Spanish summary) ["The large genus *Heteragrion* has a wide distribution in the Neotropics from southern Mexico to northern Argentina, occurring from sea level to 1800 m.a.s.l. In Colombia, so far ten species and two subspecies of the genus *Heteragrion* have been found; here we raise this number to 14, with three new records for the country (*H. angustipenne* Selys, 1886, *H. flavidorsum* Calvert, 1909 and *H. valgum* Donnelly, 1992), and the description of *H. demarmelsi* sp. nov. from Leticia Municipality, Amazonas Department. Also, the females of *H. angustipenne* and *H. flavidorsum* are described for the first time. *H. peregrinum* Williamson, 1919 is rediscovered and reported in new locations. Photographs of the main structures of taxonomic importance of males and females of all species of *Heteragrion* from Colombia are presented. Finally, we provide distribution maps, a taxonomic key (for males and females), and comments on the natural history of all *Heteragrion* species known from Colombia, are also included." (Authors)] Address: Stand-Perez, M.A., Grupo de investigación Biodiversidad del Caribe Colombiano, Depto Biol., Univ. del Atlántico, Barranquilla, Colombia. E-mail: mstand20@gmail.com

17320. Stavenga, D.G.; Wilts, B.D. (2019): Measuring the refractive index dispersion of (un)pigmented biological tissues by Jamin-Lebedeff interference microscopy. *AIP Advances* 9, 085107 (2019); <https://doi.org/10.1063/1.5113485>: 9 pp. (in English) ["Jamin-Lebedeff interference microscopy is a powerful technique for measuring the refractive index of microscopically-sized solid objects. This method was classically used for transparent objects immersed in various refractive-index matching media by applying light of a certain pre-designed wavelength. In previous studies, we demonstrated that the Jamin-Lebedeff microscopy approach can also be utilized to determine the refractive index of pigmented media for a wide range of wavelengths across the visible spectrum. The theoretical basis of the extended method was however only precise for a single wavelength, dependent on the characteristics of the microscope setup. Using Jones calculus, we here present a complete theory of Jamin-Lebedeff interference microscopy that incorporates the wavelength-dependent correction factors of the half- and quarter-wave plates. We show that the method can indeed be used universally in that it allows the assessment of the refractive index dispersion of both unpigmented and pigmented microscopic media. We illustrate this on the case of the red-pigmented wing of the damselfly *Hetaerina americana* and find that very similar refractive indices are obtained whether or not the wave-plate correction factors are accounted for." (Authors)] Address: Wilts, B.D., Adolphe Merkle Institute, University of Fribourg, CH-1700 Fribourg, Switzerland. E-mail: bodo.wilts@unifr.ch

17321. Storari, A.P.; Pereira, D.; Furieri, K.S. (2019): New occurrences of dragonflies in the Atlantic Forest fragments of Santa Teresa, Espírito Santo, Brazil. *Revista Brasileira de Gestão Ambiental e Sustentabilidade* 6(13): 481-497. (in Eng-

lish, Portuguese) ["One of the greatest obstacles to biodiversity conservation is the lack of information to prioritize efforts on practical actions. This lack of information comes mainly from absence of inventories in many areas where few groups have reasonably complete databases. The distribution of the dragonfly fauna of Brazil is little known - only 29% of the Brazilian territory presents data about the richness of Odonata. In this contribution, a database of Odonata species of Santa Teresa Municipality was built, Espírito Santo State, Brazil. The database has 627 specimens registered, 77 species distributed in eight families and 38 genera, 40 of these species are common, one endemic of the State of Espírito Santo, and 19 endemic of Brazil. In relation to the measure of conservation, four species are present in the category Insufficient Data (DD), one present in the Nearly Endangered (NT) category, three species in the Vulnerable category (VU) and one in the category In Danger (EN). 25 species are considered new occurrences for the city. These results suggest that the fauna of the studied region deserves attention and points to the interest in implanting future conservation units in the region of Santa Teresa municipality." (Authors)] Address: Storari, Arianny, Depto Ciênc. Biol., Centro Ciênc. Humanas e Naturais. Univ. Fed. do Espírito Santo. Avenida Fernando Ferrari, 514. Goiabeiras. Vitória-ES, Brasil (CEP 29075-910). Email: ariannystorari@gmail.com

17322. Stretz, P.; Anderson, T.L.; Burkhart, J.J. (2019): Macroinvertebrate foraging on larval *Ambystoma maculatum* across ontogeny. *Copeia* 107(2): 244-249. (in English) ["Understanding community interactions, such as predator-prey dynamics, is vital for determining species viability. Outside of larger macroinvertebrate predators, such as crayfish and dragonfly larvae, there is a paucity of information regarding the effectiveness of other macroinvertebrate predators in consuming larval amphibians, especially caudate larvae, during aquatic life-stages within pond communities. In this study, we tested the ability of a suite of macroinvertebrate predators to consume Spotted Salamander larvae (*Ambystoma maculatum*) at two points during larval development. We tested the ability of macroinvertebrate predators belonging to the genera *Belostoma*, *Lestes*, *Notonecta*, and *Ranatra*, the families *Aeshnidae*, *Dytiscidae*, *Gomphidae*, *Gyrinidae*, *Hirudinae*, *Libellulidae*, and *Notonectidae*, or order *Trichoptera*, as well as larvae of *Rana clamitans*, to consume *A. maculatum* immediately after hatching and several weeks into their larval period across four separate experiments. We tested for significant differences in percent survival of *A. maculatum* among predator treatments using ANOVA. Across all trials, we found a significant effect of predator treatment. Both hatchling and larval *A. maculatum* were susceptible to predation by *Aeshnidae* and *Notonectidae*. In all other treatments, we observed low or zero mortality of hatchlings of *A. maculatum* and 100% survival of larvae of *A. maculatum*. As *Aeshnidae* and *Notonectidae* are both gape unconstrained predators, the increase in larval size did not appear to increase survival of *A. maculatum* due to increased escape performance. Overall, rates of predation are low for *A. maculatum* for most macroinvertebrates during the tested life stages, suggesting that predation by only a handful of invertebrate taxa and vertebrates contribute to high mortality

rates within this system." (Authors)] Address: Stretz, P., Division Biological Sciences, Univ. of Missouri, Columbia, Missouri 65211-7400, USA. Email: pipermstretz@gmail.com

17323. Takahashi, M.; Takahashi, Y.; Kawata, M. (2019): Candidate genes associated with color morphs of female-limited polymorphisms of the damselfly *Ischnura senegalensis*. *Heredity* 122: 81-92. (in English) ["Many Odonata species exhibit female-limited polymorphisms, where one morph is similar to the conspecific male in body color and other traits (andromorph), whereas one or more other morphs differ from the male (gynomorphs). Here we investigated the differentially expressed transcripts (DETs) among males and two female morph groups (gynomorphs and andromorphs) using RNA-seq to identify candidate transcripts encoding female-limited polymorphisms in *I. senegalensis*. Seven DETs that had significantly different expression levels between males and gynomorphs, but not between males and andromorphs, were identified. The expression levels of four of these candidate genes, doublesex (*dsx*), black, ebony, and chaoptin (*chp*), were selected for further analysis using qRT-PCR. Sequence analysis of the *dsx* amplicons revealed that this gene produced at least three transcripts. Two short transcripts were mainly expressed in males and andromorphs, whereas the long transcript was specifically expressed in both morph female groups; that is, the expression pattern of the *dsx* splice variants in andromorphs was an intermediate between that of males and gynomorphs. Because the *dsx* gene functions as a transcription factor that regulates the sex-specific expression of multiple genes, its splice variants in *I. senegalensis* may explain why the andromorph is female but exhibits some masculinized traits. Because we did not detect different coding sequences of the candidate genes among the different morphs, a diallelic genomic region controlling alternative splicing of *dsx*, thus determining female-limited polymorphism in *I. senegalensis* most likely lies in a non-coding region of the *dsx* gene or in a gene upstream of it." (Authors)] Address: Takahashi, Y., Dept Biol., Fac. Science, Chiba Univ., 1-33 Yayoi, Inage, Chiba, 263-8522, Japan

17324. Tamada, A.; Okude, G.; Futahashi, R. (2019): A white-winged female of *Mnais costalis*. *Tombo* 61: 41-43. (in Japanese, with English summary) ["A white-winged female of *M. costalis* was collected in Shibata city, Niigata Prefecture. Nuclear ITS1 sequence indicated that this specimen is *M. costalis*. Morphological examination showed that the white coloration was attributed to a wax-like substrate secreted outside the wing membrane, which is similar to the white-winged form of *M. pruinosa* previously found in Boso Peninsula, Chiba Prefecture and replaces the opaque area of normal orange-winged males." (Authors)] Address: Futahashi, R., Nat. Inst. Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp

17325. Tennessen, K.J. (2019): Dragonfly nymphs of North America. An identification guide. Springer: 620 pp. (in English) ["This monograph is the first of its kind devoted entirely to the dragonfly nymphs of North America north of Mexico,

the focus being accurate identification of the 330 species of Anisoptera that occur in the region. Nymphal external morphology is described and illustrated in detail, and all terms needed to navigate the dichotomous keys are defined. Species are tabulated with references that provide the most detailed, accurate descriptions for each; species that are inadequately described are so indicated. The key separating the seven families in the region contains several new characters. The families are then covered separately: Aeshnidae (13 genera), Gomphidae (17 genera), Petaluridae (2 genera), Cordulegastridae (2 genera), Macromiidae (2 genera), Corduliidae (7 genera), and Libellulidae (29 genera). Each family is further characterized, followed by a generic key. A drawing of the habitus and diagnostic details for each genus are provided, along with additional diagnostic remarks and notes on habitat and life cycle; for each genus, a map shows its geographic distribution in North America. Full-grown nymphs of all known species of each genus are keyed and diagnosed; characters that apply to earlier instars are noted. Morphological variation in character states was analyzed in order to assess the reliability of previously utilized characters and to discover new characters. Most of the characters used to distinguish all levels of taxa are illustrated; a total of 702 figures, comprising 1,800 original drawings, along with selected photographs where necessary for clarity, accompany the keys. Measurements of total length, head width, and other variables for each species are provided in tables. Difficulties with past keys and descriptions, including errors, omissions and other shortcomings, are addressed. The importance of nymph characters in helping solve generic and specific distinctions and their role in phylogenetic studies is emphasized. Methods for collecting, rearing, and preserving dragonfly nymphs and exuviae are presented. The final chapter discusses research opportunities on North American Anisoptera nymphs, including taxonomic needs, studies on structure and function, life history and microhabitat, water quality indices and conservation efforts. The habitus drawings of all genera are arranged according to family in five plates (Appendix I); although the book is intended as a lab manual, these plates conveniently allow for comparison based on nymph shape making field identification to genus possible in many cases. Appendix II contains a brief history of dragonfly nymph studies in North America. A glossary and an index to scientific names are included." (Publisher)] Address: Tennessen, K.J., Florida State Collection of Arthropods, Gainesville, FL, USA, Wautoma, WI, USA

17326. Termaat, T.; van Strien, A.J.; van Grunsven, R.H.A.; De Knijf, G.; Bjelke, U.; Burbach, K.; Conze, K.-J.; Goffart, P.; Hepper, D.; Kalkman, V.J.; Motte, G.; Prins, M.D.; Prunier, F.; Sparrow, D.; van den Top, G.G.; Vanappelghem, C.; Winterholter, M.; Wallis DeVries, M.F. (2019): Distribution trends of European dragonflies under climate change. *Diversity and Distributions* 25 (6):936–950. ["Aim: Poleward range shifts of species are among the most obvious effects of climate change on biodiversity. As a consequence of these range shifts, species communities are predicted to become increasingly composed of warm-dwelling species, but this has only been studied for a limited number of taxa, mainly birds, butterflies and plants. As species groups may vary considerably in their adaptation to climate change, it is desirable to expand these studies to

other groups, from different ecosystems. Freshwater macroinvertebrates, such as Odonata, have been ranked among the species groups with highest priority. In this paper, we investigate how the occurrence of dragonflies in Europe has changed in recent decades, and if these changes are in parallel with climate change. Location: Europe. Methods: We use data from 10 European geographical regions to calculate occupancy indices and trends for 99 (69%) of the European species. Next, we combine these regional indices to calculate European indices. To determine if changes in regional dragonfly communities in Europe reflect climatic warming, we calculate Species Temperature Indices (STI), Multi-species Indicators (MSI) and Community Temperature Indices (CTI). Results: 55 of 99 considered species increased in occupancy at European level, 32 species remained stable, and none declined. Trends for 12 species are uncertain. MSI of cold-dwelling and warm-dwelling species differ in some of the regions, but increased at a similar rate at European level. CTI increased in all regions, except Cyprus. The European CTI increased slightly. Main conclusions: European dragonflies, in general, have expanded their distribution in response to climate change, even though their CTI lags behind the increase in temperature. Furthermore, dragonflies proved to be a suitable species group for monitoring changes in communities, both at regional and continental level." (Authors)] Address: Termaat, T., De Vlinderstichting/Dutch Butterfly Conservation, Wageningen, The Netherlands. E-mail: timtermaat@gmail.com

17327. Thakuria, D.; Kalita, J. (2019): Study on the seasonality, habitat and aspects of reproductive behavior of *Calicnemia miles* (Laidlaw, 1917) (Odonata: Platycnemididae) from Assam, India. *Advances in Zoology and Botany* 7(2): 19-23. (in English) ["*C. miles* is a bright red blood colored, damselfly specialized to waterfalls. Apart from the limited knowledge on the flight season, no prior reports on the breeding biology of the species are available. The present study attempts to describe the seasonality, habitat and behavioral aspects of oviposition in *C. miles* recorded from Assam. The population of *C. miles* was recorded during late premonsoon (April-May) and early monsoon season (June-July); peak of flight and copulation was observed in the month of June. The species occupies shady areas near waterfalls and was found to prefer roots of trees, moss carpet and damp seepage of streamlets surrounded by vegetation for mating and oviposition. The female deposits eggs into the plant tissue endophytically. Daily oviposition activity lasts from 80-120 minutes during which the males guards their females in tandem till the entire episode of oviposition." (Authors)] Address: Thakuria, D., Dept Zool., Biodiversity & Conservation Lab. Gauhati Univ., India

17328. Thaokar, N.R.; Verma, P.R.; Andrew, R.J. (2019): Moulting pattern and mortality during the final emergence of the Coromandel Marsh Dart Damselfly *Ceragrion coromandelianum* (Zygoptera: Coenagrionidae) in central India. *Journal of Threatened Taxa* 11(13): 14672-14680. (in English) ["The final emergence of *C. coromandelianum* was studied for 50 days (22 January–12 March, 2011) from the botanical garden of Hislop College, Nagpur, India, (a semi controlled site) where

small underground cement tubs/tanks are used to grow macrophytes by the Botany department. In *C. coromandelianum* emergence is asynchronous, diurnal and occurs between 07.00h and 18.00h. Stage-I starts when the ultimate instar nymph of *C. coromandelianum* leaves the water body, searches for a suitable place and then begins to shudder its body to detach the trapped pharate from the nymphal exuvia. The pharate exerts pressure on the thoracic tergites to split the cuticle. Stage-II starts when the head and thorax of the pharate emerges out of the split exuvia. The pharate struggles to remove its trapped body from the nymphal exuvia. During Stage-III, the wings expand but are opaque; pigmentation of the body occurs simultaneously all over the body. Soon the whole body develops its species specific coloration while the expanding wings gain transparency, unfold and separate out and now the imago is ready for its maiden flight. Stages I, II, and III occupy 31.66%, 11.73%, and 56.60% of the total moulting period, respectively. A total of 243 emergences occurred during the observation period, 158 emergences occurred in tanks containing *Pistia stratiotes*, while 65 emergences in tubs containing *Nymphaea nouchali* indicating that *C. coromandelianum* prefers *P. stratiotes* over *N. nouchali* for oviposition. 20 deaths were recorded during the present observation. Failure to moult (15%) and failure to emerge completely out of the exuvia (85%) were the two reasons for mortality." (Authors)] Address: Thaokar, N.R., Centre for Higher Learning & Research in Zoology, Hislop College, Civil lines, Nagpur, Maharashtra 440001, India. E-mail: Nilesh.thavkar@gmail.com

17329. Theischinger, G.; Richards, S.J. (2019): *Agyrtacantha picta* sp. nov., a new dragonfly from southern Papua New Guinea (Odonata: Aeshnidae). *Odonatologica* 48(1/2): 155-165. (in English) ["A new species of *Agyrtacantha* is described from the Purari River basin in Gulf Province, Papua New Guinea. The new species is most similar to *A. dirupta*, a species widespread in the Papuan region, but differs from that species and other known congeners by the unique colour pattern on the front and sides of the synthorax and the particularly long and slender anal appendages. Both sexes are described and illustrated, and the species is compared with its most similar congeners." (Authors)] Address: Theischinger, G., Australian Museum, Entomology, 6 College Street, Sydney, NSW 2010, Australia. E-mail: theischingergunther@gmail.com

17330. Theischinger, G. (2019): *Austrophya monteithorum* sp. n., a new dragonfly (Odonata: Anisoptera, Libelluloidea) from tropical Queensland, Australia, with notes on its collection and locality. *Australian Entomologist* 46(3): 145-155. (in English) ["*Austrophya monteithorum* sp. n. is described from a larva collected on the summit plateau of Thomson Peak in tropical Queensland, Australia. The species is compared with *A. mystica* Tillyard (type species of the hitherto monotypic genus) and with larvae of other related genera. Details are given of the type locality, which is difficult to access, and of collections that have been made there." (Author)] Address: Theischinger, G., Australian Museum, Entomology, 6 College Street, Sydney, NSW 2010, Australia. E-mail: theischingergunther@gmail.com

- 17331.** Tobias-Loaiza, M.; Tamaris-Turizo, C.E. (2019): Odonatos de la Sierra Nevada de Santa Marta, Colombia: una lista preliminar. *Rev. Acad. Colomb. Cienc. Ex. Fis. Nat.* 43(167): 212-218. (in Spanish, with English summary) ["Odonata of the Sierra Nevada de Santa Marta, Colombia: A preliminary list. We raised a list of Odonata species and genera from eight rivers of the Sierra Nevada of Santa Marta (SNSM) after the revision of scientific articles, theses, and specimens deposited in the Centro de Colecciones de la Universidad del Magdalena (CEBUMAG). We found 38 species distributed in 35 genera and eight families. The Libellulidae family presented the greatest richness (14 genera) and the widest range of altitudinal distribution (between 50 and 2,800 m a.s.l.) found in all vegetable coverages. The Gaira River exhibited the greatest wealth among the revised rivers with 26 genera of which eight are exclusive to the basin while in the Ranchería River only *Progomphus* was registered. *Argia* and *Brechmorhoga* had a wide spatial distribution as they were recorded in six rivers. The review revealed the lack of studies on the eastern and southwestern slopes of the Sierra Nevada de Santa Marta, so it is recommended to carry out taxonomic and biodiversity work to contribute to the knowledge of Odonata in the Colombian Caribbean." (Authors)] Address: Tobias-Loaiza, Grupo de Investigación & Biodiversidad y Ecología Aplicada, Univ. Magdalena, Santa Marta, Colombia. E-mail: meliztobias.26@gmail.com
- 17332.** Tonczyk, G. (2019): The Odonatological Section of the Polish Entomological Society – 20 years have passed. *Odonatrix* 15_1: 12 pp. (in Polish, with English summary) ["It was established on the 18th of April, 1998, ... This text presents a brief history of the Section, including changes to board members and the *Odonatrix* newsletter editorial staff, as well as the list of National Odonatological Symposia organised to date." (Author)] Address: Tonczyk, G., Katedra Zoologii Bezkręgowców i Hydrobiologii, Uniwersytet Łódzki, ul. Banacha 12/16, 90-237 Łódź, Poland. E-mail: tonczyk.grzegorz@gmail.com
- 17333.** Torralba-Burrial, A. (2019): Experiencia de aprendizaje no-formal para alumnado de Educación Primaria y Secundaria sobre libélulas (Insecta: Odonata) en el marco de la Semana de la Ciencia. *Boletín de la Sociedad Entomológica Aragonesa* 65: 227-230. (in Spanish, with English summary) ["Science and Technology Week is probably the largest event of scientific communication to society in Spain. A non-formal learning activity on the dragonflies was included among the activities proposed by the University of Oviedo in three academic years for Primary and Secondary Education in Asturias. The experience is described; the contributions presented by the Primary Education students are analysed in order to assess their concept of dragonfly and the diagnostic characteristics of odonates and those species that they considered most interesting, their behaviour and habitats. The students' questions and their learning interests about these insects are discussed, especially in the final years of Primary Education and in Secondary Education, as well as possible ways of motivating biodiversity learning as suggested by their questions. Student participation was higher in Primary Education and the first years of Secondary Education (especially when there had been a previous directed inquiry), and very low in the final years of Secondary Education." (Author)] Address: Torralba-Burrial, A., Dpto. Ciencias de la Educación, Univ. de Oviedo, Oviedo, Spain. E-mail: torralbaantonio@uniovi.es
- 17334.** Torres-Pachon, M.; Novelo-Gutierrez, R; Ruiz-Sanchez, E (2019): A synopsis of *Phyllogomphoides Belle*, 1970 (Odonata: Gomphidae) of Mexico: taxonomy and distribution. *Zootaxa* 4634: 67 pp. (in English, with Spanish summary) ["A synopsis of the 13 species of *Phyllogomphoides Belle*, 1970 known to occur within Mexico is presented. Taxonomic keys for males are based primarily on morphology of anterior and posterior hamules, caudal appendages and of the vulvar lamina in females and includes full descriptions for each species accompanied by high-resolution photographs, drawings, comparative diagnostic notes, natural history and distribution maps. Females of *P. danieli* González & Novelo, 1990 and *P. nayaritensis* Belle, 1987 are described for the first time. Moreover, new records for *P. albrighti* (Needham, 1950) for the states of Guerrero; *P. danieli* González & Novelo, 1990 for Colima, Guerrero and San Luis Potosí; *P. duodentatus* Donnelly, 1979 for Oaxaca; *P. luisi* González & Novelo, 1990 for Nayarit, and *P. pugnifer* Donnelly, 1979 for San Luis Potosí, are also provided." (Authors)] Address: Torres-Pachon, Monica, Programa de Doctorado en Ciencias. Red de Biodiversidad y Sistemática. Instituto de Ecología A.C., Carretera antigua a Coatepec 351, El Haya, Xalapa, Veracruz, México. E-mail: monibiolo@gmail.com
- 17335.** Trapero-Quintana, A.; Torres-Cambas, Y.; Rivas-Torres, A.; Ferreira, S.; Cordero-Rivera, A. (2019): The first record of parasitism by *Forcipomyia* (Diptera: Ceratopogonidae) in Cuban odonates. *Novitates Caribaea* 14: 105-110. (in English, with Spanish summary) ["Several species of biting midges of the genus *Forcipomyia* are frequently found attached to the wings of adult odonates, acting as parasites by sucking haemolymph from the wing veins. Here we report the first finding of *F. incubans* on odonates in the peninsula of Zapata, Cuba. We found the midge on the wings of *Erythrodiplax simplicicollis*, *E. umbrata*, *Crocothemis servilia*, and in the wings and body of *Perithemis domitia*, all species belonging to the family Libellulidae. This is the first record of this interaction for the Antilles." (Authors)] Address: Trapero-Quintana, A., Departamento de Biología Animal y Humana, Facultad de Biología, Universidad de La Habana, Cuba.
- 17336.** Tuhin, S.H. (2019): Checklist and seasonal distribution of odonata (Insecta) of Khulna University campus, Bangladesh. *Journal of Entomology and Zoology Studies* 7(1): 160-164. (in English) ["An extensive survey of odonates were conducted in Khulna University Campus from August 2014 to August 2018. In total 40 species belonging to 24 genera and 4 families of odonates were recorded. Anisoptera contributed with 25 species belonged to 17 genera and two families and Zygoptera contributed with 15 species of 7 genera and two families. Libellulidae found most dominant family of odonates by contributing 24 species over Coenagrionidae, Platycnemididae, and Gomphidae. Species richness increased in monsoon

and 95% of the total species count were recorded in June-October. In winter, species richness declined at lowest number." (Authors)] Address: Md. Sajjad Hossain Tuhin, Forestry & Wood Technology Discipline Khulna Univ., Khulna, Bangladesh

17337. Tuskavetska, I. (2019): Diversity and modern study of Odonata in the territory of Lubny district. Education and Science 1(26): 63-70. (in Ukrainian, with English summary) ["The article outlines the main river biocenoses of Lubny district (Ostapivka village, Bopodarivka village, Pisky tillage and Brovarky village), meadows, swamps, marshy lakes, coastal areas of the Sula and Viazovets rivers. The quality of representativeness of the species diversity of the Odonata fauna has been estimated by calculating their dominant index and distribution index in the main biotopes of the studied territory. 25 species of Odonata were caught with 6 families (Libellulidae, Calopterygidae, Coenagrionidae, Gomphidae, Lestidae, Aeshnidae). The most widespread species of this area are Coenagrion puella, C. pulchellum, Calopteryx splendens; common - Ischnura elegans, Lestes virens, L. sponsa, Libellula depressa, Aeshna grandis; rare are Aeshna juncea, Sympetrum danae and Libellula quadrimaculata. The most rich in species composition of the estates of the study area are the coastal areas of the river Viazovets and floodplain meadows with Bohodarivka, and the least numerous - forest glades, coastal areas of the Sula river in the village of Brovarky. Actively fly in the spring-summer period Calopteryx virgo, C. splendens, Coenagrion puchellum, C. puella, and the least in the summer-autumn - Sympetrum vulgatum and S. sanguineum." (Authors)] Address: not stated

17338. Tyrell, M. (2019): Hatching of submerged eggs of Chalcolestes viridis (Vander Linden) (Willow Emerald Damselfly). J. Br. Dragonfly Society 35(2): 39-47. (in English) ["C. viridis showed a major expansion of range in 2016 (Parr, 2017), resulting in its discovery at a small pond in Finedon Pocket Park, Northamptonshire in October of that year. In 2017 adults and oviposition were recorded at Finedon into a set of Willow trees (Salix spp.) growing in the water. During the very wet winter of 2017-2018, the pond flooded and the Willows were completely submerged such that no sign of them was obvious by April 2018. Adults were again recorded in 2018 and, during routine recording, some empty scars from 2017 were noted on previously submerged Willow branches. Images taken of these scars alongside those of fresh egg scars and those known to have hatched outside of the water confirmed that the eggs of this species can tolerate submersion during hatching and therefore hypoxic conditions are not required to stimulate egg hatching; neither do they inhibit it. Other observations suggest that egg hatching in C. viridis is stimulated by photoperiod and/or temperature." (Author)] Address: Tyrell, M., 8 Warwick Close, Raunds, Northamptonshire, NN9 6JH

17339. Tyrell, M. (2019): Coenagrion pulchellum (Vander Linden) (Variable Damselfly) in Northamptonshire VC32: A review of preferred breeding habitats. J. Br. Dragonfly Society 35(2): 70-78. (in English) ["The habitat preferences of C. pul-

chellum are not well understood, with apparently suitable habitat not selected for breeding. In Northamptonshire, this is a rare species, known from only three sites, one longstanding (Maxey Pits), one discovered in 2018 (Weldon Woodland Park) and the third discovered in 2019 (Wicksteed Park). This review examines the habitats chosen by C. pulchellum and finds that there are many characteristics that are shared with other sites that do not host this species, but that one feature - the presence of flowering lillies (Nymphaea spp.) - is common to all three of the host sites but rare at other sites. C. pulchellum appears to use these exclusively for oviposition, suggesting that the habitats in Northamptonshire, despite its rich matrix of well-vegetated gravel pits, are not suitable unless they possess this type of lilly pad." (Author)] Address: Tyrell, M., 8 Warwick Close, Raunds, Northants, NN9 6JH, UK

17340. Üveges, B.; Szederkényi, M.; Mahr, K.; Móricz, A.M.; Krüzselyi, D.; Bókony, V.; Hoi, H.; Hettyey, A. (2019): Chemical defense of toad tadpoles under risk by four predator species. Ecology and Evolution. 2019: 13 pp. (in English) ["Many organisms use inducible defenses as protection against predators. In animals, inducible defenses may manifest as changes in behavior, morphology, physiology, or life history, and prey species can adjust their defensive responses based on the dangerousness of predators. Analogously, prey may also change the composition and quantity of defensive chemicals when they coexist with different predators, but such predator-induced plasticity in chemical defenses remains elusive in vertebrates. In this study, we investigated whether tadpoles of the common toad (Bufo bufo) adjust their chemical defenses to predation risk in general and specifically to the presence of different predator species; furthermore, we assessed the adaptive value of the induced defense. We reared tadpoles in the presence or absence of one of four caged predator species in a mesocosm experiment, analyzed the composition and quantity of their bufadienolide toxins, and exposed them to free-ranging predators. We found that toad tadpoles did not respond to predation risk by upregulating their bufadienolide synthesis. Fishes and newts consumed only a small percentage of toad tadpoles, suggesting that bufadienolides provided protection against vertebrate predators, irrespective of the rearing environment. Backswimmers consumed toad tadpoles regardless of treatment. Dragonfly larvae were the most voracious predators and consumed more predator-naïve toad tadpoles than tadpoles raised in the presence of dragonfly cues. These results suggest that tadpoles in our experiment had high enough toxin levels for an effective defense against vertebrate predators even in the absence of predator cues. The lack of predator-induced phenotypic plasticity in bufadienolide synthesis may be due to local adaptation for constantly high chemical defense against fishes in the study population and/or due to the high density of conspecifics." (Authors)] Address: Üveges, B., Lendület Evolutionary, Ecology Research Group, Plant Protection Institute, Centre for Agricultural Research, Hungarian Academy of Sciences, Herman Ottó út 15, 1022 Budapest, Hungary. E-mail: uveges.balint@yahoo.de

17341. Umeda, T. (2019): Sympetrum darwinianum (Selys, 1883) with a deformed abdomen. Tombo 61: 48. (in Japanese,

with English summary) ["A mature female specimen of *S. darwinianum* with a deformed abdomen was captured in Oki island, Shimane prefecture. Forth to eighth abdominal segments of the specimen are abnormally short, while the other segments, including the genital organs, are normal. It is interesting that such a deformed individual is able to survive in a natural environment." (Author)] Address: not stated.

17342. Uz, A.G. (2019): A research of intra-species wing variations in *Orthetrum brunneum* (Fonscolombe, 1837) (Insecta: Odonata). Hitit University, Graduate School of Natural and Applied Sciences: XIII + 49 pp. (in Turkish, with English summary) ["Geographical and ecological diversity positively affect in-species diversity in different populations of the same species. Dozens of a ecological barrier, especially in Turkey to investigate the effect of Anatolia Diagonale terms of biodiversity has increased in recent years. The aim of this study is to determine the variations of wing morphology of *O. brunneum* species in different populations by using geometric morphometry method. For this purpose, intra-species wing variations of three different *O. brunneum* populations collected from Tunceli province to the east of Anatolia Diagonale and Yozgat province to the west of Anatolia Diagonale and Western Mediterranean Region were investigated. Statistical analysis (Tukey HSD) showed that a large number of biometric characteristics differed statistically among these taxa ($P < 0.05$). According to Principal Component Analysis (PCA), 4 components with total variance Eigen value over 1 can be explained among these groups and samples of Tunceli population are separated from other populations by Discriminant Function Analysis (DFA). These findings support the idea that Anatolian Diagonale may be a barrier for populations of *O. brunneum*. Therefore, it is necessary to study and take into account the variational situations of Anatolian samples." (Author)] Address: not stated

17343. Vandromme, M.; Trekels, H.; Ruiz, N.S.; Somarriba, E.; Vanschoenwinkel, B. (2019): Exploring the suitability of bromeliads as aquatic breeding habitats for cacao pollinators. *Hydrobiologia* 828: 327-337. (in English) ["Bromeliads are common plants in the Neotropics. Being epiphytic, they are often incorrectly considered as parasites and removed from agroforestry systems. However, their water-filled leaf axils provide habitats for a diverse group of aquatic organisms, potentially including cacao pollinating dipterans which could be beneficial to local farmers. Thus far, it is unclear how frequently and abundantly potential pollinators occur in bromeliads in cacao plantations. Therefore, we investigated the aquatic fauna in different types of bromeliads in Nicaraguan cacao agroforestry systems. Our main goal was to study the impact of bromeliad morphology and vertical position on aquatic biodiversity with particular attention for larvae of presumed cacao pollinators. Aquatic biodiversity was higher in larger bromeliads and in bromeliads positioned closer to the ground. Particularly invertebrates without flying life stages were deficient in elevated bromeliads suggesting dispersal limitation. Potential cacao pollinators occurred in 66% of the bromeliads and were most abundant in bromeliads with larger tanks that were located higher in the canopy rather than on the plantation floor. We conclude that larvae of cacao pollinators can be common and relatively abundant inhabitants

of tank bromeliads in cacao trees, and it is likely that preserving these habitats could boost local pollinator abundances." (Authors)] Address: Vandromme, M., Community Ecology Lab, Dept of Biology, Vrije Univ. Brussel (VUB), Brussels, Belgium

17344. Vary, P.; Sansault, E. (2019): Première observation de *Trithemis annulata* en région Centre-Val de Loire (Odonata: Libellulidae). *Martinia Tome* 34(1-2): 56. (in French) [14-X-2018, lac des Bretonnières (47,351120°N / 0,641493°E, WGS84), Joué-lès-Tours (Indre-et-Loire, 37), France.] Address: Vary, P., 3, rue Edith Piaf, F-37300 Joué-lès-Tours, France. E-mail: p.vary@orange.fr

17345. Vassilenko, D.V.; Pritykina, L.N. (2019): *Mongolothemis gobicus* Pritykina et Vassilenko, 2014 is an objective synonym of *Paragonophlebia patriciae* Nel, 2009 (Insecta: Odonata). *Paleontological Journal* 53(3): 323-323. (in English) ["In 2014 we identified a fossil hindwing from the Upper Jurassic Shar Teg locality (Southern Mongolia) as belonging to the extinct dragonfly family Euthemistidae Pritykina, 1968 and described it as the species *Mongolothemis gobicus* Pritykina et Vassilenko, 2014 (Pritykina et Vassilenko, 2014). Later it turned out that this specimen (PIN, no. 4270/873) had previously been described as *Paragonophlebia patriciae* Nel, 2009 belonging to a new genus and new family Paragonophlebiidae Nel, 2009 (Nel, 2009). In our opinion, the erection of a new family is unnecessary but quite acceptable, taking into account the taxonomic importance of the characters used by the author. Thus, the species name *Mongolothemis gobicus* given by us is an objective synonym of *Paragonophlebia patriciae* Nel, 2009." (Authors)] Address: Vassilenko, D.V., Borissiak Paleontological Institute, Russian Academy of Sciences, Moscow, Russia

17346. Verheyen, J.; Stoks, R. (2019): Temperature variation makes an ectotherm more sensitive to global warming unless thermal evolution occurs. *Journal of Animal Ecology* 88(1): 624-636. (in English) ["1. To assess long-term impacts of global warming on species there is growing interest in latitudinal intra-specific patterns in thermal adaptation. Yet, while both mean temperatures and daily temperature fluctuations (DTFs) are expected to increase under global warming, latitudinal differences in the effects of DTFs have not been documented. 2. We tested whether low-latitude populations of an ectotherm deal better with greater DTF than high-latitude populations, especially at a high mean temperature close to the optimal temperature for growth where DTF causes exposure to extreme high temperatures. We evaluated the impact of DTFs when assessing the effect of gradual thermal evolution at the high latitude with a space-for-time substitution. 3. We compared effects of both mean temperatures (20°C and 24°C) and DTFs (constant = 0°C, low = 5°C and high = 10°C) on growth rates between low-latitude and high-latitude populations of *Ischnura elegans* in a common-garden experiment. 4 DTFs, if anything, reduced growth and were generally stressful as indicated by reductions in body condition, antioxidant defense and metabolic rate, and increases in oxidative damage. Most negative effects of DTFs were only present at a mean of 24°C when

too high temperatures were reached during a daily cycle. Notably, while 4°C warming was beneficial in terms of growth rate at both latitudes at a constant temperature regime, this changed in a negative effect at high DTF. Moreover, this modulating effect of the mean temperature by DTF differed between latitudes indicating local thermal adaptation. While 4°C warming at low DTF still caused faster growth in low-latitude larvae, it already slowed growth in high-latitude larvae. This supports the emerging insight that warming would increase growth in high-latitude larvae in absence of DTF, yet would decrease growth in the more realistic scenarios with DTF. In contrast, a space-for-time substitution approach suggested that under gradual thermal evolution, the evolved high-latitude larvae would no longer suffer a growth reduction in the presence of DTF. 5. Our study provided important proof-of-principle that jointly integrating gradual thermal evolution and the expected increase in DTF generates opposing predictions of effects of global warming on this ectotherm." (Authors)] Address: Stoks, R., Lab. Aquatische Ecologie, K.U.Leuven, De Beriotstraat 32, 3000 Leuven, Belgium. E-mail: robby.stoks@bio.kuleuven.ac.be

17347. Vilela, D.S.; Koroiva, R.; Guillermo-Ferreira, R. (2019): *Heteragrion denisye* sp. nov. (Odonata: Zygoptera: Heteragrionidae), a notable species from Serra da Canastra, Minas Gerais, Brazil. *Zootaxa* 4671(4): 589-594. (in English) ["*Heteragrion denisye* sp. nov. (Zygoptera: Heteragrionidae) is described and diagnosed on specimens collected near a Vereda (i.e. palm swamp) area of the National Park of Serra da Canastra, Minas Gerais, Brazil (-20.2323, -46.6085, 1305 m, 25 x 2018, Vilela, Koroiva, Nobrega & Lera leg.). This species is unique within the genus and it is easily distinguished from congeners due to its blue coloration pattern and cerci morphology, which is robust and presents a reduced apical portion, longer on most *Heteragrion* species." (Authors)] Address: Vilela, D.S., Lab. Ecol. Stud. on Ethology & Evolution (LESTES), Dept of Hydrobiol., Fed. Univ. of São Carlos, Brazil. E-mail: deeegoo@gmail.com

17348. Vilela, D.S.; Koroiva, R.; Cordero-Rivera, A.; Guillermo-Ferreira, R. (2019): A further study on *Franciscobasis* Machado & Bedê, 2016 (Odonata: Coenagrionidae), a newly described genus from Minas Gerais, Brazil. *PLoS ONE* 14(10): e0223241. <https://doi.org/10.1371/journal.pone.0223241>: 14 pp. (in English) ["The genus *Franciscobasis* Machado & Bedê, 2016 is endemic to the Serra da Canastra National Park in Minas Gerais state, Brazil. Two species of *Franciscobasis* were described simultaneously with the genus description: *F. franciscoi* and *F. sonia*, the latter described only from females. Through morphological and molecular analysis, we investigated if *F. sonia* may represent the young female of *F. franciscoi*. Resulting data did not present adequate differences between females to characterize them as different species. Therefore, we suggest that *F. sonia* is a junior synonym of *F. franciscoi*, and the female of *F. franciscoi* goes through a complex ontogenetic color change." (Authors)] Address: Vilela, D.S., Graduate Program in Entomology, Dept of Biology, Univ. of São Paulo (USP), Ribeirão Preto, Brazil. E-mail: deeegoo@gmail.com

17349. Vilela, D.S.; Guillermo-Ferreira, R.; Encalada, A.C.; Cordero-Rivera, A. (2019): *Philogenia gaiae* sp. nov. (Zygoptera: Philogeniidae) and description of the female of *P. macuma* Dunkle, 1986, two species from the Ecuadorean lowland rainforest. *Zootaxa* 4683(3): 412-420. (in English) ["*P. gaiae* sp. nov. (Holotype ♂, Ecuador, Orellana, Tiputini Biodiversity Station, -0.6349, -76.1501, 241 m, 13 xii 2012, A. Cordero-Rivera & M. Sanchez-Herrera leg., in MUAE) from the helena group is described, illustrated, diagnosed and compared with morphologically close species of the genus. *P. gaiae* can be distinguished from its most similar congener *P. minteri* Dunkle, 1986 by the enlarged cerci and the club-like paraprocts. We also describe the female of *P. macuma* Dunkle, 1986, from a pair collected at Jatun Sacha Biological Reserve, which is also similar to *P. gaiae* and can be distinguished by the intersternite morphology, ovipositor length and vulvar lamina shape." (Authors)] Address: Vilela, D.S., Lab. of Ecological Studies on Ethology & Evolution (LESTES), Dept of Hydrobiology, Federal University of São Carlos, Brazil.

17350. Vilela, S.S.; Cordero-Rivera, A.; Guillermo-Ferreira, R. (2019): The female of *Heteragrion icterops* Selys, 1862 (Odonata: Heteragrionidae) with comments and key on the Brazilian females of *Heteragrion* group B. *Zootaxa* 4576(1): 187-194. (in English) ["The female of *H. icterops*, incompletely mentioned in 1886, is described, illustrated, keyed and diagnosed based on specimens collected in Pará State, North Brazil. We also provide an identification key and diagnostic comments on other two Group B females occurring in Brazil: *H. angustipenne* Selys, 1886 and *H. bariai* De Marmels, 1989. *H. icterops* females can be distinguished from other female congeners by having the genital valves tips leveling the posterior margin of S10 and by the morphology of the intersternites, presenting a well-developed dorsal plate and lacking a posterior plate." (Authors)] Address: Vilela, S.S., Graduate Program in Entomology, Dept Biol., Univ. of São Paulo (USP), Ribeirão Preto, Brazil. E-mail: deeegoo@gmail.com

17351. Villalobos-Jiménez G.; Hassall, C. (2019): Wing shape patterns among urban, suburban, and rural populations of *Ischnura elegans* (Odonata: Coenagrionidae). *International Journal of Odonatology* 22(1): 37-49. (in English) ["Odonata are among the most efficient flying insects. However, fragmentation of the landscape can increase distance between habitats and affect costs of dispersal, thus shaping phenotypic patterns of flight-related traits, such as wing shape, wing loading and wing size. Urban landscapes are highly fragmented, which limits dispersal among aquatic habitats. Hence, strong selective pressures can act upon urban populations in favour of individuals with increased flight performance or may lead to the reduction in dispersal traits. Here, we explore differentiation in morphological flight-related traits among urban, suburban, and rural populations of *I. elegans*, which is one of the most abundant species in both urban and rural ponds in Europe. We sampled 20 sites across Leeds and Bradford, UK, in an urban-to-rural gradient from June to August 2014 and 2015 (Nmales = 201, Nfemales = 119). We compared wing shape

among different land use types using geometric morphometrics. Other wing properties analysed were wing aspect ratio, wing loading and wing centroid size. Unexpectedly, no significant effect of urban land use was found on wing shape. However, wing shape differed significantly between males and females. Additionally, females showed significantly larger wing centroid sizes ($P < 0.001$), increased wing loading (forewings: $P = 0.007$; hind wings: $P = 0.002$) and aspect ratio ($P < 0.001$) compared to males across all land use types. Possible mechanisms driving these results are further discussed." (Authors)] Address: Hassall, C., School of Biology, Univ. of Leeds, Woodhouse Lane, LS2 9JT, Leeds, UK. E-mail: c.hassall@leeds.ac.uk

17352. Villalona, V.C. (2019): Diversidad e importancia económica de las libelulas (Insecta: Odonata) en la Escuela Agrícola Panamericana a Zamorano, Honduras. Proyecto especial de graduación presentado como requisito parcial para optar al título de Ingeniera Agrónoma en el Grado Académico de Licenciatura. Escuela Agrícola Panamericana, Zamorano, Honduras: V + 34 pp. (in Spanish, with English summary) ["Dragonflies are primary or secondary predators that can be beneficial or detrimental specific to the environment in which they are found. The research taking place within the thesis seeks to find diversity within the Odonata order in Zamorano, study its importance on campus and create an identification guide that facilitates the recognition of some of the species. All data from field collections and reviews of the reference material of the Insects Collection will be specified within the body paragraphs of the thesis. The collection was carried out in lotic and lentic ecosystems during the months of May through August. For 10 weeks, eight hours per week per ecosystem was put forth by two people, where specimens were collected with an entomological network. Within the Insect Collection, the data of all the specimens collected in Zamorano was captured by registering all the information on the collection labels. We found a total of 57 species of dragonflies in Zamorano, 17 of which were obtained within the field collections. Of the species collected (11 Anisoptera and 6 Zygoptera), three of the Anisoptera and one of the Zygoptera species were not reported for Zamorano. The Anisoptera include *Brachymesia furcata*, *Erythemis peruviana*, *Erythrodiplax basifusca* and the one Zygoptera was *Argia joergenseni*. Species such as *Pantala flavescens* and *Brachmesia furcata* are threats in the livestock sector. Anisoptera are vulnerable to *Prosthogonimus* spp, a trematode known for being able to affect birds in pastures. An identification guide is presented for the collected species that helps the knowledge of insect diversity in Zamorano ecosystems." (Authors) Address: not stated

17353. Wang, J.-D.; Wang, C.-Y.; Zaho, M.; He, Z.; Feng, Y. (2019): The complete mitochondrial genome of an edible aquatic insect *Epophtalmia elegans* (Odonata: Corduliidae) and phylogenetic analysis. *Mitochondrial DNA Part B*, 4:1: 1381-1382. (in English) ["*E. elegans* is one of edible aquatic insects in Southwest China. In this study, the complete mitochondrial genome *E. elegans* was determined. The mitogenome is 15,719 bp in size (GenBank accession number MK522522), including 13 protein-coding (PCGs), 22 transfer RNAs, 2 ribosomal RNAs

genes, and a noncoding D-loop region. The overall base composition of *E. elegans* mitogenome is 40.40% for A, 15.09% for C, 33.18 for T, and 11.33% for G, with a high AT bias of 73.58%. This mitogenome data can contribute to our understanding of the phylogeny and evolution of *E. elegans*." (Authors)] Address: Wang, J.-D., Key Lab. of Cultivating & Utilization of Resource Insects of State Forestry Administration, Res. Institute of Resource Insects, Chinese Academy of Forestry, Kunming, PR China. E-mail: cywang11@126.com

17354. Wang, L.J.; Lin, M.-Y.; Shiao, S.-F.; Sung, C.-H. (2019): The complete mitochondrial genome of *Psolodesmus mandarinus* McLachlan, 1870 (Odonata: Calopterygidae). *Mitochondrial DNA Part B* 4(1): 337-339. (in English) ["In the present report, we describe the complete mitochondrial genome of *P. mandarinus*, from the Hualien County, Taiwan. This mitogenome is 15,176 bp long, containing 13 protein-coding, 22 tRNA, and two rDNA genes. Nucleotide composition of the whole mitogenome was 41% for A, 25.92% for T, 19.06% for C, and 14.03% for G. The AT and GC skewness of mitogenome sequence was 0.225 and 0.152, showing the A-skew and C-skew. The reconstructed phylogenetic relationships of 23 Odonata species based on 13 protein-coding genes were highly supported. *P. mandarinus* grouped within the clade including the other three Calopterygidae genera, *Mnais*, *Vestalis*, and *Atrocalopteryx* was solid supported (100%). It was relatively close to *M. costalis* in the phylogenetic analysis. Our study will be useful for the population genetics, biogeography, and conservation of *P. mandarinus* in the future." (Authors)] Address: Sung, C.-H., Planning & Information Division, Fisheries Research Institute, Keelung, Taiwan. E-mail: chsung@mail.tfrin.gov.tw

17355. Wang, Z.J.; Melfi Jr, J.; Leonardo, A. (2019): Dragonfly's Righting Reflex. *Bulletin of the American Physical Society*; 72nd Annual Meeting of the APS Division of Fluid Dynamics. Saturday–Tuesday, November 23–26, 2019; Seattle, Washington. Session G27: Biological Fluid Dynamics: Insect Flight II. 3:48 PM–5:32 PM, Sunday, November 24, 2019. Room: 609. Abstract: G27.00001: ["Insects must right themselves in air so as not to fall. Exactly how insects manage to right themselves via a succession of neural-motor actions is a large mystery in neural behavior of animals. The goal of our work is to find clues about their internal actions through careful measurements and analyses of their aerial acrobatics, in the case of a dragonfly. A dragonfly falling upside down can right itself in about 200ms. During this brief episode, not only it has to sense its perilous condition, it also has to respond with proper muscle actions so to modulate the flapping wing motions such that to generate enough aerodynamic torque in order to correct its orientation. Here, we measure the intricate wing modulations of all four wings that a dragonfly employs to make such a maneuver. We further develop a computational model to simulate the righting maneuver so to tease out the key wing asymmetry that leads to a successful recovery. By analyzing the falling trajectory, we calculate the muscle torque dragonfly used to drive the body rotation. We further conjecture a sensory motor pathway during the dragonfly's righting reflex in response to the perceived horizon.] (Authors) Address: not stated

17356. Wehmann, H.-N.; Heepe, L.; Gorb, S.N.; Engels, T.; Lehmann, F.-O. (2019): Local deformation and stiffness distribution in fly wings. *Biology Open* (2019) 8, bio038299. doi: 10.1242/bio.038299: 15 pp. (in English) [Mechanical properties of insect wings are essential for insect flight aerodynamics. During wing flapping, wings may undergo tremendous deformations, depending on the wing's spatial stiffness distribution. We here show an experimental evaluation of wing stiffness in three species of flies using a micro-force probe and an imaging method for wing surface reconstruction. Vertical deflection in response to point loads at 11 characteristic points on the wing surface reveals that average spring stiffness of bending lines between wing hinge and point loads varies ~77-fold in small fruit flies and up to ~28-fold in large blowflies. The latter result suggests that local wing deformation depends to a considerable degree on how inertial and aerodynamic forces are distributed on the wing surface during wing flapping. Stiffness increases with an increasing body mass, amounting to ~0.6 Nm.1 in fruit flies, ~0.7 Nm.1 in house flies and ~2.6 Nm.1 in blowflies for bending lines, running from the wing base to areas near the center of aerodynamic pressure. Wings of house flies have a ~1.4-fold anisotropy in mean stiffness for ventral versus dorsal loading, while anisotropy is absent in fruit flies and blowflies. We present two numerical methods for calculation of local surface deformation based on surface symmetry and wing curvature. These data demonstrate spatial deformation patterns under load and highlight how veins subdivide wings into functional areas. Our results on wings of living animals differ from previous experiments on detached, desiccated wings and help to construct more realistic mechanical models for testing the aerodynamic consequences of specific wing deformations." (Authors)] Address: Lehmann, F.-O., Dept of Animal Physiology, Inst. Biol. Sciences, Univ. Rostock, Albert-Einstein-Str. 3, Rostock 18059, Germany. E-mail: fritz.lehmann@uni-rostock.de

17357. Wibowo, S.S.; Basukriadi, A.; Winarni, N.L. (2019): Dragonfly species diversity (Odonata) in three Telaga on the highland freshwater, West Java. *IOP Conf. Ser.: Earth Environ. Sci.* 394 012007: 1-8. (in English) ["Odonata was very selective to the habitat selection. Their sensitivity toward environment makes them be good indicator species. Information of species diversity of Odonata in the highland of tropical freshwater lakes is still rare. The purpose of this research was to compare species diversity of Odonata in Telaga Biru Mount Gede Pangrango National Park, Telaga Warna, Nature Park, and Telaga Saat, West Java. Data of Odonata population were collected using fixed point count method. The results showed that species diversity of Odonata in Telaga Saat is higher than Telaga Warna, Nature Park and Telaga Biru, Mount Gede Pangrango National Park. Species diversity indices of Odonata in the three of lakes ranged between 0.78 – 1.75 and were categorized medium and low diversity. Jaccard index of similarity showed that Telaga Warna and Telaga Saat had the similar communities of Odonata. The high index of species diversity of Odonata in Telaga Saat was probably due to the higher intensity of light, which created the higher air temperature at the lake. Species richness, diversity and Shannon index of Odonata was the highest in Telaga Saat compared two other sites." (Authors)]

Address: Wibowo, S.S., Dept Biol., Fac. Math. & Nat. Sciences, Univ. Indonesia, Depok, Indonesia. E-mail: sri.supardi@ui.ac.id

17358. Wildermuth, H.; Schröter, A.; Kohl, S. (2019): The West Palearctic biting midge *Forcipomyia paludis* (Diptera: Ceratopogonidae): first evidence as a parasite on Odonata wings from the Caucasus ecoregion. *Notulae odonatologicae* 9(4): 158-163. (in English) ["The biting midge *F. paludis* was found parasitizing seven Odonata species and subspecies in Georgia, southern Caucasus ecoregion, ca 1 800 km east of the nearest known occurrence in Europe. It is suggested that the distribution of this species ranges continuously from Ireland and Spain to the Caucasus. Three new host species and two new host subspecies are added to the list of considerably more than 70 Odonata species previously recorded as hosting this midge." (Authors)] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rütli, Switzerland. E-mail: hansruedi@wildermuth.ch

17359. Wildermuth, H.; Jödicke, R.; Schröter, A.; Borkenstein, A. (2019): Death feigning in sexual conflict between dragonflies (Odonata): does it exist? *Odonatologica* 48(3/4): 211-228. (in English) ["Death feigning, sometimes designated as thanatosis, reflex immobilization, tonic immobility or faking death is generally assumed a last-resort antipredator defence, attempting to avoid being killed and consumed. Recently, faking death has also been claimed to exist with respect to sexual conflict in Odonata. Here we review a number of published cases in Anisoptera that describe how non-receptive females during oviposition escape male harassing by fleeing, plunging into vegetation, freezing immediately and remaining motionless in random body position, no longer being noted by the male hovering nearby. We argue that this reaction of the female does not match the definition of death feigning and propose a new term for it: 'drop and stop' behaviour. In this context it is reasoned how and under what circumstances males, if at all, are able to recognize immobile females and react to them. The adaptive value of 'drop and stop' is discussed and it is suggested that this behaviour in sexual conflict could have evolved from a predator avoiding tactic." (Authors)] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rütli, Switzerland. E-mail: hansruedi@wildermuth.ch

17360. Wildermuth, H. (2019): Altersbedingte Veränderungen des Farbmusters während des Imaginalstadiums von *Leucorrhinia pectoralis* (Odonata: Libellulidae). *Libellula* 38(1/2): 117-125. (in German, with English summary) ["Age-related changes of the colour pattern during the imaginal stadium of *L. pectoralis* – In dragonflies, changes during the imaginal stadium become mainly manifest in the colour pattern of the thorax and abdomen. Based on photographs of *L. pectoralis* that were taken during 12 years of flight seasons, the sequence of age-related changes in colouration was judged and reconstructed. After emergence, males and females are deep black with large bright yellow spots on thorax and abdomen. By maturation the males additionally turn red on the dorsum of the thorax and the first abdominal segments. In the course of the reproductive period the spots darken in both genders, turning brown. Only the spot on the seventh abdominal segment, characteristic for the species, remains bright yellow. Maturing and aging in Libellulidae are discussed in respect to their presumptive

physiological and genetic causes." (Authors)] Address: Wildermuth, H., Haltbergstrasse 43, 8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

17361. Wildermuth, H.; Borkenstein, A.; Jödicke, R. (2019): Robert's watercolour of *Sympetrum striolatum* and the ambiguity of the thermoregulatory obelisk posture (Odonata: Libellulidae). *Notulae odonatologicae* 9(3): 83-90. (in English) ["In his 1958 book the well-known Swiss artist and odonatologist Paul-André Robert depicted a male *S. striolatum* adopting obelisk posture that might be interpreted as either warming-up or avoiding heat. We analysed the watercolour based on circumstantial evidence such as direction of irradiation, landscape, locality and season and we conclude that Robert painted the dragonfly in warm-up posture. The same posture was observed in a male held in a non-heated greenhouse on a cold morning. Similar postures were found on various photographs taken in the field at known temperatures. On the other hand, among 1164 analysed photos from our own archives, from other photographers and from the Internet only five pictures exhibited unambiguous heat avoiding posture. Compared with other European *Sympetrum* spp. *S. striolatum* rarely adopts warm-up posture and only exceptionally heat avoiding posture. This species presumably avoids overheating mainly by seeking shade in woods." (Authors)] Address: Wildermuth, H., Haltbergstrasse 43, 8630 Rüti, Switzerland; hansruedi@wildermuth.ch

17362. Wildermuth, H. (2019): Färbungsvarianten bei den Weibchen von *Coenagrion puella* (Odonata: Coenagrionidae). *Mercuriale* 18/19: 17-26. (in German, with English summary) ["Colour variants in female *C. puella* – In general, two colour forms of *C. puella* are distinguished: the common green (gynochromatypic or heteromorph) and the usually rare blue (androchromatypic or homeomorph) form. A field study based on photographs of tandems and copulation wheels in the eastern Swiss Plateau revealed that various transitional forms exist, whereby green, blue and rarely also yellow as ground colour occur in different combinations and the black patterns vary as to their extension and shape. It is discussed to what certainty the females of *C. puella* can be identified and assigned to one of the variants on the basis of photographs only." (Authors)] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rüti, Switzerland. E-mail: hansruedi@wildermuth.ch

17363. Wildermuth, H. (2019): Zur Bedeutung der fotografischen Dokumentation anekdotischer Ereignisse am Beispiel einer biotischen Interaktion (Odonata: Coenagrionidae, Aeshnidae; Hemiptera: Gerridae). *Libellula Supplement* 15: 173-182. (in German, with English summary) ["On the significance of photographic documentation of anecdotic events considering the example of a biotic interaction (Odonata: Coenagrionidae, Aeshnidae; Hemiptera: Gerridae) – During observations on the oviposition behaviour of *Erythromma viridulum*, a dead female of this species was incidentally detected floating on the water surface with a larval *Anax imperator* and a water strider (*Gerris* sp.) both feeding on the damselfly's body. At the same time, males of *Enallagma cyathigerum* tried to grasp the body and to connect with it. This event was photographically

documented, and based on the pictures, the entire procedure was reconstructed. It is discussed to what extent generalizing conclusions can be drawn from single observations in respect to female recognition in *E. cyathigerum*, and what significance can be assigned to the photographic documentation of such occurrences." (Author)] Address: Wildermuth, H., Haltbergstr. 43, 8630 Rüti, Switzerland; hansruedi@wildermuth.ch

17364. Wilk, T. (2019): New locality of pygmy damselfly *Nehalennia speciosa* (Odonata: Coenagrionidae) in southern Poland. *Chronmy Przyr. Ojcz.* 75(5): 395-400. (in Polish, with English summary) ["*N. speciosa* is a habitat-specialised dragonfly whose population declines in a significant part of its range. In Europe, including Poland, it is an endangered taxon of high conservation concern, being the only invertebrate species in the country, for which protection zones have to be designated. *N. speciosa* is one of the rarest dragonflies in Poland and its known populations are concentrated mainly in the northern part of the country, in the post-glacial landscape. In 2019, a new site of this species was found in the Nowa Dêba Military Training Area, located in the Sandomierz Forest (Special Area of Conservation Natura 2000, PLH180055 "Enklawy Puszczy Sandomierskie"). On 22 July 2019, 12 imagines were found at a small peatland waterhole and the number was estimated at min. 20 individuals. The discovered population is one of the few in the southern part of the country, being the fourth known site in the Podkarpacie Province. Due to the location within an active military training ground, the population is currently not directly threatened." (Author)] Address: Wilk, T., Ogólnopolskie Towarzystwo Ochrony Ptaków 05–270 Marki, ul. Odrowaca 24, Poland. E-mail: tomaszwilk3@gmail.com

17365. Wilson, K.D.P. (2019): The genus *Stylurus* and resolution of *Stylurus annulatus* (Odonata: Gomphidae) and its close allies in Asia. *Agrion* 23(1): 8-24. (in English) ["The distribution of the Holarctic genus *Stylurus* Needham 1897 is reviewed and discussed. The Chinese *S. flavicornis* (Needham, 1931), *S. kreyenbergi* (Ris, 1928) and *S. tongrensis* Liu, 1991 are shown to be junior synonyms of *S. annulatus* (Djakonov, 1926), described from the Russian Far East, for which a revised synonymy is provided. Details are provided of the first record of *S. clathratus* (Needham, 1930) from Hong Kong together with an updated synonymy. Details are also provided of a *Stylurus* sp., potentially a new species, from north Vietnam and a key to the Asian *Stylurus* is provided." (Author)] Address: Wilson, K.D.P., 18 Chatsworth Road, Brighton, BN1 5DB, UK. E-mail: kdpwilson@gmail.com

17366. Wood, C.; Fitt, R.N.L.; Lancaster, L.T. (2019): Evolving social dynamics prime thermal tolerance during a poleward range shift. *Biological Journal of the Linnean Society* 126(3): 574-586. (in English) ["Cold tolerance plays a critical role in determining the geographical range limits of species. Previous studies have found that range shifts in response to climate warming are facilitated, paradoxically, by cold acclimation capacities, due to increasingly colder and variable weather at high latitudes. However, the evolutionary dynamics of this process are poorly understood. In this study we combined experiments and field studies to investigate the social and

ecological factors affecting cold tolerances in range-shifting populations of the female-polymorphic *Ischnura elegans* in north-east Scotland, and their consequences for evolutionary change. In the field, we observed both environmental and social effects on cold tolerance and female colour morph frequencies. This process results in a latitudinal cline in female morph frequencies, due to positive feedback between social stress and thermal tolerances. Density manipulations in the laboratory provide experimental evidence that social interactions directly impact cold tolerance. Reciprocal effects of social environments on thermal acclimation may be important but commonly overlooked aspects of allee effects that contribute to the formation of range margins. Moreover, there is a wider need to consider the role of evolving social dynamics to reciprocally shape both the thermal physiology of individuals and the thermal niches of species." (Authors)] Address: Lancaster, Lesley, School Biol. Sciences, Univ. Aberdeen, Aberdeen AB24 2TZ, UK. E-mail: lesleylancaster@abdn.ac.uk

17367. Wu, X.; Liu, Z.; Chen, Y.; Wang, B. (2019): Description of larva of *Euphaea superba* Kimmins, 1936 (Odonata: Zygoptera: Euphaeidae) from China. *Zootaxa* 4545(4): 585-592. (in English) ["The final stadium larva of *Euphaea superba* Kimmins, 1936 is described and illustrated based on a male and a female specimens collected in Zhejiang province, China. The larvae were associated with the adults by mtCOI gene sequence. The larva of *E. superba* is diagnosed from other described members of the genus by the gena having 2–4 spines on outer side, the movable hook about 1.6 time as long as median cleft and female with primary genitalia extending to the posterior margin of abdominal segment 10." (Authors)] Address: Wang, B., College of Plant Protection, Nanjing Agricultural University, Jiangsu Province, 210095, PR. China. E-mail: wangbeixin@njau.edu.cn

17368. Xirouchakis, S.M.; Alivizatos, H.; Georgopoulou, E.; Dimalexis, A.; Latsoudis, P.; Portolou, D.; Karris, G.; Georgiakakis, P.; Fric, J.; Saravia, V.; Barboutis, C.; Bourdakis, S.; Kakalis, E.; Kominos, T.; Simaiakis, S. (2019): The diet of the Eleonora's falcon (*Falco eleonorae*) in the Aegean archipelago (Greece). *Journal of Natural History* 53 (29-30): 1767-1785. (in English) ["In the present study we investigated the diet of Eleonora's falcons in Greece and assessed the regional dietary pattern of 16 breeding colonies of the Aegean. Overall 224 nests were visited and a total of 8067 prey items were collected which contained two mollusca classes, seven insect orders, one reptile family, two mammalian taxa and at least 54 avian species. ... Cicadas were the most common insects found in pellets (44.7%) followed by ants (35.3%) and beetles (15.8%) ... The contribution of dragonflies, grasshoppers, flies and moths was insignificant i.e. <5%." (Authors)] Address: Xirouchakis, S.M., Nat. Hist. Mus. Crete, Univ. Crete, University Campus (Knossos), Heraklion, Greece. E-mail: sxirouch@nhmc.uoc.gr

17369. Yamaguchi, Y.; Sasaki, D.; Okamoto, M.; Shimoyama, K.; Obayashi, S. (2019): Numerical investigation of geometrical corrugation influence to vortex flowfields at low Reynolds number. *Journal of Fluid Science and Technology* 14(3): 1-8. (in English) ["Corrugated wings, which are cross-sectional

shapes of dragonfly wing, are expected to improve aerodynamic performance due to vortices generated by irregular shapes at low Reynolds number region. It is difficult to observe the influence of vortices generated from the unevenness of the shape by experiments. In this research, the flowfields around corrugated wings were calculated using Cartesian mesh-based Computational Fluid Dynamics (CFD), Building-Cube Method (BCM). The simulation grasped the detailed flowfield, which was difficult to be visually observed by the experiment. From the visualization result, it is found that the flow circulation velocity inside the concave and convex surface is not accelerated but slow. The result indicates that the improvement in aerodynamic performance is caused by the shape and position of unevenness." (Authors)] Address: Yamaguchi, Y., Kanazawa Inst. of Technology, 3-1 Yatsukaho, Hakusan, Ishikawa 924-0838, Japan. E-mail: b1406241@planet.kanazawa-it.ac.jp

17370. Yang, G. (2019): Descriptions of *Cephalaeschna zhuae* sp. nov. (Odonata: Aeshnidae) from Yunnan, China. *Entomotaxonomia* 41(3): 238-242. (in English, with Chinese summary) ["*Cephalaeschna zhuae* Yang sp. nov. (holotype ♂, from Yunnan Province in China) is described and illustrated, and compared with known Chinese species of *Cephalaeschna*. This new species has a distinct bicolor dorsal carina and special colors on the legs, which can distinguish it from other species of the genus *Cephalaeschna*." (Author)] Address: Yang, G., College of Agriculture & Life Sciences, Dali Univ., Dali, Yunnan 671003, China

17371. Yang, Q.; Ren, D.; Pang, H.; Shih, C. (2019): Chapter 6: Odonata – Dragonflies and Damselflies. In: Ren, D., C. Shih, T. Gao, Y. Wang & Y. Yao (eds.): *Rhythms of Insect Evolution: Evidence from the Jurassic and Cretaceous in Northern China*. Wiley-Blackwell. 728 pp. ["The superorder Odonoptera comprise the three orders Geroptera, Protodonata and Odonata. As one of the most basal groups of insects, Odonata are valuable for the study of evolution, especially the origination and development of wings. Odonata mate in the air. The mating rituals are displayed by pairs coupling together and flying in tandem. Aeshnidae are an extinct family which survived from the Late Jurassic to Early Cretaceous. They were usually found near seashores and rarely in deeply intra-continental environments. The Corduliidae comprise the emerald dragonflies or green-eyed skimmers. These dragonflies are usually black or dark brown with areas of metallic green or yellow, and most of them have large, emerald-green eyes. Hemeroscopidae, an extinct family from the Early Cretaceous, are known from fossils collected in the Transbaikal Region, Mongolia and China. The Tarsophlebiidae are an extinct family of medium-sized fossil odonates from the Upper Jurassic and Lower Cretaceous of Eurasia." (Authors)] Address: not stated

17372. Yerokine, M. (2019): Contribution à la connaissance des Odonates de l'île de la Réunion. Présence de *Tramea basilaris* (Palisot de Beauvois, 1817) (Odonata: Libellulidae). *Cahiers scientifiques de l'océan Indien occidental* 10: 1-2. (in French) ["Etang de Saint-Paul, January 2018."] Address: Yerokine, M., 5 c, ruelle Delgard, 97419, La Possession, Ile de La Réunion, France. E-mail: myc@wanadoo.fr

17373. Yerokine, M. (2019): Contribution à la connaissance des Odonates de l'île de la Réunion 12. *Urothemis edwardsii* (Selys, 1849), une espèce nouvelle pour l'île (Odonata: Libellulidae). Cahiers scientifiques de l'océan Indien occidental 10: 7-8. (in French) [10, 11 and 16 Dezember 2019, l'Etang de St-Paul] Address: Yerokine, M., 5 c, ruelle Delgard, 97419, La Possession, Ile de La Réunion, France. E-mail: myc@wanadoo.fr

17374. Yokoi, N.; Soiphanthong, V. (2019): Description of *Macromia murakii* sp. nov. (Anisoptera: Macromiidae) from northern Laos, with a consideration on the taxonomic relationship between similar species *M. chui* and *M. daimoji*. Tombo 61: 17-24. (in English, with Japanese summary) ["*Macromia murakii* is described from northern Laos (Nam Hien, Houaphan Province) as a new species. The holotype ♂ is deposited in the collection of National Museum of Nature and Science, Tsukuba, Ibaraki. This new species can be distinguished from the allied species, *M. daimoji* and *M. chui* by their morphological differences in the caudal appendages and the accessory genitalia. In addition, we discuss the taxonomic relation between *M. chui* and *M. daimoji*, which have been recently argued on synonym, and consider that they are highly possible to be different species." (Authors)] Address: Yokoi, N., Koriyama, Fukushima Pref., Japan. E-mail: yokoi@orange.plala.or.jp

17375. Yukita, Y. (2019): A recent record of *Zygomma obtusum* Albarda, 1881 from Iriomote Island. Tombo 61: 53-54. (in Japanese, with English summary) ["*Z. obtusum* has been recorded from the Daitou Islands and Yaeyama Islands, Okinawa Prefecture, in Japan. This species originally inhabited the in Daitou Islands and has been recorded from Yaeyama Island since 1996. However, the population in the Daitou Islands is currently threatened with extinction and the population from the Yaeyama Islands is assumed to be migrants from overseas. Although this species has not been recorded from the Yaeyama Islands in recent years, a male is here recorded from Iriomote Island taken on May 6, 2018." (Authors)] Address: not stated

17376. Zaman, M.N.; Fuadi, B.F.; Sultoni, A. (2019): Diversity of dragonfly genus *Drepanosticta* in tourism forest Curug Cipendok, Banyumas district. Proc. Internat. Conf. Sci. Engin. 2: 115-119. ["Cipendok especially have rich biodiversity. One of the themes is Javanese endemic dragonfly. Around 3 Javanese endemic dragonfly species was recorded in Curug Cipendok. Collection data was carried out in July until August 2017. The method used was exploration following path in several habitats, namely plantation, secondary forest, Pocung lake and field. Purpose of this study is to record the diversity of Javanese endemic dragonfly and distribution *Drepanosticta* in forest tourism curug Cipendok. The result from this observation is found three species that is *D. sundana*, *D. gazella*, and *D. spatulifera*. The highest population is *D. gazella* with 48% from totally individual and lowest is *D. sundana* 13%. The diversity with Shannon-Wiener index is 0.97 that is low diversity. From observation distribution of *Drepanosticta* only founded in a specific habitat, that is a secondary forest." (Authors)]

Address: Mokhammad Nur Zaman, M.N., Biology Dept, Fac. of Science & Technology UIN Sunan Kalijaga Jl. Marsda Adisucipto No. 1 Yogyakarta 55281, Indonesia. E-mail: azamavicenna@gmail.com

17377. Zeng, X. (2019): Healable omnidirectional antireflection coatings inspired by dragonfly wings. Dissertation of Department of Chemical Engineering, Zhongxing University: 98 pp. (in Chinese, with English summary) ["In this study, large-area and single-layer non-closed stacks silica colloidal crystal/Shape Memory Polymer composite were fabricated on polyethylene terephthalate (PET) substrates by spin coating technology using 90 nm, 180 nm, and 240 nm silica colloidal particles. The silica colloidal crystal/Shape Memory Polymer composite is etched with the reactive ion etching, and the dragonfly wing inspired structure with different sizes can be fabricated on the PET substrate by different etching time. The graded refractive index, by measuring the optical properties, shows that the dragonfly wing inspired structure is in the visible wavelength range, which can reduce the reflection of the larger light incident angle and improve the transmission. In addition, by studying the characteristics of shape memory polymer, deionized water was applied to the dragonfly wing inspired structure after etching, and the structure collapsed and aggregated, and its transmission decreased from 91.5% to 73.8%, and then acetone solution was applied. The dragonfly wing inspired structure was recovered, and its transmission raised from 73.8% to 91.2%. So, it shows the structure has property of shape memory. Therefore, it is a structure with property of omnidirectional anti-reflection and shape memory." (Author)] Address: not stated

17378. Zhang, X.-l.; Jiao, S.-w.; Wu, M.; Saho, X.-x.; Ye, X.-q.; Yan, Y.-n. (2019): Diet of two passerine birds during breeding season in reed wetland of Hangzhou Bay. Chinese Journal of Ecology 38(6): 1810-1816. (in Chinese, with English summary) ["Information on the bird's diet composition is essential to understand how wetland reclamation affects diversity of passerine birds. Samples of feathers of Reed Parrotbill (*Paradoxornis heudei*) and Oriental Reed Warbler (*Acrocephalus orientalis*) and samples of potential dietary insects were collected in the southern Hangzhou Bay (Shangyu, Shaoxing City), during the breeding season from July to August in 2017. Food sources were analyzed by measuring $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values in bird feathers and insect samples. The results showed that the contribution of various diet composition of Reed Parrotbill ranked as: Noctuidae pupa > Lepidoptera > Arachnida > Hymenoptera > Homoptera. The contribution of various diet composition of Oriental Reed Warbler ranked as: Hymenoptera > Arachnida > Odonata > Lepidoptera > Coleoptera > Homoptera. The value of feeding niche breadths of Reed Parrotbill and Oriental Reed Warbler was 5.21 and 5.95, respectively. There was no significant difference in the $\delta^{13}\text{C}$ values between the two species, indicating an overlap between their feeding niches ($P > 0.05$). However, there was a significant difference in the value of $\delta^{15}\text{N}$, with feeding niche overlap being 6.25, suggesting some differences of nutritional levels ($P < 0.01$). Lepidoptera, Arachnida, Hymenoptera, and Homo-

ptera were overlapping food-source insects for the two passerine species. The narrower niche breadth of Reed Parrotbill was inferior, and the loss of reed habitat had greater impacts on Reed Parrotbill." (Authors)] Address: Zhang, X.-I., Research Institute of Subtropical Forestry, Chinese Academy of Forestry, Hangzhou 311400, China

17379. Zhao, G.; Yuan, Y.; Zhang, P.; Zang, C.; Zhang, J.; Tao, L.; Zhang, G.; Zhou, H. (2019): Effects of laser-processed unit distribution density on wear resistance of biomimetic 6082 aluminum alloy. *Optics & Laser Technology* 112: 175-182. (in English) ["Highlights: •Bionic surface with various units distribution was prepared on 6082 Al alloy. •The unit present superior microstructure and hardness. •The wear resistance of Al alloy was increased by 53.43%. •An optimal unit distribution interval was obtained to resist wear. •The wear resistance mechanism was analyzed and the stress was simulated. Abstract: Biomimetic coupling units with different distribution densities were produced on the surface of 6082 aluminum alloy first by imitating the non-smooth wearproof surfaces of natural living things and then by simulating their soft-hard alternated surfaces with the laser surface melting technology. The effects and optimal level of unit distribution density on the abrasive resistance of 6082 aluminum alloy were analyzed via wear tests and simulation analysis. It was found biomimetic coupling units considerably improved the wear resistance of 6082 aluminum alloy. Stress analysis and experiments showed the wear resistance of 6082 aluminum alloy was optimized and enhanced by 53.43% from non-treated alloy when the density distribution coefficient of units was 0.4. Moreover, the wearproof mechanism of biomimetic coupling units was experimentally analyzed and discussed." (Authors)] Address: Zhao, G., The Key Lab of Automobile Materials, Ministry of Education, Jilin Univ., Changchun 130025, PR China

17380. Zheng, D.; Nel, A.; Jarzembowski, E.A. (2019): The first Cretaceous damselfly of the Jurassic family Steleopteridae (Odonata: Zygoptera), from Surrey, England. *Cretaceous Research* 93(1): 1-3. (in English) ["Steleopteron cretacicus sp. nov., first Cretaceous and most recent representative of the small Mesozoic family Steleopteridae, is described from the Wealden of the UK. This discovery shows that this Jurassic family survived into the Cretaceous. It probably became extinct during or after the great entomofaunal changes of the Albian e Cenomanian event." (Authors)] Address: Nel, A., Lab. Ent.. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@cimrs1.mnhn.fr

17381. Zheng, D.; Wang, B.; Nel, A.; Jarzembowski, E.A.; Zhang, H.; Chang, S.-C. (2019): Mesostictinae subfam. nov., an archaic group of platystictid damselflies (Odonata: Zygoptera) from mid-Cretaceous Burmese amber. *Journal of Systematic Palaeontology* 17(1): 1-8. (in English) ["Odonatans are quite rare in the fossil record compared with the other insects, especially in Cretaceous amber inclusions. The extant family Platystictidae is one of the most diverse Zygoptera, but short of fossil records. In this paper, a new species, *Mesosticta davidattenboroughi* sp. nov., is described from mid-Cretaceous Burmese amber, representing the third-known fossil

species of Platystictidae. *M. davidattenboroughi* sp. nov. has a long IR1 beginning one cell distal of the base of RP2, confirming the previous attribution of *Mesosticta* Huang, Azar, Cai & Nel, 2015 to Platystictidae. It differs from other species of *Mesosticta* in having a long IR1 and a basally crossed subdiscoidal cell. The fossil genus *Mesosticta* shares the diagnostic characters of the modern platystictid genera, viz. a basally recessed 'CuP' (shared by all species), a very long IR1 (only in *M. davidattenboroughi* sp. nov.), and a specialized subdiscoidal area mostly rhomboidal in shape (only in *M. electronica* Zheng, Zhang, Chang & Wang, 2016). Based on the platystictid damselflies from Burmese amber, a new subfamily Mesostictinae subfam. nov. is established. Mesostictinae subfam. nov. represents the first fossil group of modern platystictid damselflies, documenting the appearance of Platystictidae as early as mid-Cretaceous. It differs from modern Platystictidae by the presence of fewer postnodal and postsubnodal crossveins, a short MP, the base of RP2 being nearer to the subnodus and the nodus lying more distally." (Authors)] Address: Nel, A., Lab. Ent.. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@cimrs1.mnhn.fr

17382. Zheng, D.; Wang, B. (2019): The second hemiphlebiid damselfly (Odonata: Zygoptera) from mid-Cretaceous Burmese amber. *Alcheringa* 43(2): 257-260. (in English) ["*Burmahemiphlebia zhangi* Zheng et al. 2017 is the dominant damselfly found in Burmese amber. Here, a new hemiphlebiid damselfly, *Burmahemiphlebia hui* sp. nov., is described representing the second *Burmahemiphlebia* species discovered in Burmese amber. *Burmahemiphlebia hui* sp. nov. differs from *B. zhangi* in having more postnodal cross-veins, CuP and the separating point of AA from AP basal of $A \times 1$, Arc aligned with $A \times 2$, RP2 base closer to N than to Pt, and IR1 five cells distal of RP2 base. The new damselfly is extremely rare and the only one known from Burmese amber, unlike *B. zhangi*." (Authors)] Address: Zheng, D., State Key Lab. Palaeobiology & Stratigraphy, Nanjing Inst. Geology & Palaeontology & Center for Excellence in Life & Palaeoenvironment, Chinese Acad. of Sciences, 39 East Beijing Road, Nanjing 210008, PR China. E-mail: dranzheng@gmail.com

17383. Zheng, D.; Wang, H.; Nel, A.; Dou, L.; Dai, Z.; Wang, B.; Zhang, H. (2019): A new damsel-dragonfly (Odonata: Anisozygoptera: Campteropteroptidae) from the earliest Jurassic of the Junggar Basin, northwestern China. *Alcheringa*: 43(4): 563-567. (in English) ["A new genus and species of campteropteroptid damsel-dragonfly, *Jurassophlebia xinjiangensis* gen. et sp. nov., is described from the Lower Jurassic Badaowan Formation in the Junggar Basin, northwestern China. *Jurassophlebia* differs from all other campteropteroptid genera in having PsA in the same orientation as the distal branch of AA, and in its uniquely open subdiscoidal cell with very acute apical angle in the hind wing. The new discovery adds to the Asian diversity of damsel-dragonflies in the earliest Jurassic." (Authors)] Address: Zheng, D., State Key Lab. Palaeobiology & Stratigraphy, Nanjing Institute of Geology & Palaeontology & Center for Excellence in Life & Palaeoenvironment, Chinese Academy of Sciences, 39 East Beijing Road, Nanjing 210008, PR China. E-mail: dranzheng@gmail.com

17384. Zheng, D.; Nel, A.; Jarzembowski, E.A.; Chang, S.-C.; Zhang, H.; Wang, B. (2019): Exceptionally well-preserved dragonflies (Insecta: Odonata) in Mexican amber. *Alcheringa*: 43(1): 157-164. (in English) ["Dragonflies (odonatans) are comparatively rare as amber inclusions, and most are not well preserved on account of their size. Here, we report a single piece of Mexican amber with one complete dragonfly and two damselflies. The dragonfly is attributed to the extant gomphid *Erpetogomphus Selys Longchamps*, and the damselflies belong to the extant coenagrionid *Argia Rambur*. Both genera are nowadays distributed widely in Mexico. The new discovery dates the origins of these two genera to the Miocene at least." (Authors)] Address: Nel, A., Lab. Ent. Mus. Natn. Hist. Nat., 45 rue Buffon, F-75005 Paris, France. E-mail: anel@cimrs1.mnhn.fr

17385. Zia, A. (2019): *Coeliccia vacca* Laidlaw, 1932 (Odonata: Zygoptera: Platycnemididae) A data deficient potentially threatened species. *Pakistan Journal of Agricultural Research*, 32(4): 706-709. (in English) ["*C. vacca* has been added to the Odonata fauna of Pakistan by reporting it from three mountainous spots in sub Himalayan hill tracts of Pakistan. It is a data deficient, potentially threatened species whose habitat and ecology was never known. To date, there is no information available for its male and immature stages. It is second species for the genus to be recorded from Pakistan. Distributional details along with important taxonomic characters and habitat information is discussed in detail to facilitate readers of this document. A key to the known species of *Coeliccia* from Pakistan is also provided. A need to conduct further surveys in whole hill belt is highly felt with a view to get more information especially for its male and naiads." (Authors)] Address: Zia, A., Institute of Plant & Environmental Protection, National Agriculture Research Centre, Islamabad, Pakistan. E-mail: saiyyedahmed@gmail.com

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17386. Aono, T.; Kagimoto, B. (2020): A second record of *Sympetrum uniforme* (Selys, 1883) from Hiroshima Prefecture, 2019. *Tombo* 62: 130. (in Japanese, with English summary) ["*S. uniforme* is a rare species in Japan. In Hiroshima Prefecture, this species was newly recorded at one pond in Higashi-Hiroshima city in 2018. On 25 October 2019, the first author discovered a male of this species at another pond in Higashi-Hiroshima city." (Authors)] Address: E-mail: miyajimatonbo@yahoo.co.jp

17387. Aparicio Valenciano, A.; Aguirre, J.L.; Larrán, A. (2020): Primera cita de *Diplacodes lefebvrei* (Rambur, 1842) (Odonata: Libellulidae) para la Comunidad de Madrid (España) y biodiversidad de odonatos de la Laguna de Meco. *Boletín de la Sociedad Entomológica Aragonesa* 67: 411-414. (in Spanish, with English summary) ["The present article shows a provisional checklist of the odonates present in the Laguna de Meco (Meco, Madrid). The checklist includes the 21 species of odonates (9 Zygoptera and 12 Anisoptera). We describe the wetland habitat and consider it as an area of special interest for the conservation of Odonata because of the high species richness values. First record of *D. lefebvrei* and new ones of *Anax*

ephipplger and *Orthetrum trinacria* for Madrid." (Authors)] Address: Aparicio Valenciano, A., Cátedra de Medio Ambiente. Fac. Ciencias de la Vida. Univ. Alcalá, alejandro.aparicio@uah.es

17388. Asensio, R.; Leonardo, J.M. (2020): Confirmación de la presencia y reproducción de *Gomphus vulgatissimus* (Linnaeus, 1758) (Odonata: Gomphidae) en Bizkaia (País Vasco, España). Confirmation of the presence and reproduction of *G. vulgatissimus* in Bizkaia (Basque Country, Spain). *Munibe, Cienc. nat.* 68: 9 pp. ["During 62 macroinvertebrate benthic fauna samplings carried out between 2016 and 2018 along 17 sections of the Cadagua river basin (Bizkaia), six specimens of *G. vulgatissimus* in larval state were captured. Additionally, in 15 routes made in the summer of 2019 along 13 sections of the same river basin for the observation of odonatal imagos, an adult male of *G. vulgatissimus* was identified. These 7 new observations confirm the presence of this species in Bizkaia and represent the first report of its effective reproduction in this Historic Territory. Two new 10x10 km UTM grids have therefore been added to the small distribution area known for this species in the Iberian Peninsula, which is limited to its northern third." (Authors)] Address: CUESTASENSIO S.C. Antonio de Trueba, 8-5º 48012, Bilbao. E-mail: cuestasensio@gmail.com

17389. Atourrohman, M.; Ulfah, M.; Septiani, M.; Silmi, F.I.; Utami, R.T.; Malimah, S.F.; Rahmawati, S.D.; Ananto, A.D.; Dewi, B.A.; Setyawati, S.M. (2020): Karakterisasi dan Identifikasi *Orthetrum sabina* (Odonata: Libellulidae) di Lapangan Rusunawa Jerakah Purwoyoso Semarang: Karakterisasi dan Identifikasi *Orthetrum sabina* (Odonata: Libellulidae) di Lapangan Rusunawa Jerakah Purwoyoso Semarang. *Jurnal Litbang Edusaintech* 1(1): 57-60. (in Indonesian, with English summary) ["This study purpose to identify and characteristic dragonflies in the Rusunawa field. The type of research used is qualitative descriptive research, which aims to determine the morphology of dragonflies with *O. sabina* type and to know the environmental factors that affect dragonfly breeding. The method used in this study is roaming, by searching for dragonflies in the Rusunawa field Jerakah. The dragonfly population found in the Jerakah field is mostly one of which is *O. sabina* The number of dragonflies is influenced by several factors, namely temperature, climate, air humidity, water ph and insecticide use." (Authors)] Address: A'tourrohman, M., Dept of Biology, Fac. Science & Technology UIN Walisongo, Semarang 50185, Indonesia. E-mail: athoqsara11@gmail.com

17390. Avila Junior, W.F.; Lencioni, F.A.A.; Carneiro, M.A.A. (2020): *Heteragrion itacolomii* sp. nov. (Odonata: Zygoptera: Heteragrionidae) from Itacolomi State Park, Ouro Preto, Minas Gerais, Brazil. *Zootaxa* 4779(1): 121-130. (in English) ["*H. itacolomii* sp. nov. (♂ holotype: Brazil, Minas Gerais, Ouro Preto, Parque Estadual do Itacolomi, Trilha da Lagoa, 1350m, 23-xii-2018, 20°25'57"S, 43°30'27"W; and ♀ allotype, same data as holotype, but collected in tandem 20-iii-2019, deposited in ABMM-CCT/UFMG collection) is described and illustrated. The new species is similar to *H. tiradentense* Machado & Bede, 2006, *H. muryense* Costa & Santos, 2000 and *H. mantiqueirae* Machado, 2006, based on coloration of the thorax and has

cerci similar to those of *H. freddiemercuryi* Lencioni, 2013. It belongs to Group A and differs from other congeners by the morphology of the ventral expansion and the medial process of the cerci in males. Information about the intersternite of the single female specimen is also provided." (Authors)] Address: Ávila Junior, W.F., Universidade Federal de Ouro Preto, Lab. Entomologia Ecológica DEBIO/ICEB, Campus Morro do Cruzeiro, CEP 35400-000, Ouro Preto, MG, Brazil. E-mail: walterfaj88@gmail.com

17391. Bae, Y.J.; Yum, J.H.; Kim, D.G.; Suh, K.I.; Kang, .H. (2020): *Nannophya koreana* sp. nov. (Odonata: Libellulidae): A new dragonfly species previously recognized in Korea as the endangered pygmy dragonfly *Nannophya pygmaea* Rambur. *Journal of Species Research* 9(1): 1-10. (in English) ["*N. koreana* sp. nov., is described from Korea on the basis of morphology and mitochondrial cytochrome oxidase c subunit I (COI) gene sequences. *Nannophya* materials from Korea and other areas in Southeast Asia were compared. The new species was previously recognized in Korea as the endangered *N. pygmaea* Rambur, 1842, which is widely distributed in insular and peninsular Southeast Asia. However, male adults of the *Nannophya* population in Korea could be distinguished from other *N. pygmaea* populations by the presence of a thick, incomplete black stripe on the lateral synthorax that terminated at half-length (vs. continuous to wing base), light orange (vs. red) anal appendages, and 4-5 (vs. 2-3) black teeth on the ventral superior appendages. In addition, the body length of *N. koreana* was generally larger (1.2-1.4 times) than that of *N. pygmaea*, regardless of life stage. COI gene sequences from the two groups exhibited substantial genetic differences (>12%), thereby sufficiently substantiating their differentiation. The taxonomic status, distribution, and habitat of the new species are discussed." (Authors)] Address: Bae, Y.J., National Institute of Biological Resources, Ministry of Environment, Incheon, Republic of Korea. nibrpresident@korea.kr

17392. Beddiar, M.; Benchalel, W.; Boucetta, S.; Bouslama, Z.; Elmsellem, H. (2020): Physico-chemical and biological evaluation of the quality of surface water in the Wadi El-Melha watershed (North-East Algeria). *Maroccan Journal of Chemistry* 8(2): 486-496. (in English) ["This environmental study targeted the ecological assessment and classification of the waters' state of health at the level of the Wadi El-Melha watershed flowing from Lake Mellah (northeast of Algeria) through Physico-chemical parameters measured in situ and measured in the laboratory, and the biological quality achieved through Odonates as bio indicators of ecological potential in watercourses. The aim is to conserve the potential of the ecosystem (biotope, habitat and reproduction of species, flow of water, rambling of the bed). The waters' quality of the Wadi El-Melha watershed seems to be generally good at the end of this study despite some recognized disturbances in some sections, which are essentially linked to alterations by, nitrites nitrates and phosphates which in places influence the quality of the surveyed river. In terms of biological quality which was assessed using ecological indices, the results revealed a stability of the stand during the study period. The odonatological procession is diverse (Shannon index $H' = 2.26$), and it is in equilibrium (equitability index $E = 0.90$).

Based on the classification proposed by [1], Wadi El-Melha is among the "middle" rivers, meaning a "moderately polluted" classification. ... The overall relative frequency revealed that the species *Ischnura graellsii* is the most frequent, representing 24.57% of the total population, followed by *Orthetrum coerulescens* with 15.69% *Calopteryx haemorrhoidalis* (12.13%). The other nine species (*Ceriagrion tenellum*; *Anax imperator*; *Platycnemis subdilatata*; *Chalcolestes viridis*; *Gomphus lucasii*; *Crocothemis erythraea*; *Trithemis annulata*; *Sympetrum striolatum*; *Boyeria irene*) are represented by the respective percentages of 8.36%; 7.84%; 7.12%; 5.21%; 5.16%; 3.82%; 3.66% and 2.89%." (Authors)] Address: Beddiar, M., Lab. Ecol. of Terrestrial & Aquatic System «ECOSTAQ», Badji Mokhtar Univ. Annaba, Algeria. E-mail: Beddiar_marwa@yahoo.co

17393. Bedjanic, M.; Kalkman, V.J.; Subranabian, K.A. (2020): A new species of *Orthetrum* Newman, 1833 (Odonata: Libellulidae) from the Andaman Islands, India. *Zootaxa* 4779(1): 91-100. (in English) ["*Orthetrum andamanicum* sp. nov. (holotype σ : India, Andaman and Nicobar Islands, South Andaman island, Chidiyatapu, N 11.51, E 92.71; 08-xii-1998; deposited in RMNH, Leiden; RMNH.INS.1152911), is described as new to science. Based on additional photographic records, notes on mature males' life colouration, distribution and habitat of this Andaman endemic are provided." (Authors)] Address: Bedjanic, M., National Institute of Biology, Vecna pot 111, SI-1000, Ljubljana, Slovenia. E-mail: matjaz.bedjanic@nib.si

17394. Belenguier, L.; Flammant, P.; Legrand, R. (2020): Le «Lac bleu» de la mine des Rosiers (Puy-de-Dôme): une zone humide originale d'intérêt pour les Odonates et disparue en 2017. *arvensis* 91-92: 1-22. (in French) [The «Lac bleu» of the Rosiers mine, in Saint-Pierre-le-Chastel (63) was a wetland that took place in mining residues. The authors report on its disappearance with the aim of transmitting the information available on this site and its odonatological procession before its destruction. This wetland, which had significant concentrations of certain heavy metals, was home to an important station of *Leucorrhinia dubia*.] Address: Belenguier, L., 123, avenue Joseph Claussat, 63400 Chamalières, France. E-mail: lbelenguier@gmail.com

17395. Benchalel, W.; Beddiar, M.; Boucetta, S.; Bouslama, Z. (2020): Bioecology of *Calopteryx haemorrhoidalis* (Zygoptera, Odonata) in response to environmental factors in the Brabtia sector streams, El-Kala, Algeria: implications for ecohydrological biomonitoring. *Studia Universitatis Vasile Goldis Seria Stiintele Vietii (Life Sciences Series)* 30(1): 21-32. (in English) ["Aspects of the phenology, reproductive biology and larval cycle of natural populations of *C. haemorrhoidalis* are described. Populations of this species in Brabtia sector (eastern Numidia, North-East Algeria) were studied between March 2017 and April 2018. An overview of the current state of the population is provided. The streams of Eastern Numidia have suffered over recent years from major disturbances including the effects of 20 rapid climate changes. Although the status of autochthony is preserved in the site, the populations are currently diminished compared to that recorded two dec-

ades ago. Aspects of the species reproductive behavior, biology, and ecology are reported. The species is univoltine with a direct development in 12 larval stages. The effects of some climatic conditions, particularly air temperature, included an extension of the adult phenology period. The species is unable to tolerate a certain amount of stress similar to stagnant water species. The correlation established between the abundance of *C. haemorrhoidalis* and the physico-chemical parameters from the principal correspondence analysis (PCA) shows an ecological gradient, in the distribution of the species, significantly ($P < 0.001$) explained by a requirement for dissolved oxygen, both temperatures and pH." (Authors)] Address: Beddiar, M., Laboratory of Ecology of Terrestrial and Aquatic System «EcoSTaq», Badji Mokhtar University, Annaba, Algeria. E-mail: Beddiar_marwa@yahoo.com

17396. Bhatti, H.; Panhwar, W.A.; Zia, S.A. (2020): Study on the dragonfly (Anisoptera: Odonata) fauna of district Larkana Sindh, Pakistan. *Journal of Entomology and Zoology Studies* 8(2): 619-623. (in English) ["A detailed odonatological field investigations were carried out to capture the dragonfly fauna of Larkana district, during March 2018 to October 2018 from various sites. Total of 215 samples recognized into 9 species under 5 genera pertaining to two families. The family Libellulidae was found most dominant with record of 8 species pertaining to 4 genera while family Aeshnidae was recorded with single species. Family Libellulidae showed its wide diversity and over all percentage of Libellulidae was recorded significantly highest (81.39%) and lowest that of family Aeshnidae (18.60%). Beside this, identification keys were also provided for easily isolation of families and genera." (Authors)] Address: Zia, S.A., National Insect Museum, National Agricultural Research Center, Islamabad, Pakistan

17397. Borkataki, S.; Taye, R.R.; Padhy, V. D.; Ramalakshmi; Reddy, M.D. (2020): Occurrence of odonates in M. S. Swaminathan School of agriculture (MSSSoA), CUTM, Paralakhemundi campus, Odisha. *Journal of Entomology and Zoology Studies* 8(2): 806-808. (in English) ["The present investigation on occurrence of Odonates was carried out in the campus of M. S. Swaminathan School of Agriculture (MSSSoA), CUTM, Paralakhemundi during 2018-2019. A total of 21 species of Odonata including 14 species of dragonflies under 1 family – Libellulidae of Anisoptera and 7 species of damselflies under 1 family – Coenagrionidae of Zygoptera were recorded from three different types of habitats in MSSSoA campus. The species belonging to the family Libellulidae was found to be abundant with 14 species followed by the family Coenagrionidae with 7 species." (Authors)] Address: Borkataki, S., Assistant Professor, Department of Entomology, Assam Agricultural University, Jorhat, Assam, India

17398. Borkenstein, A.; Jödicke, R. (2020): Body posture of *Sympetrum striolatum* at low temperatures in the absence of direct solar irradiation (Odonata: Libellulidae). *Notulae odonatologicae* 9(5): 209-217. (in English) ["The flight season of *S. striolatum* in NW Germany extends into the beginning of winter. To understand behavioural thermoregulation we studied the body posture of females and males on cool ($T < 10^{\circ}\text{C}$) and

overcast days. Although this species typically roosts in treetops, we discovered a few individuals perching on birch stems or roosting low on birch twigs. In both situations the wings were held predominantly horizontal relative to the dragonfly's body, the legs were moderately stretched and the body axis was positioned parallel to but distant from the support. When the surface temperature of the bark was cooler than the ambient air, the individuals changed their perching angle to maximize the distance of pterothorax and abdomen from the support." (Authors)] Address: Borkenstein, Angelika, Lebensbomer Weg 5, 26419 Schortens, Germany. E-mail: angelikaborkenstein@t-online.de

17399. Brito, J.; Louback-Franco, N.; Mendoza, C.; Nonato, F.; Juen, L. (2020): After 10 years the myth of *Crotalaria* spp. and dragonflies remains alive. *Biota Neotropica* 20(2): 6 pp. (in English, with Portuguese summary) ["The struggle to control insect-borne diseases can lead to make rash decisions. For instance, the controversial method of planting of *Crotalaria* spp. to attract predatory dragonflies can be used to control insect vectors of dengue fever and several other medically significant insect-borne diseases. Nevertheless, there is no scientific support for this assumption. Despite the lack of evidence, in Brazil, there remains a multitude of online articles and grey literature sources still promote *Crotalaria* planting as a means to prevent dengue fever. Here we discuss the reasons why Odonata would not be attracted by *Crotalaria* and, therefore, it cannot not be considered as an efficient method for vector control. Finally, the best practice to avoid the spread of insect-borne diseases in the tropics is to avoid the accumulation of standing water in urban areas." (Authors) fake news] Address: Juen, L., Univ. Fed. do Pará, Lab. de Ecol. e Conservação, Belém, PA, Brasil. E-mail: leandrojuen@ufpa.br

17400. Buczynski, P.; Stasiak, K. (2020): *Sympetma paedisca* (BRAUER, 1877) (Odonata: Lestidae) caught in a light trap. *Odonatrix* 16_6 (2020): 3 pp. (in Polish, with English summary) ["A female of *S. paedisca* was caught on 23.07.2013 in a light trap in a forest near the village of Gołab in east-central Poland ($51^{\circ}30'N$, $21^{\circ}55'E$; UTM: EC60). This odonate was collected during research on the food resources of the Nightjar (*Caprimulgus europaeus*). However, it was probably an individual roosting away from its breeding site, which was stimulated to activity by the strong light from the trap. This species is therefore unlikely to be a potential food item of the Nightjar. But this record is interesting because *S. paedisca* is rare in the Mazovian Lowland and protected by law in Poland." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, 20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

17401. Buczynski, P.; Tonczyk, G. (2020): Polish and dedicated to Poland odonatological papers. 18. The year 2019. *Odonatrix* 16_1 (2020): 5 pp. (in Polish, with English summary) ["The authors present a list of Polish and dedicated to Poland odonatological papers that were published in the year 2019. In the reported time period, 38 publications of various kind were published, and one PhD thesis and one Msc thesis were created." (Authors)] Address: Buczynski, P.,

Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, 20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

17402. Buczynski, P.; Buczyńska, E.; Baranowska, M.; Lewniewski, L.; Góral, N.; Kozak, J.; Tarkowski, A.; Szykut, K.A. (2020): Dragonflies (Odonata) of the city of Lublin (Eastern Poland). *Polish Journal of Entomology* 89(3): 153-180. ["The authors discuss the dragonfly fauna of Lublin based on fragmentary historical data and the results of their own research from the period 1992-2019. A total of 54 dragonfly species were recorded: 17 in the historical period and 53 contemporarily. Although the Lublin area is a hot spot of odonate species richness in both the Lublin Upland and central and eastern Poland, it is of little importance for habitat specialists and also endangered and protected species. The species composition of the fauna was analysed in three zones of the city: the outskirts, the urbanized area and the City Centre. The diversity and numbers of dragonflies decreased significantly along this urbanization gradient and some groups of stenotopic species disappeared. The importance of anthropogenic water bodies in maintaining the diversity of dragonflies in urban areas, in particular stormwater ponds and garden ponds, is emphasized." (Authors)] Address: Buczynski, P., Dept of Zoology & Nature Protection, Institute of Biological Sciences, Maria Curie-Skłodowska University, Akademicka 19, 20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

17403. Buczynski, P.; Bobrek, M.; Bobrek, R. (2020): An interesting record of the accidental introduction of the exotic dragonfly *Pseudagrion microcephalum* (RAMBUR, 1842) (Odonata: Coenagrionidae) to Poland. *Odonatrix* 16_5 (2020): 6 pp. (in Polish, with English summary) ["One female of the Australian-Oriental *P. microcephalum* emerged in a pet shop with fish aquaria containing tropical plants in Kraków (UTM: DA24) (S Poland) in February 2020. It probably entered the aquarium as an egg or a larva on aquatic plants originating from south-east Asia. This is the fourth known case of the accidental introduction of an exotic odonate to Poland: the earlier ones involved *Mecistogaster* sp., *Crocothemis servilia* and *Ischnura senegalensis*. The case of *P. microcephalum* is particularly interesting, because the plants came from a greenhouse complex in Poland, to which no new plants had been imported for around half a year. Given the larval development time in tropical Coenagrionidae, this indicates the persistence in heated greenhouses of a population of *P. microcephalum* that has been present for at least three or four generations. This is probably the first confirmed information of this kind from Europe. Systematic studies on the existence of reproducing populations of dragonflies in greenhouses cultivating exotic aquarium plants are worth undertaking." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska Univ., Akademicka 19, 20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

17404. Burwell, C.J.; Theischinger, G.; Leach, E.C.; & Burwell-Rodriguez, A.I. (2020): Dragonflies and damselflies (Odonata) of the Eungella region, central coastal Queensland, Australia. *Proceedings of The Royal Society of Queensland* 125: 33-42. (in English) ["We collate records of species of

Odonata from the broader Eungella region within the Clarke Range, central coastal Queensland, Australia, comprising the Eungella plateau, the upper Pioneer Valley as far east as Gargett, and the area around Eungella Dam on the western side of the Clarke Range. Records are based on specimens collected on Griffith University and Queensland Museum surveys of the region in 2013 and 2014, specimen records in museum collections, and observational records sourced using the Atlas of Living Australia and accompanied by identifiable photographs. A total of 58 species are recorded from the Eungella region: 37 dragonflies and 21 damselflies, representing 12 families. Four species appear to be endemic to the Clarke Range. Another six are southern species that occur as far north as Eungella and the broader Clarke Range but do not cross the Burdekin-Lynd Barrier. Two species are essentially confined to northern Queensland and occur south of the Burdekin-Lynd Barrier but only as far south as the Eungella region. The majority of the region's species are widespread, occurring from northern to southern Queensland and often far beyond." (Authors)] Address: Burwell, C.J., Biodiversity Program, Queensland Mus., PO Box 3300, South Brisbane, Queensland, Australia. E-mail: chris.burwell@qm.qld.gov.au

17405. Cabana Otero, M.; Barreiro, A.R.; Cordero-Rivera, A. (2020): Primera cita de *Aeshna isocles* (Müller, 1767) (Odonata: Aeshnidae) para la provincia de Lugo y situación de la especie en Galicia (noroeste de la Península Ibérica). *Boletín de la Sociedad Entomológica Aragonesa* 67: 399-400. (in Spanish, with English summary) ["The first record of *A. isocles* from Lugo province is reported, as well as new observations from A Coruña province. The situation of this dragonfly in Galicia (north-western Spain) is briefly described and discussed." (Authors)] Address: Cabana Otero, M., Grupo de Investigación en Biología Evolutiva (GIBE), Depto de Biología. Facultad de Ciencias. Univ. da Coruña. Campus da Zapateira, s/n. 15071 A Coruña, Spain. E-mail: mcohylla@gmail.com

17406. Cardoso, F. (2020): Ângelo Machado - In memoriam (1934-2020). *Arquivos de Neuro-Psiquiatria* 78(5): 316-317. (in English) ["Professor Ângelo Barbosa Monteiro Machado, MD-PhD was born in Belo Horizonte City on the 25th of May, 1934). He graduated from the Medical School of Universidade Federal de Minas Gerais (UFMG) but never practiced Medicine. Despite this fact and paradoxically, as we shall see, he exerted a profound and lasting influence over Medicine, particularly in the fields of Neurology and Neurosurgery. Immediately after graduating, he became part of the faculty at the Anatomy Department of UFMG, where received his PhD title in 1963. From 1965 to 1967, he was a research post-doctoral fellow at the Morphology Department of Northwestern University in Chicago, IL. Upon his return to Brazil, in partnership with his main collaborator and wife, Professor Conceição Ribeiro da Silva Machado (1936-2007), he founded the Laboratories of Electron Microscopy and Neurobiology at the Institute of Biological Sciences of Universidade Federal de Minas Gerais (Laboratórios de Microscopia Eletrônica e Neurobiologia do Instituto de Ciências Biológicas, ICB-UFMG). After retiring as a Professor at the Morphology Department in 1987, he returned to work at the same ICB-UFMG, but this

time at the Laboratory of Insects Systematic of the Zoology Department (Laboratório de Sistemática de Inseto do Departamento de Zoologia). After compulsory retirement in 2004, he became Professor Emeritus at ICB-UFMG in the following year. His most significant contributions in the field of Neurobiology were to elucidate the formation of norepinephrine containing synaptic vesicles from the smooth endoplasmic reticulum as well as several aspects of involvement of the autonomic nervous system in experimental models of Chaga's disease. In the field of Entomology, his area of expertise was dragonflies. He described the astonishing number 98 species and 11 genres of these insects. By the way, Professor Ângelo loved dragonflies so much that the tiles marking the rim of the water of the swimming pool at his house were illustrated with drawings of dragonflies. The third intellectual activity to which he was involved was environmentalism. At an age when this was an issue that deserved at best rare footnotes, he vigorously engaged himself on the defense of the environment. Moreover, he developed a late interest in literature, writing dozens of plays and books. Most of them targeted children and teenagers. In 1993, he received the Jabuti Award for the book *O velho da montanha, uma aventura amazônica*. The Jabuti Award is the most prestigious award in Brazilian letters, comparable to the Pulitzer Prize in the USA. His indelible legacy for Neurology had an almost serendipitous nature. Already an assistant to Professor João Afonso Liberato Didio, MD-PhD, then Professor and Chief of Anatomy at UFMG, always tongue-in-cheek, he thought that "there was no future in dissecting". He moved to the sector of Neuroanatomy. With his remarkable didactic skills, he rendered intelligible a subject that was virtually inaccessible to Medical students. Up to that time, they were forced to study thick and hermetic foreign textbooks. The students started copying the lectures, typed them, bounded them together and created a makeshift book that circulated among them semester after semester. After that, Professor Ângelo curated the text and this is how the first edition of the textbook *Functional Neuroanatomy (Neuroanatomia Funcional)* gained life. There is a fastidious overuse of the adjective seminal. Yet in this particular case it is fitting to associate this book with a reproductive function: there are very few Brazilian neurologists that have not fallen in love with the nervous system and decided to pursue a career in Neurology after reading such work. I regret for those who did not have the privilege of meeting Professor Ângelo Machado. To be born in an aristocratic family with plenty of towering figures in Medicine (Lucas Machado), Politics (Cristiano Machado), and Literature (Maria Clara Machado and Abílio Machado) may be an easy way to have one's talent blocked. However, and fortunately, this never happened to him. Aside his intellectual prowess, he was an eccentric and deliciously funny man, warmly called "Angelim" by his peers and students. He also had many other scientific and non-scientific interests. Among these, he was endowed with an unmatched skill for foreign languages; he was a talented amateur comic actor during the Medical School and was a nocturnal flâneur in the bohemian scene of Belo Horizonte. His retirement of the latter (by the way, bitterly regretted by his fellow bohemians!) was caused by the most fateful event of his life: passion for and marriage with Professor Conceição née

Ribeiro Machado, resulting not only in a highly productive scientific partnership, but also in the birth of Lúcia (neuro-pediatrician), Flávia (intensivist), Paulo (biologist) and Eduardo (employee of the Brazilian Central Bank). Professor Ângelo Machado died on the 6th of April 2020." (Author)] Address: Cardoso, F., Univ. Federal de Minas Gerais, Medical School, Internal Medicine Dept, Neurology Service, Movement Disorders Unit, Belo Horizonte MG, Brazil

17407. Chan, K.S.; Tan, J.; Goh, W.L.; Earl of Cranbrook (2020): Diet profiling of house-farm swiftlets (*Aves*, Apodidae, *Aerodramus* sp.) in three landscapes in Perak, Malaysia, using high-throughput sequencing. *Tropical Ecology* 60: 379-388. (in English) ["In Peninsular Malaysia, from the 1980s there has been progressive expansion of an industry based on specially designed buildings to house colonies of edible-nest swiftlets (*Apodidae*, *Collocaliini*). The structures are termed house-farms and the birds, house-farm swiftlets. Genetic research has so far failed to establish affinity with any wild form of swiftlets that builds 'white' edible nests; we therefore identify house-farm swiftlets only as *Aerodramus* sp. The diet profiles of house-farm swiftlets were compared in different landscapes in Perak State, Malaysia, using a high-throughput sequencing of total DNA extracted from faecal samples collected at six house-farms, located at Beruas, Gopeng, Ipoh and Pantai Remis, in the month of October 2017. Landscape profiles of the presumed foraging area within 6 km radius of these six sites were estimated using Google MyMaps, and categorised as urban, monocrop or mixed-use. Based on the partial mitochondrial cytochrome oxidase I region (ca. 218-bp), 4852 operational taxonomic units (OTUs) were recovered, of which 266 belonged to arthropods. Overall, the diets of house-farm swiftlets assessed in this study mainly comprised Diptera (64.49%), followed by Hemiptera (16.73%), Coleoptera (13.47%), Lepidoptera (2.04%), Hymenoptera (1.63%), Blattodea (0.82%) and Odonata (0.82%). Ipoh (urban landscape) and Pantai Remis (mixed) recorded the highest diversity of dietary insects. Presence of the aquatic insect families in these diets may reflect extensive freshwater bodies in the urban landscape. Coleoptera and Hemiptera were found to be dominant in the swiftlet diets at two monocrop landscapes Beruas OP1 and Beruas OP2, but did not include the weevil *Elaeidobius kamerunicus*, an important pollinator of oil palm. Results confirm that house-farm swiftlets are opportunistic feeders, so that variation in the diet profiles in Perak reflected the availability of insect prey within the landscapes of the foraging ranges." (Authors)] Address: Chan, K.S., Dept of Biological Science, Faculty of Science, Univ. Tunku Abdul Rahman, Jalan Universiti, Kampar, Malaysia

17408. Chiari, C. (2020): Prima segnalazione di *Selysiothemis nigra* (Van der Linden, 1825) (*Anisoptera*: *Libellulidae*) per la provincia di Brescia (Pianura Padana, Lombardia). *Natura Bresciana - Ann. Mus. Civ. Sc. Nat., Brescia* 43: 141-143. (in Italian, with English summary) ["First report of *S. nigra* in the Brescia Province (Po Plain, Lombardy). This note documents the finding of a small population of *S. nigra* in a former quarry basin in the municipality of Poncarale (BS). This is the first recorded report for the province of Brescia and for Lombardy

where this species, notoriously nomadic and endowed with migratory capacity, had never been reported." (Author)] Address: Chiari, C., via Donatello 261, 25124 Brescia (Bs), Italy. E-mail: carlo.emidio@gmail.com

17409. Chiari, C.; Piglia, A.; Sacchi, F.; Sand, M.L. (2020): Presenza di *Trithemis annulata*, *Obelisco violetto* (Palisot de Beauvois, 1805) (Anisoptera: Libellulidae) in provincia di Brescia nel 2018. *Natura Bresciana - Ann. Mus. Civ. Sc. Nat., Brescia* 43: 145-148. (in Italian, with English summary) ["Presence of *T. annulata* in Brescia Province in 2018. At the beginning of August 2018 some individuals of *T. annulata*, a male and a female, were observed for the first time in province of Brescia at the Fishing Club Laghi Mella in the municipality of Poncarale (UTM WGS84: 32T593473.5034238, 98 m). These former quarry basins are now used for sport fishing. Subsequently, since the beginning of September, an important reproductive population has been identified in the same place where hundreds of adult individuals have been observed intent on mating, oviposition and defence of the territory by conspecifics and by *Orthetrum cancellatum*, *O. albistylum*, *Crocothemis erythraea*, *Anax imperator* and *A. parthenope*. At the same time other groups, composed of small populations and single individuals, were identified in six other artificial basins originating for former gravel and sand quarries located in the upper and lower Brescia plain and located in the municipalities of: Brescia, Montirone, Bagnolo Mella, Roncadelle, Travagliato and Provaglio d'Isèo. The station with the presence of *Trithemis annulata*, located further north in the province of Brescia, was located in Provaglio d'Isèo in the "Lame" of the SIC-ZPS – "Torbiere del Sebino", former peat quarries." (Authors)] Address: Piglia, Alida, Via A. Cečov 21, 20151 Milano, Italy. E-mail: alida.piglia@tiscali.it

17410. Chourasia, R.; Bhargava, D.; Vyas, V. (2020): Study on Odonata as health indicator of riparian ecosystem of Betwa River, Bhojpur, Raisen. *Journal of Entomology and Zoology Studies* 8(6): 1339-1344. (in English) ["In the present study Odonates are used as a health indicator of the riparian ecosystem of Betwa river, Raisen (Division: Bhopal). A total of 30 species including 22 species of Anisoptera and 8 species of Zygoptera were recorded in four different sites during the study period from July to December 2019. 23 species recorded from Site A (Riparian zone adjoining to Forest), 22 species recorded from Site C (Bhojpur Ghat), 21 species from Site D (Riparian zone adjoining to Agriculture field), and 16 species from Site B (Jain Temple). Site A was the most abundant habitat with 582 individuals (379 Anisopterans and 203 Zygopterans), followed by Site C with 517 individuals (338 Anisopterans and 179 Zygopterans), followed by Site D with 435 individuals (318 Anisopterans and 117 Zygopterans) and Site B with 200 individuals (184 Anisopterans and 16 Zygopterans) was the least abundant." (Authors)] Address: Chourasia, R., Dept of Zoology & Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India

17411. Chovanec, A. (2020): Die Libellenfauna (Odonata) eines naturnahen metarhithralen Gewässers im niederösterreichischen Alpenvorland. *Mercuriale* 20: 15-32. (in German,

with English summary) ["The dragonfly fauna (Odonata) of the pristine metarhithron Piesting in the Alpine Foothills of Lower Austria. – In the years 2019 and 2020 a total of six field trips were carried out at a metarhithron stretch of the Piesting, a river situated in the Alpine Foothills of Lower Austria, and a small adjacent backwater, to record the representative spectrum of Odonata species. Investigations focused on the detection of teneral and adult specimens as well as on the observation of reproductive behaviour. The study revealed an inventory of 19 species, 11 of them were certainly, probably or possibly autochthonous. The pristine status of this river section is reflected in the records of river-type specific reference species: the first-degree indicators *Calopteryx virgo* and *Onychogomphus forcipatus*, both probably autochthonous, and the second-degree indicators *Pyrrhosoma nymphula* (certainly autochthonous) and *Orthetrum brunneum*. At the Piesting itself 7 species were found. The backwater comprised a spectrum of 17 species with remarkable records of *Lestes virens* and *Coenagrion ornatum*: both species are "critically endangered" according to the Austrian Red List, *C. ornatum* also is listed in Annex II of the Habitats Directive 92/43/EEC." (Author)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-Mail: andreas.chovanec@bmlrt.gv.at

17412. Chovanec, A. (2020): Zur Aussagekraft unsystematisch erhobener Libellendaten (Insecta: Odonata) aus einem gewässerlosen Garten. *Beiträge zur Entomofaunistik* 21: 181-210. (in German, with English summary) ["The informative value of dragonfly records (Insecta: Odonata) unsystematically gathered in a private garden without water bodies. – In the period 2009–2019, dragonflies appearing in the author's garden in Lower Austria were unsystematically recorded. Despite the fact, that there is no water body in this 300 m² garden, 26 species (one third of the Austrian Odonate fauna) were found, including for example *Coenagrion scitulum* and *Sympetrum meridionale*, both species "critically endangered" in Austria. *S. striolatum* accounts for 42 % of the total sum of 467 records. Studies carried out at running and standing waters in the surroundings of the garden revealed an inventory of 37 taxa belonging to the seven dragonfly associations ("ecologic guilds"), which are described for the bioregion where the garden is situated. The species detected in the garden are representative of the species spectrum recorded in the surrounding area because all associations are also represented by the species found in the garden. *Orthetrum albistylum* was seen only in the garden and not at the waters situated in its surrounding area. The highest number of specimens appearing on one day in the garden was 13, the highest number of species four. The records in the garden also reflect characteristic phenological patterns of winter-, spring-, early/midsummer- as well as midsummer/autumn-species." (Author)] Address: Chovanec, A., Krotenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-Mail: andreas.chovanec@bmlrt.gv.at

17413. Chovanec, A. (2020): Fotografische Dokumentation dunkler Pterostigmata bei Männchen von *Erythromma lindenii* (Selys, 1840) (Odonata: Coenagrionidae). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen* 72: 1-6.

(in German, with English summary) ["Photographic documentation of dark pterostigmata in males of *Erythromma lindenii* (Selys, 1840) (Odonata: Coenagrionidae). – Both sexes of *E. lindenii* typically show a bright ochre coloured pterostigma that is important for identification in the field. The present paper shows and discusses photographs of male specimens from Austria and Germany with a deviating dark pterostigma." (Authors)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-Mail: andreas.chovanec@bmlrt.gv.at

17414. Chovanec, A. (2020): Fotografische Dokumentation einer bemerkenswerten Konstellation von *Pyrrhosoma nymphula* (Odonata: Coenagrionidae) und *Anax imperator* (Odonata: Aeshnidae) bei der Eiablage. *Mercuriale* 20: 67-70. (in German, with English summary) ["Photographic documentation of a remarkable constellation of *P. nymphula* and *A. imperator* during oviposition. – Photos show a female *A. imperator* that chose the same oviposition site as a tandem of *P. nymphula*. The *Anax* female was sitting on top of the *Pyrrhosoma* female and touched it with its legs. *Pyrrhosoma* continued oviposition, at least for a short time." (Author)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-Mail: andreas.chovanec@bmlrt.gv.at

17415. Chovanec, A. (2020): Die Libellenfauna der Krems in Ansfelden / Oberaudorf (Oberösterreich) mit einem individuenreichen Vorkommen von *Erythromma lindenii* (Selys, 1840) (Odonata: Coenagrionidae). *Beiträge zur Entomofaunistik* 21: 3-31. (in German, with English summary) ["In the year 2019, 28 Odonate species were recorded at the rehabilitated section of the River Krems in Ansfelden / Oberaudorf (Upper Austria), 22 of them were classified as certainly, probably or possibly autochthonous (reproducing in the investigation area). 21 species (18 of them autochthonous) belong to the inventory of reference species, which is typical of the biocoenotic region of the River Krems in this area, the hyporhithron / epipotamon transition zone. Thus, the dragonfly-based ecological status of this river section was classified as "high". The different hydrological and morphological characteristics of lotic and lenitic sub-sections are reflected by the Odonate fauna and by the results of the assessment procedures: Lotic sub-sections were classified as "high" and "good", lenitic ones as "good" and "moderate". The record of the largest population of the *E. lindenii* ever detected in Austria has to be emphasized. The comparison of the results of the present study with an odonatological investigation of the same study area carried out in 2013 revealed higher total species numbers and higher numbers of rivertype-specific reference species in 2019. The abundances of those species occurring in both years were higher in 2019." (Authors)] Address: Chovanec, A., Krottenbachgasse 68, 2345 Brunn am Gebirge, Austria. E-Mail: andreas.chovanec@bmlrt.gv.at

17416. Corso, A.; Penna, V. (2020): *Orthetrum chrysostigma* (Burmeister, 1839): new for the Italian fauna (Odonata Libellulidae). *Biodiversity Journal* 11(2): 359-362. (in English) ["Details about the first Italian record of *O. chrysostigma*, obtained in south-western Sicily, are reported. One mature male

was collected in the province of Agrigento in August 2014." (Authors)] Address: Corso, A., Via Camastra 10, 96100 Siracusa, Italy. E-mail: zoologywp@gmail.it

17417. Costa Natividade, D.; Ferreira Santana, Q.C.; Silva Pinto, N. (2020): Weight determines the outcome in territorial contests of *Erythrodiplax fusca* Rambur, 1842 (Odonata: Libellulidae). *Rev. Biol. Neotrop. / J. Neotrop. Biol.* 17(2): 103-109. (in Portuguese, with English summary) ["*E. fusca* ... defend their territories close to rivers, lakes and swamps. Disputes over access to females or breeding sites usually occur during flight activities. The objective in this work was to analyze the disputes over territories between males and to evaluate if the winners are heavier than losers. The study was conducted at the Morro Feio Experimental Farm, located in the municipality of Hidrolândia, state of Goiás, Brazil. First, an inspection was carried out to find points on the bank of the stream that males commonly dispute to establish their territories. After the identification of these points, all disputes for territory were counted and at the end of the conflict the two males were collected (winner and loser) and weighed. 74 individuals of *E. fusca* (37 winners and 37 losers) were collected. The fresh weight was decisive to win the dispute, with winner males 10% heavier than losing males. Therefore, this work corroborates the hypothesis that the weight of the males of *E. fusca* is related to increases in probability of victory in disputes over territories." (Authors)] Address: Silva Pinto, N., Centro Univ. Araguaia, Av. T10, 1047 Setor, Bueno, Goiânia, 74223060, Goiás, Brasil. E-mail: nelsonsilvapinto@gmail.com

17418. Craves, J.A.; O'Brien, D.S.; Marvin, D.A. (2020): New population of the rare dragonfly *Ophiogomphus howei* (Odonata: Gomphidae) in southern Michigan, United States. *Journal of Insect Science* 20(5), 33: 9 pp. (in English) ["*O. howei* is a rare North American dragonfly, given a global conservation rank of Vulnerable by NatureServe. This species inhabits localized stretches of a limited number of typically undisturbed, high-quality, forested rivers in two disjunct regions in North America. We describe a new population in between the known ranges from an impaired river in a largely urban watershed in southern Michigan. We also report a previously overlooked specimen from a new location in Pennsylvania, and provide current occurrence and conservation status of the species in North America." (Authors)] Address: Craves, Julie, 12200 Centennial Lane, Ann Arbor, MI 48103, 2604 West Lapeer, Lansing, MI 48933, USA. E-mail: jcraves@umich.edu

17419. Crescia, P.; Soccini, C.; Ferri, V.; Celletti, S. (2020): First occurrence of *Lindenia tetraphylla* (Vander Linden, 1825) for Northern Lazio (Odonata, Gomphidae). *Atti Soc. it. Sci. nat. Museo civ. Stor. nat. Milano* 7(2): 79-82. (in Italian, with English summary) ["The presence of *L. tetraphylla*, is reported in the Mignone River Valley, Tarquinia (VT) (ZSC IT6010035 "River Mignone - lower course") reconfirming this gomphid for Lazio. This rare dragonfly is localized in Italy and is reported in a few locations in Tuscany, Campania, Umbria, Molise, Abruzzo, Puglia, Sicilia and Sardinia. *L. tetraphylla* was previously reported for a locality in southern Lazio (Lago di Fondi, LT)

on the basis of two preserved specimen in the Entomological Collection A. Costa of the Museum of Zoology of the Naples University in and dating back to the midnineteenth century. The habitat of the species is made up of the gravelly shore and the curtain of willows, poplars and tamarisks of one of the best-preserved rivers in Lazio." (Authors)] Address: Ferri, V., Gruppo Naturalistico della Maremma Laziale, Tarquinia (VT), Italy. E-mail: drvincenzoferri@gmail.com

17420. Cuenca Espinosa, E.D. (2020): Odonatos de las charcas artificiales de la sierra del Arca, San Roque (Cádiz, España). *Revista gaditana de Entomología* XI: 99-110. (in Spanish, with English summary) ["We present the results of the Odonata samples carried out in two Sierra del Arca artificial ponds, San Roque (Cádiz, Spain). A total of 24 species were detected. The highest number of species was observed in June, while the highest abundance of individuals occurred in July. The highlights are the populations of *Coenagrion scitulum* because its level of protection and *Paragomphus genei* because its singularity." (Authors)] Address: Cuenca Espinosa, E.D., San Felipe 13, 9ºB – 11300 La Línea de la Concepción (Cádiz), Spain. E-mail: davidcuenca.proyecto@gmail.com

17421. Czechowski, P. (2020): New records of dragonflies (Odonata) from Zielona Góra (Lubusz Province – western Poland) in 2016-2019. *Odonatrix* 16_8 (2020): 7 pp. (in Polish, with English summary) ["In 2016-2019, occasional observations of dragonflies were made on some waterbodies and watercourses within the administrative boundaries of Zielona Góra (western Poland); they were incidental to other environmental projects in this city. The species found at 10 localities are listed, along with single records from three others. Certain species of special interest are characterized from the faunistic, zoogeographical and ecological points of view. A total of 40 species of dragonflies were recorded in Zielona Góra during the four years in question. They included three protected species (*Gomphus flavipes*, *Ophiogomphus cecilia* and *Cordulegaster boltonii* and one on the Red List of Threatened Species of Poland (*Orthetrum coerulescens*." (Authors)] Address: Czechowski, P., Katedra Turystyki, Filia Uniwersytetu Zielonogórskiego w Sulechowie, ul. Armii Krajowej 51, 66-100 Sulechów, Poland. E-mail: paczechow@gmail.com

17422. de Carvalho, G.; Cozzer, G.D.; Rezende, R.; Magro, J.D.; Simões, D.A. (2020): Efeito Sinérgico do BTI e predacion sobre a mortalidade de larvas do mosquito *Aedes aegypti* (Linnaeus, 1762). *Revista Acta Ambiental Catarinense* 17(1): 10-16. ["This study objective was to evaluate the effect of use of predatory Libellulidae larvae associated with BTI on larval reduction of mosquitoes. Our tested hypothesis seeks to answer whether there would be an increase in the mortality of *A. aegypti* larvae caused by the synergistic effect of BTI along with the predator. The microcosms consisted of 300mL containers containing 100mL of water with densities of 100, 200, and 300 larvae of *A. aegypti* and one predator larva. The BTI and BTI + Predator treatments received 0.01ppm BTI. Control received only *A. aegypti* larvae. The results showed a significant effect on BTI + Predator treatment in the density of 1 larva / mL, while in the densities of 2 and 3 larvae / mL the same effect

was not observed, partially corroborating the hypothesis of BTI and predation synergistic effect in larval mortality. Increasing larval density increased predation rate, while the effect of BTI on mortality decreased. Our results show that the synergistic effect exists, but that density-dependent factors may hide such effect." (Authors)] Address: Cozzer, G.D., Mestrando do Programa de Pós-Graduação em Ciências Ambientais pela Universidade Comunitária da Região de Chapecó, Brazil. E-mail: pinocozzer.ps@unochapeco.edu.br

17423. Demyr Aydin, D.; Bolu, H. (2020): Odonata Fauna of Diyarbakır Province. *Journal of the Institute of Science and Technology* 10(3): 1494-1506. (in Turkish, with English summary) ["This study was conducted in Diyarbakır (Bağlar, Kayapınar, Sur and Yenipazar districts) province in May, June, July and August of 2017. As a result of the survey studies, 261 samples belonging to the Odonata order were collected. Seven species ... were determined: *Brachythemis fuscopallata*, *Crocothemis erythraea*, *Orthetrum albistylum*, *O. brunneum*, *O. coerulescens*, *Platycnemis dealbata*, *Ischnura elegans*. Six of the 7 species identified in the study are the first records for the Diyarbakır insect fauna." (Authors)] Address: Bolu, H. E-mail: besni@dicle.edu.tr

17424. Dow, R.A. (2020): Revision of the genus *Coeliccia* Kirby in Borneo part III: Two new species from the *C. membranipes*-group from Sarawak and Brunei (Odonata: Zygoptera: Platycnemididae). *Zootaxa* 4890(4): 473-492. (in English) ["*C. junis* sp. nov. (holotype ♂ from Borneo, Sarawak, Bintulu Division, Planted Forest Project, Bukit Mina Wildlife Corridor, "Day 4" stream near Bukit Nyegoh and Bukit Jugam, near small brown water pool, 10 viii 2018, deposited in the Naturalis Biodiversity Center, Leiden, the Netherlands) and *Coeliccia roberti* sp. nov. (holotype ♂ from Borneo, Sarawak, Miri Division, Lambir Hills National Park, small stream on Oil Well Trail, 22 iv 2011, deposited in the Naturalis Biodiversity Center, Leiden, the Netherlands) are described from Borneo. Both new species belong to the *Coeliccia membranipes*-group and bring the number of named species known from the group from Borneo to nine and the total number of named species from Borneo currently placed in *Coeliccia* to 15. *Coeliccia junis* is only known from a small area in Sarawak, *C. roberti* is also known from Brunei. Both species are considered likely to be closely allied with *C. macrostigma* Laidlaw." (Author)] Address: Dow, R.A., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands. E-mail: rory.dow230@yahoo.co.uk

17425. Dow, R.A.; Zhang, H.-m. (2020): Two new species of *Coeliccia* Kirby from Yunnan, China (Odonata: Zygoptera: Platycnemididae). *Zootaxa* 4838(4): 491-502. (in English) ["Two new species of *Coeliccia* Kirby are described from Yunnan, China: *Coeliccia tongbiguan* sp. nov. and *Coeliccia yunnanensis* sp. nov. (holotype ♂ for both from Tongbiguan National Nature Reserve, Yingjiang County, Yunnan). *C. tongbiguan* is allied to *C. hoanglienensis* Do, known only from Vietnam. *C. yunnanensis* appears to be closely allied to the *Coeliccia hayashii*-group, also from Vietnam. The fifteen named species of *Coeliccia* now known to occur in China are listed, twelve of them occur

in Yunnan, the presence of *C. didyma* in the country is confirmed." (Authors)] Address: Dow, R.A., 6 Bramley Avenue, Coulsdon, Surrey, CR5 2DP, UK. E-mail: rory.dow@virgin.net

17426. Dow, R.A.; Price, B.W. (2020): A review of *Megalogomphus sumatranus* (Krüger, 1899) and its allies in Sundaland with a description of a new species from Borneo (Odonata: Anisoptera: Gomphidae). *Zootaxa* 4845(4): 487-508. (in English) ["*M. sumatranus* and its allies in Sundaland are reviewed. The accessory genitalia of the males of this genus, hardly considered previously, are found to be taxonomically informative. The taxon from Borneo previously treated as *M. sumatranus* is described from both sexes as *M. buddi* sp. nov. (holotype ♂ Sungai Datai, Nanga Bloh, Lanjak Entimau Wildlife Sanctuary, Kapit Division, Sarawak, Malaysia, 22 viii 2013, leg. J. anak Awan & M. anak Adau; deposited at the Naturalis Biodiversity Center, Leiden, the Netherlands). *M. borneensis* (Laidlaw, 1914), described as a subspecies of *M. icterops* (Martin, 1903) and subsequently relegated to the synonymy of that species, is considered to be a distinct species. *M. icterops* is however considered to be a junior synonym of *M. sumatranus*. A re-description of the holotype of *M. borneensis* is provided as is the first description of the female. Descriptive notes with illustrations of *M. sumatranus* are given." (Authors)] Address: Dow, R.A., 6 Bramley Avenue, Coulsdon, Surrey, CR5 2DP, UK. E-mail: rory.dow@virgin.net

17427. Dow, R.A.; Phan, Q.T.; Choong, C.Y. (2020): *Protosticta joepani* sp. nov. from Borneo with notes on *P. kinabaluensis* Laidlaw, 1915 (Odonata: Zygoptera: Platystictidae). *Zootaxa* 4729(3): 371-387. (in English) ["*P. joepani* sp. nov. is described from Malaysian Borneo (holotype ♂ Bario, Kelabit Highlands, Miri Division, Sarawak, Malaysia, deposited in the Naturalis Biodiversity Center, Leiden). It is the sister species of *P. kinabaluensis* Laidlaw, 1915; some descriptive notes and a set of illustrations are provided of the latter species. A COI gene tree for both species is provided. The placement of both *P. joepani* and *P. kinabaluensis* is discussed, but although it is very unlikely that they belong in *Protosticta sensu stricto*, the issue is left open here." (Authors)] Address: Dow, R.A., Sarawak Mus. Campus Proj., Jabatan Muzium Sarawak, Jalan Barrack, 9300 Kuching, Sarawak, Malaysia. E-mail: rory.dow230@yahoo.co.uk

17428. Estacio, R.D.; Villanueva, R.J.T.; Freitag, H. (2020): Odonata fauna of riparian habitats in selected areas of Luzon and Mindoro region. *International Journal of Scientific and Research Publications* 10(8): 788-794. (in English) ["Odonata is considered as potential indicator of environmental disturbances. Despite of great efforts in recording the Odonata Fauna of the Philippines in general, the Riparian habitats in Bataan/Subic Bay (Luzon) and Mt. Hinunduang/Baroc River Catchment (Mindoro) are still unexplored. Due to the continuous forest and freshwater habitat destruction, faunal survey of Odonata species is urgent. The present study surveyed selected riparian habitats in these regions in December 2015 to April 2016. A total of 206 species belonging to 20 genera (*Heteronaias*, *Brachydiplax*, *Diplacodes*, *Macrodiplax*, *Neurothemis*, *Orthetrum*, *Pantala*, *Potamarcha*, *Trithemis*, *Zyxomma*, *Neuro-*

basis, *Cyrano*, *Rhinocypha*, *Agriocnemis*, *Ischnura*, *Pseudagrion*, *Teinobasis*, *Euphaea*, *Coeliccia*, and *Risicnemis*) were recorded and seven endemic species of the family *Platycnemididae*, *Euphaeidae*, and *Calopterygidae* were documented in both regions. From the collected specimens, one species under the family *Platycnemididae* is new to science but additional collection and evaluation are needed. The data collected contribute to the understanding of Odonata diversity and distributions in the regions and support future conservation and management strategies." (Authors)] Address: Estacio, R.D., College of Arts and Sciences, Quezon City University 673 Qurino High way, San Bartolome, Novaliches, Quezon City, 1116 Philippines. E-mail: jaischneider17@gmail.com

17429. Fadila, M.I.; Mardiasuti, A.; Mulyani, Y.A. (2020): Insects as food source for cattle egret (*Bubulcus ibis*) in Jatibarang landfill, Semarang. *IOP Conference Series: Earth and Environmental Science* 528: 8 pp. (in English) ["In the Jatibarang waste landfill, many cattle egrets were foraging for food insects. The objective of this paper was to identify insect (larvae and imago) and its abundance in Jatibarang waste landfill during March to May 2019. Plots (27 plots, 0.5x0.5m) were selected and insect larvae were collected beneath the wastes. Sweep net were used to sample flying (imago) insects. Population of cattle egret were estimated through counting from vantage points. There were 27 species of insects (larva and imago combined). ... 4 species of dragonflies ... High diversity and density (up to 3373.33 individuals/m²) of the insects in the garbage dump was able to support high population of cattle egrets, as many as 3365 individuals. The waste landfill can serve as an artificial feeding ground for cattle egrets due the abundant larvae and imago insects.] Address: Mardiasuti, A., Dept of Conservation Forest Resource & Ecotourism, IPB Univ. (Bogor Agricultural University), Bogor, Indonesia. E-mail: aniipb@indo.net.id

17430. Faradilla, A.R.; Uthami, M.; Andini, B.; Rachman, H.T. (2020): The life history and microhabitat ecology of a phyto-tem-breeding damselfly *Pericnemis stictica* in Jateviulyo Forest, Yogyakarta. *Treubia* 47(1): 63-75. (in English, with Indonesian abstract) ["This study aims to understand the life history and microhabitat ecology' of a phytotelmata-breeding species. *Pericnemis stictica*. Data was collected at 46 breeding sites in the Jatimulyo Forest. Kulonprogo. Several parameters were recorded from each breeding site. Le. plant species, diameters, depth, water depth, water volume, water pH. and water turbidity'. Naiads and imagoes of *P. stictica* were measured morphometrically'. The data taken was analyzed descriptively using Minitab 19. The results showed that 17 naiads of *P. stictica* were found in 13 bamboo stumps. The bamboo species most commonly used by *P. stictica* as a breeding site was *Dendrocalamns asper*. Naiads of *P. stictica* were found in the same habitat as mosquito larva from genera *Toxorhynchites*. *Aedes*. *Armigeres*. and *Culex*. During the rearing process, it was recorded that *P. stictica* naiads can eat more than ten mosquito larvae a day'. Four males and one female imagoes of *P. stictica* were found. The imagoes were mostly' found in a secondary' forest with shady' ravine areas. Imago's average total length was 7.19 cm Naiad's final instar average size

was 16.7 mm. Water depth, water temperature, bamboo depth, bamboo volume, and humidity' were all positively correlated to *P. stictica*'s phytotelmata-breeding behavior." (Authors)] Address: Faradilla, A.R., Dept of Biology- Education. Yogyakarta State Univ., Jalan Colombo 1. Karang Malang. Caturtunggal Depok. Sleman, Yogyakarta 55281, Indonesia

17431. Farrell, D.; Makbun, N. (2020): First records of three Lestidae species in Thailand, with a checklist of the dragonflies known from Nam Nao National Park and Phu Khieo Wildlife Sanctuary (Odonata). *Faunistic Studies in Southeast Asian and Pacific Island Odonata* 32: 1-11. (in English) ["*Indolestes gracilis* expressior Kosterin, 2015, *I. inflatus* (Fraser, 1933) and *Orolestes selysi* McLachlan, 1895, are reported from Thailand for the first time from records based mostly on photographs. The biology and habitats of the species are briefly discussed. A checklist of the Odonata recorded in Nam Nao National Park and Phu Khieo Wildlife Sanctuary is also presented for the first time." (Authors)] Address: Farrell, D., 9/756 Moo 11, Pimanthani Muang Gao, Glang Muang, Amphur Muang, Khon Kaen, 40000, Thailand. E-mail: thaiodonata@gmail.com

17432. Felker, A.S. (2020): New damselflies of the Family Kennedyidae (Odonata) from the Permian of European Russia. *Paleontological Journal* 54: 734-742. (in English) ["One new damselfly genus and species, *Progophlebia tarasenkovae* gen. et sp. nov., and two new species from known genera: *Progoneura kityakensis* sp. nov. and *Kennedyia tyulkinensis* sp. nov. of the family Kennedyidae (Odonata: Protozgyoptera) from several Permian localities (Vyazovka, Kityak, and Tyulkino) of European Russia are described. All known representatives of the family are briefly reviewed. The distinctive features of the localities are characterized." (Authors)] Address: Felker, A.S., Borissiak Paleontological Institute, RAS, Moscow, Russia

17433. Feng, R.-Q.; Luo, F.-Z.; Zhang, L.-J.; Li, M.; Cao, Y.; Yuan, M.-L. (2020): The complete mitochondrial genome of *Sympetrum striolatum* (Odonata: Libellulidae) and phylogenetic analysis. *Mitochondrial DNA Part B Resources* 5(2): 1677-1678. (in English) ["Here, we sequenced and annotated the complete mitogenome of *S. striolatum*. This mitogenome is 15,435 bp in length, consisting of 13 protein-coding genes (PCGs), 22 transfer RNA genes (tRNAs), 2 ribosomal RNA unit genes, and a large non-coding region (putative control region). The *S. striolatum* mitogenome with an A + T content of 71.54% presented a positive AT-skew (0.081) and a negative GC-skew (-0.127). Twelve PCGs started with a typical ATN codon, the remaining one PCG started with TTG (nad1). All tRNAs had a typical secondary cloverleaf structure, except for tmS1 which lacked the dihydrouridine arm. The Bayesian phylogenetic tree of 29 Odonata species based on the concatenated nucleotide sequences of 13 PCGs supported the monophyly of Libellulidae and a closer relationship of *S. striolatum* and *Brachythemis contaminata*." (Authors)] Address: Feng, R.-Q., State Key Lab. of Grassland Agro-Ecosystems, Lanzhou University, Lanzhou, People's Republic of China.

17434. Ferwer, W.; Nel, A. (2020): A new damselfly genus and species from Baltic amber (Odonata: Zygoptera: Euphaeidae). *Bulletin de la Société Géologique de France* 191(12): 4 pp. (in English, with French summary) ["The new euphaeid genus and species, *Wolfgangeuphaea ferweri* Nel, are described from the Middle Eocene Baltic amber. It belongs to the Paleogene subfamily Eodichrominae. This new discovery confirms to remarkable past diversity of this family that contains now as many extinct genera and recent ones. They were distributed in North America and Europe, while the family is now-a-day only present in the Old World. There seems to have been a "replacement" of the Euphaeidae by the Calopterygidae during the latest Oligocene and the Neogene." (Authors)] Address: Ferwer, W., Römerfeld 10, 51467 Bergisch Gladbach, Germany

17435. Fleck, G. (2020): *Onychogomphus* (*Siriusonychogomphus*) *louissiriusi*, a new species and new subgenus from Thailand (Odonata: Anisoptera: Gomphidae). *Faunitaxys* 8(7): 1-9. (in English). ["Based on reared larvae from Peninsular Thailand, the adult male and the adult female of *Onychogomphus louissiriusi* n. sp. are described and illustrated. This species is placed in *Siriusonychogomphus* n. subg. characterized notably by the combination of following characters: peculiar shape and disposition of larval antennae meeting for a long distance medially thus completely covering labrum and clypeus; unique triangular shape of larval frons; larval abdominal dorsal hook well developed only on second segment and directed anteriorly; hindwing lacking anal loop; vesica spermalis lacking flagellae and instead with pair of oreillets; prepuce rounded and not directed backwards; male caudal appendages strongly developed, of same length and not overlapping, with cerci almost straight in dorsal view, and with epiproct having closely appressed branches and bearing long molar ridge at base. Affinities with other species are discussed, the Bornean *Onychogomphus marijanmatoki* is considered possibly allied to this new species." (Author)] Address: E-mail: fleckgunther@gmail.com

17436. Fliedner, H. (2020): The scientific names of Brauer's odonate taxa. *International Dragonfly Fund Report* 148: 1-55. (in English, with German summary) ["An explanation is presented for each of the 135 scientific names given to Odonata by F. M. Brauer (fossils and synonyms included), in addition the names of the actual genera in which Brauer's species are now classified are explained. Prior to that part biographical information is given and Brauer's merits in enlightening the taxonomy of dragonflies are analysed. Conclusions are drawn as to his preferences in odonatological nomenclature and finally the difficulties are discussed, which Brauer had to face in his taxonomic work.] Address: Fliedner, H., Louis Seegelken Str. 106, 28717 Bremen, Germany, E-mail: H.Fliedner@tonline

17437. Fukawa, H. (2020): A record of mature *Sympetrum frequens* (Selys, 1883) in May. *Tombo* 62: 140. (in Japanese, with English summary) ["A mature male of *S. frequens*, which is usually seen in autumn, was observed on May 23, 2019 in a wetland at the Sayama Hills in Mizuho-cho, Nishitama-gun, Tokyo." (Authors)] Address: E-mail: work615@gmail.com

- 17438.** Fukaya, W. (2020): A record of *Aeshna mixta* Latreille, 1805 from Saitama Prefecture. Tombo 62: 128-129. (in Japanese, with English summary) ["A male of *A. mixta* was recorded from Kumagaya-shi, Saitama Prefecture on October 1, 2017." (Author)] Address: E-mail: tochiyai@au.com
- 17439.** Furieri, K.S.; Fraga, F.B.; Tribull, C.; Colombo, W.D. (2020): Description of two females of *Leptagrion Selys* (Odonata: Coenagrionidae). Zootaxa 4821(2): 343-352. (in English) ["In this paper, we provide taxonomic updates on the genus *Leptagrion Selys*: the females of *L. acutum* Santos and *L. porrectum* Selys are illustrated and diagnosed for the first time. We also add to the original description of *L. acutum* based on a male collected in the Atlantic Forest. A key for females is also provided for the currently known species of Southeast of Brazil." (Authors)] Address: Furieri, Karina, Univ. Federal do Espírito Santo, Centro Universitário Norte do Espírito Santo, São Mateus ES, Brazil. E-mail: kfurieri@gmail.com
- 17440.** Futahashi, H.; Futahashi, M.; Futahashi, R. (2020): The first record of *Anax ephippiger* (Burmeister, 1839) from Toyama Prefecture, Honshu, Japan. Tombo 62: 131-132. (in Japanese, with English summary) ["A male *A. ephippiger* was collected in Kairyu-macni, Imizu-shi, Toyama Prefecture, Honshu, Japan. This is the first record of this species from Toyama Prefecture." (Authors)] Address: Futahashi, R., National Institute of Advanced Industrial Science & Technology (AIST), Central 6, Tsukuba, Ibaraki 305-8566 Japan. E-mail: ryo-futahashi@aist.go.jp
- 17441.** Gainzarain, J.A. (2020): Primera cita para el País Vasco (norte de España) de *Aeshna juncea* (Linnaeus, 1758) (Odonata, Aeshnidae). Boletín de la Sociedad Entomológica Aragonesa 67: 401-402. (in Spanish, with English summary) ["The first record of *A. juncea* from the Basque Country administrative region (northern Spain) is reported: at least three males observed at the Ordunte mountain range (Biscay) in August 2020." (Authors)] Address: Gainzarain, J.A., Instituto Alavés de la Naturaleza Apdo. de correos 2092 01080 Vitoria-Gasteiz, Spain E-mail: j.gainzarain@gmail.com
- 17442.** Galasso, P.; Ientile, R. (2020): Odonata checklist of Nature Reserve and SAC (Special Area of Conservation) "Vallone di Piano della Corte" (Sicily, Italy). Biodiversity Journal 11(4): 837-844. (in English) ["From March to September 2018 and 2019, a first monitoring of Odonata promoted by CUTGANA was conducted inside a site of Natura 2000 network, named "Vallone di Piano della Corte", near Agira (Enna), Sicily. A total of 21 different species were recorded, including *Pyrrhosoma nymphula* (Sulzer, 1776), for which there are no stations reported for this side of Sicily." (Authors)] Address: Galasso, P., Stiftung Pro Artenvielfalt, Meisenstraße 65, 33607 Bielefeld, Germany. E-mail: paolo_galasso@hotmail.com
- 17443.** Galasso, P.; Marletta, A.; Corso, A. (2020): Odonata of Sicilian southeast swamp lakes "Pantano Cuba" and "Pantano Longarini" (SE-Sicily, Italy). Biodiversity Journal 11(1): 57-64. (in English) ["From March 2015 to December 2019 a focused study on Odonata, funded by the German foundation "Stiftung Pro Artenvielfalt" (Foundation Pro Biodiversity), was conducted at the swamp lakes named "Pantano Cuba" and "Pantano Longarini", in the southeast coast of Sicily (Italy), near Pachino, Siracusa. A total of 27 different species were recorded in Pantano Cuba and Longarini, including *Brachytron pratense*, found for the first time in Sicily during this study and *Pantala flavescens*, never seen before in Italy excluding the islands of Linosa and Lampedusa, Sicilian Channel." (Authors)] Address: Galasso, P., Stiftung Pro Artenvielfalt, Meisenstr. 65, 33607 Bielefeld, Germany. E-mail: paolo_galasso@hotmail.com
- 17444.** Girardin, V.; Grung, M.; Meland, S. (2020): Polycyclic aromatic hydrocarbons: bioaccumulation in dragonfly nymphs (Anisoptera), and determination of alkylated forms in sediment for an improved environmental assessment. Scientific Reports 10(1) (10958): 15 pp. (in English) ["Road runoff carries a mixture of contaminants that threatens the quality of natural water bodies and the health of aquatic organisms. The use of sedimentation ponds is a nature-based solution for the treatment of road runoff. This study assessed the concentration of polycyclic aromatic hydrocarbons (PAHs) and their alkylated homologues in sediment from seven highway sedimentation ponds and three natural urban ponds. In addition, the study explored the bioaccumulation of PAHs in dragonfly nymphs (Anisoptera). Finally, biota-sediment accumulation factors (BSAFs) were estimated. The results revealed a significant difference in the concentrations of 16 priority PAHs in sediment, with overall higher levels in sedimentation ponds (2,911 ig/kg on average) compared to natural urban ponds (606 ig/kg on average). PAH levels increased substantially once alkylated homologues were considered, with alkylated comprising between 42 and 87% of the total PAH in sediment samples. These results demonstrate the importance of alkylated forms in the environmental assessment of PAHs. The bioaccumulation assessment indicates that dragonfly nymphs bioaccumulate PAHs to a certain degree. It is not clear, however, whether they metabolize PAHs. BSAF results ranged from approx. 0.006 to 10 and indicate that BSAFs can be a powerful tool to determine the functionality of sedimentation ponds." (Authors)] Address: Girardin, Viviane, Norwegian Institute for Water Research (NIVA), Gaustadalléen 21, 0349 Oslo, Norway. E-mail: viviane.girardin@niva.no
- 17445.** Golab, M.J.; Brodin, T.; Sniegula, S. (2020): Two experimental designs generate contrasting patterns of behavioral differentiation along a latitudinal gradient in *Lestes sponsa* — Common-garden not so common after all? Ecology and Evolution 10(18): 10242-10253. (in English) ["Understanding why and how behavioral profiles differ across latitudes can help predict behavioral responses to environmental change. The first response to environmental change that an organism exhibits is commonly a behavioral response. Change in one behavior usually results in shifts in other correlated behaviors, which may adaptively or maladaptively vary across environments and/or time. However, one important aspect that is often neglected when studying behavioral expressions among populations is if/how the experimental design might affect the results. This is unfortunate since animals often plastically modify

their behavior to the environment, for example, rearing conditions. We studied behavioral traits and trait correlations in larvae of a univoltine damselfly, *Lestes sponsa*, along its latitudinal distribution, spreading over 3,300 km. We compared behavioral profiles among larvae grown in two conditions: (a) native temperatures and photoperiods or (b) averaged constant temperatures and photoperiods (common-garden). We hypothesized latitudinal differences in behavioral traits regardless of the conditions in which larvae were grown, with northern populations expressing higher activity, boldness, and foraging efficiency. When grown in native conditions, northern larvae were bolder, more active and more effective in prey capture than central and low latitude populations, respectively, as well as showed the strongest behavioral correlations. In contrast, larvae reared in common-garden conditions showed no differences between regions in both individual traits and trait correlations. The results suggest different selective pressures acting on the studied traits across populations, with environment as a central determinant of the observed trait values. Common-garden designed experiments may evoke population-dependent levels of plastic response to the artificial conditions and, hence, generate results that lack ecological relevance when studying multi-population differences in behavior." (Authors)] Address: Golab, Maria, Institute of Nature Conservation PAS, 31-120 Kraków, Poland. E-mail: marysiagolab@gmail.com

17446. González, A.; Barnes, C.L.; Wilder, S.M.; Long, J.M. (2020): Differences in macronutrient content of common aquatic macroinvertebrates available as prey for young-of-the-year Scaphirhynchus sturgeons in the lower Missouri River. *Journal of Freshwater Ecology* 35(1): 191-202 (in English) ["Nutrient availability in prey items can have important consequences for the growth, reproduction, survival, and recruitment into adulthood of juvenile fish. For young of the year sturgeon, which are highly dependent on macroinvertebrates as prey, knowing the nutritional content across various prey items within their habitats can help managers during habitat restoration. The objective of this study was to test for differences in the macronutrient composition of major invertebrate groups commonly consumed by young of the year sturgeon in the lower Missouri River in the summer, when sturgeon habitat assessments occur. Potential prey vary considerably in size. In addition, there were significant differences in the concentrations of nutrients. The lowest concentration of lipid was found in Odonata ($2.36 \pm 1.83 \text{ mg } 100 \text{ mg}^{-1}$; mean \pm pooled variance standard error) and the highest was in Diptera ($14.49 \pm 3.30 \text{ mg } 100 \text{ mg}^{-1}$). The lowest concentration of protein was found in Ephemeroptera ($58.98 \pm 1.90 \text{ mg } 100 \text{ mg}^{-1}$) and the highest concentration was in Trichoptera ($70.07 \pm 3.26 \text{ mg } 100 \text{ mg}^{-1}$). Some spatial differences were found in energy derived from protein in Ephemeroptera in the lower Missouri River, but not in energy derived from lipid. Our findings provide useful information that can contribute to adaptive management efforts for sturgeons in the lower Missouri River." (Authors)] Address: González, A., Oklahoma Cooperative Fish & Wildlife Res. Unit, Dept of Natural Resource Ecology & Management, Oklahoma State Univ., Stillwater, OK, USA. E-mail: alin.gonzalez_barnes@okstate.edu

17447. Gonzalez, I.G.; Núñez-Avellaneda, M.; Zúñiga, M. (2020): Los macroinvertebrados acuáticos de la región andino-amazónica colombiana: Camino Andakí, departamento de Caquetá. *Revista Colombia Amazonica* 12: 191-202. (in Spanish, with English summary) [This study was carried out in the Pescado river basin where the so-called "Camino Andakí" is located, an ancestral route used by indigenous populations between the low areas of the Caquetá department and the Andes. Within the framework of the "ColombiaBio Expedition to biodiversity in the Andean-Amazon transition of the department of Caquetá", an initiative of COLCIENCIAS and the Instituto Amazónico de Investigaciones Científicas -SINCHI, between January and February 2017, a sampling campaign was carried out for aquatic macroinvertebrates. Twelve stations were established between 410 and 1468 masl and 6290 individuals were collected, distributed in 109 genera. The most diverse order was Coleoptera and the most abundant was Ephemeroptera. Odonata expands the distribution of 11 genera for the department of Caquetá (*Palaemnema*, *Heteragrion*, *Enallagma* *, *Rhionaeschna* *, *Archaeogomphus* *, *Epigomphus* *, *Gomphoides* *, *Brachymesia*, *Elga* and *Elasmothemis**) and six of them (*) are new report for the Colombian Amazon basin. The similarity cluster analysis established three groups of taxa that were correlated with the altitude ranges of stations that were clustered in upper, upper middle, and lower middle. The station at Pescado river, Los Angeles village (E-12), showed the lowest affinity in its taxonomic composition compared to the rest of the assembly, an aspect influenced by the rise in the altitudinal range and the replacement of taxa. Ten of the genera found this zone, did not appear in any other sampling station. It is important to continue these studies in areas with little available information, such as the Andean-Amazon region that presents biogeographic elements and important components of the country's and continent's biodiversity." (Authors)] Address: González, I.G., Grupo Ecosistemas Acuáticos Instituto Amazónico de Investigaciones Científicas SINCHI, Avenida Vásquez Cobo entre calles 15 y 16 Leticia, Amazonas, Colombia. E-mail: igegeg@gmail.com

17448. Gonzalez Gomez, I.G.; Oviedo-Machado, N.; Núñez-Avellaneda, M. (2020): Primer registro de *Peruviogomphus* (Odonata: Gomphidae) para Colombia. *Boletín Científico Centro de Museos, Museo Historia Natural U. de Caldas* 24(2): 138-143. (in Spanish, with English summary) ["First record of *Peruviogomphus* for Colombia: The knowledge about the distribution of Odonata in Colombia has increased thus contributing to reduce the information gaps in the distribution of some taxa. In this study, the *Peruviogomphus* genus is reported for Colombia, based on two nymphs collected in the Department of Amazonas and deposited in the Colección de Macroinvertebrados Acuáticos de la Amazonia Colombiana (COMAC), of the SINCHI Institute. This finding updates the records of the *Peruviogomphus* genus in South America." (Authors)] Address: González Gómez, I.G., Grupo de Ecosistemas Acuáticos, Colección de Macroinvertebrados Acuáticos de la Amazonia Colombiana (COMAC), Instituto Amazónico de Investigaciones Científicas Sinchi, Avenida Vásquez Cobo entre calles 15 y 16 Leticia, Amazonas - Colombia. E-mail: igegeg_@hotmail.com.

17449. Gonzalez-Soriano, E. (2020): A new species of *Micrathyria* Kirby, 1889 from México and Central America (Anisoptera: Libellulidae), with a key to Mexican species. *Zootaxa* 4718(2): 184-190. (in English) ["*Micrathyria paulsoni* sp. nov. is described on specimens collected in Veracruz, México (19.1593–97.0045), Holotype ♂ 9 July 2000, Laguna de Santo Domingo, Huatusco, leg E. González-Soriano & L. E. González-Figueroa [in Colección Nacional de Insectos (CNIN), Instituto de Biología, UNAM] and compared with similar species. By its enlarged hamular process, this species belong to the so-called *Micrathyria didyma* group." (Author)] Address: Gonzalez-Soriano, E., Instituto de Biología, UNAM, Depto de Zoología, Apdo. Postal 70-153, CP 04510, México, Cd. México. E-mail: esoriano@ib.unam.mx

17450. Günther, A. (2020): Reproductive behaviour of *Chlorocyphidae*. Part 2. Genus *Disparocypha* Ris, 1916 (Odonata). *Odonatologica* 49(1/2): 85-106. (in English) ["The reproductive behaviour of *Disparocypha biedermanni* was studied in various streams, mainly in the Lake Poso area of Sulawesi. Flight styles of males were analysed in detail for the first time using high speed cinematography. Protracted threatening flights were particularly common between territorial neighbours. Males flew with regular counter-stroking wing beats and the abdomen held horizontally. Occasionally one of the males performed short ascending flights, pausing the wing beat. These threatening flights were interrupted periodically by short bursts of increased intensity with higher stroke frequency where males arched their abdomens. The escalated threat display could be intensified by tremulous horizontal changes in position. Unlike most *Chlorocyphidae*, mating took place without courtship and oviposition was in vertical mossy structures well above the water. The female was guarded by the male only at the start of oviposition. Possibly the mating system evolved in such a way as to avoid interspecific competition with other *Chlorocyphidae* but this needs more supporting evidence." (Author)] Address: Günther, A., Naturschutzinstitut Freiberg, B.-Kellermann-Str. 20, 09599 Freiberg, Germany. E-mail: andre.guenther@extern.tu-freiberg.de

17451. Haber, W.A. (2020): *Telebasis rojinegra* (Odonata: Zygoptera: Coenagrionidae) sp. nov. from Costa Rica. *Zootaxa* 4755(1): 129-138. (in English, with Spanish summary) ["*Telebasis rojinegra* sp. nov. was recorded from ponds at La Selva Biological Station and three other sites in the Caribbean lowlands of Costa Rica. The new species appears closely related to *T. boomsmae* Garrison, 1994 recorded from Mexico, Belize and Costa Rica, *T. collopistes* Calvert, 1902 ranging from Mexico to Honduras, and *T. garrisoni* Bick & Bick, 1995 from South America, but differs in having straighter and more elongate paraprocts and a half black pattern on the rear of the head. The female mesostigmal plates are also distinct from the above species. *T. rojinegra* was active on the water primarily during afternoon hours] Address: Haber, W.A., Research Associate, Museo de Zoología, Universidad de Costa Rica, San Pedro, Costa Rica. E-mail: bill.haber01@gmail.com

17452. Hämäläinen, M. (2020): The etymology of ten eponymous species names of Odonata introduced by Selys in his

'*Odonates de Cuba*' (1857), honouring prominent people or religious movements from classical antiquity and the middle ages. *Notulae odonatologicae* 9(5): 178-184. (in English) ["Ten of the 15 new species-group names of Odonata introduced by Edmond de Selys Longchamps in his '*Odonates de Cuba*' (1857) are considered to be eponyms, named after historical personages, dynasties or religious movements from classical antiquity and medieval times. Seven of these species epithets belong to taxa currently regarded as valid species. In their present combinations these are: *Erythemis attala*, *Macrothemis celeno*, *Micrathyria didyma*, *Telebasis dominicana*, *Erythrodiplax justiniana*, *Miathyria marcella*, *Triacanthagyna septima*. Three are synonymous names: *justina* (in *Erythrodiplax*), *metella* (in *Perithemis*) and *mithra* (in *Erythemis*)." (Author)] Address: Hämäläinen, M., Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA, Leiden, The Netherlands. E-mail: matti.hamalainen@helsinki.fi

17453. Haring, E.; Fischer, I.; Sittenthaler, M.; Wolf, P.; Koblmüller, S.; Sattmann, H.; Beqiraj, S.; Pešić, V.; Zangl, L. (2020): Intraspecific genetic diversity in selected widespread dragonfly species (Insecta: Odonata). *Acta ZooBot Austria* 157: 239-256. (in English, with German summary) ["Dragonflies inhabit a wide range of habitats, with different species having different species-specific habitat requirements and corresponding niches. Therefore, they are very well suited as indicator species for habitat quality and conservation. Especially in the fields of taxonomy and phylogenetics new insights in odonatology have been gained through molecular genetic methods. Using "DNA barcodes" (DNA sequences of a standardised gene segment, in this case the cytochrome c oxidase 1 gene (COI)), the intraspecific genetic distances of 14 dragonfly species from 18 countries were analysed. We investigated whether there are general differences in intraspecific genetic variability between common species of Zygoptera and Anisoptera. In addition, we examined how DNA sequences with missing data and the different handling of such data in genetic analyses can affect the calculated distances and thus the interpretation of results. Our data show that the dragonfly species studied here generally show very little genetic variation over very large geographical distances, regardless of their assignment to Zygoptera or Anisoptera. The presumably lower active dispersal potential of Zygoptera obviously does not lead to an increased genetic structure. Although these results were consistent across all calculation methods, there were sometimes considerable differences in the way incomplete data were handled. For better comparability, we recommend documenting all parameters in detail in similar studies." (Authors)] Address: Haring, Elisabeth, Central Research Laboratories, Museum of Natural History Vienna, Burgring 7, 1010 Vienna, Austria. E-Mail: elisabeth.haring@nhm-wien.ac.at

17454. Hirai, N.; Morioka, T. Ishii, M. (2020): Species diversity of Odonata in Nakaikemi Marsh, Fukui Prefecture, Japan. *Jpn. J. Environ. Entomol. Zool.* 31: 1-12. (in English, with Japanese summary) ["Nakaikemi Marsh was designated as a wetland of international importance under the Ramsar Convention on Wetlands in 2012 because of its rich species diversity and the presence of threatened and endangered animal

and plant species. Although the marsh had been maintained using traditional methods for centuries as rice paddy fields, land use has changed since the abandonment of cultivation in the 1990s. In this study, species diversity of Odonata in the marsh was investigated once a month between April and November 2012 using line-transect and point-census methods for adults and a netting method for larvae. We recorded adults and larvae of 50 Odonata species; a total of 2093 adults from 47 species and 503 larvae from 27 species were observed in the eight surveys. Most of the species found in this study were those recorded in the past, but *Aeschnophlebia longistigma*, *A. anisoptera*, and *Nannophya pygmaea*, which had been continuously observed in the early 1990s, were not recorded. In contrast, we found increased numbers of *Rhyothemis fuliginosa*, *Ischnura senegalensis*, and *Sympetrum croceolum* around the newly formed Sasahana Pond. A population analysis using Kimoto's similarity index ($C\pi$) revealed that the odonatan assemblage around the pond differs from those in other areas in Nakaikemi Marsh. It is possible that the Sasahana Pond has become one of the most important odonatan habitats in the marsh. We found several endangered species and the second highest species richness and diversity in the Ushirodani Valley adjoining the marsh, where traditional methods are used to maintain paddy fields. Invasive alien plant and animal species such as *Solidago altissima* and *Procambarus clarkii* were widespread across the whole area and are considered to harm native vegetation and aquatic animals in the marsh. Our findings indicate that *P. clarkii* density has a significant negative effect on the species diversity of Odonata larvae in the marsh." (Authors)] Address: Hirai, N., Graduate School of Life and Environmental Sciences, Osaka Prefecture University, 1-1 Gakuen-cho, Nakaku, Sakai, Osaka 599-8531 Japan

17455. Hong, S.-J. ; Cheong, S.-W. (2020): A Study on the Community Characteristics and Changes of Benthic Macroinvertebrates in the Conservation Area of the Shinbulsan Wetland. *Journal of Environmental Science International* 29(11): 1079-1088. (in Korean, with English summary) ["The Shinbulsan wetland, located in Yangsan-si, Gyeongsangnam-do, South Korea, was designated as a conservation area in 2004. The area was monitored from 2015 to 2019 to investigate the community characteristics and changes of benthic macroinvertebrates. Between 2015 and 2016, several insects of the orders Ephemeroptera, Odonata, and Hemiptera were identified, but their numbers decreased significantly in 2017 and 2018 following the loss and recovery of the moor owing to drought. During this period, there were relatively more insects of the order Diptera. Within this order, three functional feeding groups, gathering-collectors, plant-piercers, and predators were investigated. Predator species were the most abundant (83.3%), whereas gathering-collectors accounted for the largest proportion of individual insects (50.5%). Between 2015 and 2016, when the moors were stable, groups I and III had the highest community stability. After 2017, when the moors had dried up, group III effectively disappeared because of its lower relative resistance and resilience, and only taxa belonging to group I remained. The results of this study indicate that benthic macroinvertebrates that adapt early during moor formation inhabit the Shinbulsan wetland." (Authors)] Address: Cheong,

S.-W., Dept of Biology & Chemistry, Changwon National University, Changwon 51140, Korea

17456. Hulo, I., Aleksic, S.; Lovas, G. (2020): Results of the preliminary faunistic research of dragonflies (Insecta: Odonata) of northern Bracka. *Museon* 18: 129-167. (in Serbian, with English summary) ["Results of a preliminary survey of Odonata fauna conducted from 2016 to 2020 are presented. The aim of the research was to map possible habitats in the territory of Northern Backa suitable for the life and reproduction of these insects, as well as to detect the presence or absence of dragonfly species at certain localities. During the research, adult (imago) dragonflies were detected and identified by methods of observation and taking and then analysing of digital photographs. 26 sites with potential dragonfly habits were mapped, out of which 20 sites at standing and 6 sites at flowing waters. A total of 38 species were registered in these habitats, with 37 species observed at standing waters and 22 species at flowing waters. Among the recorded species on the territory of Northern Bačka, the following stand out as rare: *Lestes macrostigma*, *Coenagrion scitulum* and *Sympetrum depressusculum*. The localities with a noticeable diversity of dragonflies are Lake Kelebija, Bački Vinogradi-Ruža majur and Palic-Tresetište, where more than 20 species were registered. However, in many localities significant habitat degradation has been observed due to anthropogenic influence. Besides field surveys, based on examined material in collections, the presence of *S. pedemontanum* in Vojvodina has been established for the first time. This research also confirmed the importance of artificial aquatic habitats that gradually take over the role of extinct or degraded natural biotopes and provide the possibility of survival for certain species of dragonflies. The results of this research provide a basis and an encouragement for further studies and protection activities to save the fauna of dragonflies in this area." (Authors)] Address: Hulo, I., Gradski muzej Subotica, Trg sinagoge 3, 24000 Subotica, Serbia. E-mail: istvanhullo@gmail.com

17457. Humala, A.; Polevoi, A.V. (2020): First records of remarkable damselfly species *Nehalennia speciosa* (Odonata: Coenagrionidae) from the Republic of Karelia (Russia). *Russian Entomol. J.* 29(2): 123-136. (in English, with Russian summary) ["Several local populations *N. speciosa* are reported for the first time from the Republic of Karelia. *N. speciosa* is considered a threatened species in Europe even though it is widespread throughout the Palaearctic region. The species was found within several nature protected areas of Karelia, where entomological studies were conducted. The biology and distribution of *N. speciosa* are briefly observed." (Authors)] Address: Humala, A., Forest Research Institute, Russian Academy of Sciences, Pushkinskaya St. 11, Petrozavodsk 185910, Russia. E-mail: humala@krc.karelia.ru

17458. Iannella, M.; Console, G.; D'Alessandro, P.; Cerasoli, F.; Mantoni, C.; Ruggieri, F.; Di Donato, F.; Biondi, M. (2020): Preliminary analysis of the diet of *Triturus carnifex* and pollution in mountain karst ponds in Central Apennines. *Water* 2020, 12(1), 44: 15 pp. (in English) ["Mountain karst ponds are sensitive environments, hosting complex trophic networks

where amphibians play a major role, often as top predators. The diet of the Italian crested newt (*Triturus cristatus*) is still poorly known for populations occupying mountain karst ponds. These are traditionally used as livestock's watering points, leading to water pollution due to excreta and wading behavior. The aim of this paper is to understand the relationship between *T. cristatus* diet composition, assessed through the stomach flushing technique, and physical and chemical characteristics in mountain ponds, focusing on parameters altered by livestock pressure, such as ammonium concentration and dissolved oxygen. The high diversity of prey items found within the newts' gut contents confirms the generalist diet even in mountain ponds. The number of prey taxa, their relative abundance and Shannon–Wiener diversity index show variations among the sampled sites, related to livestock organic pollution. Moreover, we report the very first European records of microplastic items in amphibians' stomach content, which also represent the first evidence for Caudata worldwide. Our findings suggest that livestock pressure directly influences *T. cristatus* diet and highlight that the emerging issue of plastics is a threat even in remote high-altitude environments. ... Prey items were counted and classified in 19 different taxa, namely Crustacea (4750 prey items), Diptera (1800), Haptotaxida (328), Odonata (220), Hemiptera (191), Mollusca (135), Ephemeroptera (75), Coleoptera (53), Araneae (35), Acarina (17), Hymenoptera (13), Dermaptera (five), Caudata (four), Trichoptera (three), Tricladida (three), Lepidoptera (two), Julida (two), Neuroptera (one) and Mermithida (one). A total of 641 items could not be determined, due to the high level of deterioration; 161 fragments of plants, 93 particles of inorganic sediments probably deriving from the bottom, 59 microplastic items in the form of fibres, splinters and other undeterminable fragments were also found." (Authors)] Address: Iannella, M., Dept of Life, Health & Environmental Sciences, Environmental Sciences Sect., Univ. of L'Aquila, Via Vetoio, Coppito, 67100 L'Aquila, Italy

17459. Ilahi, I.; Yousafzai, A.M.; Rahim, A.; Haq, T.U.; Wahab, S.; Ali, H.; Halimullah; Farooq, M.; Muhammad, H.; Ullah, F.; Ahmad, B.; Ullah, S.; Hussain, S. (2020): Sensitivity of odonate nymphs to different classes of agricultural insecticides, frequently applied in Swat Valley Pakistan. *Applied Ecology and Environmental Research* 18(3): 4115-4136. (in English) ["The sensitivity of *Ischnura elegans* and *Trithemis aurora* nymphs to six different insecticides were studied during 48-hour exposure in the laboratory conditions. Lambda cyhalothrin was found to be the most toxic. Chlorpyrifos was found least toxic. The highest concentrations of deltamethrin, cypermethrin, lambda-cyhalothrin, chlorpyrifos, dichlorvos and acetamiprid that caused no mortality of *I. elegans* were 0.0078, 0.0039, 0.00048, 0.0078, 0.0039 and 0.00195 ppm, respectively. The highest concentrations of deltamethrin, cypermethrin, lambda-cyhalothrin, chlorpyrifos, dichlorvos and acetamiprid that caused no mortality of *T. aurora* were 0.0039, 0.00195, 0.00048, 0.0156, 0.0078 and 0.000975 ppm, respectively. The lowest concentrations of deltamethrin, cypermethrin, lambda-cyhalothrin, chlorpyrifos, dichlorvos and acetamiprid that caused 100% mortality of *I. elegans* were 0.5, 0.5, 0.0156, 1.0, 0.5 and 0.25 ppm, respectively. The lowest concentrations of deltamethrin, cypermethrin,

lambda-cyhalothrin, chlorpyrifos, dichlorvos and acetamiprid that caused 100% mortality of *T. aurora* were 0.25, 0.25, 0.0312, 2, 1 and 0.125 ppm, respectively. Significantly ($P < 0.05$) lowest LC90 values were observed for lambda cyhalothrin (LC90 against *I. elegans* = 0.01 ppm, LC90 against *T. aurora* = 0.018 ppm). Next to the lambda cyhalothrin, significantly ($P < 0.05$) lowest LC90 values were observed for acetamiprid (LC90 against *I. elegans* = 0.122 ppm, LC90 against *T. aurora* = 0.093 ppm). From the findings of the present study, it was concluded that *I. elegans* and *T. aurora* nymphs are highly sensitive to lambda cyhalothrin and acetamiprid." (Authors)] Address: Ilahi, I., Dept Zool., Univ. of Malakand Chakdara, Dir Lower, Khyber Pakhtunkhwa, Pakistan. E-mail: ikramilahi@uom.edu.pk

17460. Ito, H.C.; Shiraishi, H.; Nakagawa, M.; Takamura, N. (2020): Combined impact of pesticides and other environmental stressors on animal diversity in irrigation ponds. *PLoS ONE* 15(7): e0229052. <https://doi.org/10.1371/journal.pone.0229052>: 20 pp. (in English) ["Rice paddy irrigation ponds can sustain surprisingly high taxonomic richness and make significant contributions to regional biodiversity. We evaluated the impacts of pesticides and other environmental stressors (including eutrophication, decreased macrophyte coverage, physical habitat destruction, and invasive alien species) on the taxonomic richness of freshwater animals in 21 irrigation ponds in Japan. We sampled a wide range of freshwater animals (reptiles, amphibians, fishes, mollusks, crustaceans, insects, annelids, bryozoans, and sponges) and surveyed environmental variables related to pesticide contamination and other stressors listed above. Statistical analyses comprised contraction of highly correlated environmental variables, best-subset model selection, stepwise model selection, and permutation tests. Results showed that: (i) probenazole (fungicide) was a significant stressor on fish (i.e., contamination with this compound had a significantly negative correlation with fish taxonomic richness), (ii) the interaction of BPMC (insecticide; also known as fenobucarb) and bluegill (invasive alien fish) was a significant stressor on a "large insect" category (Coleoptera, Ephemeroptera, Hemiptera, Lepidoptera, Odonata, and Trichoptera), (iii) the interaction of BPMC and concrete bank protection was a significant stressor on an "invertebrate" category, (iv) the combined impacts of BPMC and the other stressors on the invertebrate and large insect categories resulted in an estimated mean loss of taxonomic richness by 15% and 77%, respectively, in comparison with a hypothetical pond with preferable conditions." (Authors)] Address: Ito, H.C., Hiroaki Shiraishi1, Megumi Nakagawa1, Noriko Takamura, Japan. E-mail: hiroshibeetle@gmail.com

17461. Janni, O.; Viganò, M.; Corso, A. (2020): First records of *Diplacodes lefebvrei* (Rambur, 1842) for Sicily and additional record of *Trithemis kirbyi* Selys, 1891 (Odonata Libellulidae). *Biodiversity Journal* 11(1): 65-68. (in English) ["We report the first records (three specimens on two dates) of *D. lefebvrei* for Sicily, obtained during October 2019 at the island of Linosa, Pelagie Archipelago (Sicily, Italy). Additional records of *T. kirbyi*, already known for the region, are provided." (Authors)] Address: Corso, A., Via Camastra 10, 96100 Siracusa, Italy. E-mail: zoologywp@gmail.com

- 17462.** Janra, M.N.; Herwina, H. (2020): Some additional records to the inventory of dragonflies and damselflies (Odonata) in Andalas University's Limau Manis campus complex, Padang, West Sumatra. *Jurnal Natural* 20(1): 1-5. (in English) ["Since the last publication of the inventory list for Odonata within the boundary of Andalas University's Limau Manis Campus Complex, Padang, (AULMCC) in 2018, the study has been continuously conducted. In this study we add five new species of Odonata for AULMCC, with one species *Drepanosticta* cf. *bispina* requires further investigation and elaboration on its existence in West Sumatra. We also corrected the identification of *Heliocypha fenestrata* into *H. angusta angusta*. With this addition, AULMCC currently resides for 32 species and 9 families of Odonata, increasing from previously 27 species and 8 families." (Authors)] Address: Janra, M.N., Biol. Dept, Fac. of Mathematics & Natural Sciences, Andalas Univ., Jalan Kampus Unand Limau Manis Pauh Padang, West Sumatra 25163, Indonesia. E-mail: mnjanra@sci.unand.ac.id
- 17463.** Janra, M.N.; Herwina, H.; Rahmayani, H.; Rahmawati, L.; Sehati, D.P.; Fandesti, S.R. (2020): Defining the rearing cage for *Agriocnemis femina* damselfly (Odonata, Zygoptera, Coenagrionidae). *Jurnal Riset Biologi dan Aplikasinya* 2(2): 42-48. (in English) ["Rearing insects such as Odonata aim to gain uniform progeny that used for scientific purposes. In Indonesia, unfortunately, this rearing type is not yet common which suggests the time for its initiation. This study has objective to define the type of rearing cage for *A. femina*. It was conducted descriptively by using two smalls (9 x 13 x 23 cm), four medium (14 x 15 x 22 cm) and two larges (20 x 23 x 33 cm) size boxes as cage setups, with or without ornamental plants in it. The feeding was with limited (10-15 *Drosophila* flies provided per day) and unlimited provision. Data was analyzed descriptively. The results showed that *A. femina* lived normally, including eating and mating, within the large cage setup equipped with ornamental plants and unlimited feeding." (Authors)] Address: Janra, M.N., Jln. Kampus Unand Limau Manis Padang, Sumbar 25163 Indonesia. E-mail: mnjanra@sci.unand.ac.id
- 17464.** Jattiot, R.; Latutrie, B.; Nel, A. (2020): The first damselfly (Odonata, Lestidae) from the upper Eocene of Monteils (Gard, France). *Zootaxa* 4750(3): 432-436. (in English) ["The discovery of *Lestes regina* Théobald, 1937 from Monteils (Gard, France) supports the identity of late Eocene age of this outcrop with the historical outcrop of Célas, type locality for the type series of this species. *L. regina* is also documented from the late Eocene Isle of Wight basin, confirming the presence of significant contacts between this southern area and the anglo-Parisian lacustrine basin at that time. Nearly all the Eocene and Oligocene fossil *Lestes* from Western Europe have a particular character, viz. the presence of a supplementary row of cells between the veins MP and CuA. This character is much less frequent in extant *Lestes* and is still unknown among Neogene representatives of the genus." (Authors)] Address: Jattiot, R., Fachbereich 5 Geowissenschaften, Univ. Bremen, Klagenfurter Str. 4, 28357, Bremen, Germany. E-mail: jattiot@uni-bremen.de
- 17465.** Jedro, G.; Maciag, M. (2020): *Aeshna grandis* (Linnaeus, 1758) (Odonata: Aeshnidae) in a light trap. *Odonatrix* 16_18 (2020): 3 pp. (in Polish, with English summary) ["A male *A. grandis* was caught in a blacklight trap (368 nm UVA) deployed on a raised bog in the Słowiński National Park (UTM XA46, 54.688625; 17.177049) between 20:15 and 23:30 hrs on August 20, 2020. Dragonflies only very occasionally turn up at this type of trap; precisely why they do so is not known. One theory is that they are attracted to the light, because other insects on which they can prey have also been lured there: this might have been the case here. This is the first documented record in Poland of *A. grandis*, and indeed of any odonate, being caught in such a trap." (Authors)] Address: Maciag, M., Nadlesnictwo Gniezno, ul. Wrzesińska 83, 62-200 Gniezno, mirosław.maciag@poznan.lasy.gov.pl
- 17466.** Jedro, M.; Jedro, G. (2020): New localities of Sedgling *Nehalennia speciosa* (Charpentier, 1840) (Odonata: Coenagrionidae) in the Slupia Valley Landscape Park. *Odonatrix* 16_4 (2020): 7 pp. (in Polish, with English summary) ["*N. speciosa* is a stenotopic species that inhabits mainly small primary water bodies supporting mud sledge *Carex limosa*. To date, over a dozen sites of this species have been discovered in the province of Pomerania, two of which are protected as buffer zones. Sedglings were discovered in the Slupia Valley Landscape Park in July 2017, at two peatbog localities close to the villages of Lipieniec [UTM XA61] and Skotawsko [XA62] in the commune of Czarna Dąbrówka. The central points of both bogs are dystrophic water bodies with mats of *Sphagnum* moss and *Carex* sp. tussocks. Teneral specimens and copulating pairs of the species were present. The populations are stable, with more than 100 individuals at each site. Apart from Sedgling, 16 and 17 other dragonfly species, respectively, were recorded in the two peatbogs, including: *Leucorrhinia dubia*, *L. pectoralis*, *L. albifrons* and *Cordulegaster boltonii*. In addition, the rare, red-listed European sundew moth *Buckleria paludum* (Pterophoridae) was discovered at Skotawsko. Forest buffer zones are crucial for *N. speciosa*: they influence water chemistry and vegetation composition, and also act as windshields. Deforestation, eutrophication, drainage and pesticides are the main factors endangering this species. Protective buffer zones extending up to 100 m around these two localities are planned. Cooperation between officials of the Regional Directorate for Environmental Conservation, foresters, Landscape Park staff and local naturalists is therefore essential for the creation and subsequent maintenance of these two buffer zones and to minimize the adverse, anthropogenic impact on these localities." (Authors)] Address: Jedro, Magdalena, Słowiński Park Narodowy, ul. Bohaterów Warszawy 1A, 76-214 Smoldzino, e-mail: m.jedro@slowinski.pn.pl
- 17467.** Joshi, S.; Agashe, D. (2020): Ontogenic colour change, survival, and mating in the damselfly *Agriocnemis pygmaea* Rambur (Insecta: Odonata). *Ecological Entomology* 45(5): 1015-1024. (in English) ["1. Damselflies often show intra-specific colour variation, which may represent genetic polymorphism or age-related (ontogenic) colour changes. 2. Such variation has distinct implications for the species' ecology and evolution. Colour variation in females of the damselfly *Agriocnemis*

pygmaea was studied, which range from blue male-like individuals (andromorphs) to those with a distinct red colour (heteromorphs). From preliminary observations, it was hypothesised that this species exhibits ontogenic colour change from heteromorph to andromorph coloration. 3. Mark–recapture experiments and egg counts of dissected females suggested that immature females are heteromorphic and gradually begin to resemble males as they attain sexual maturity. 4. Reflectance spectra of field-caught individuals indicated that, although males are indistinguishable from andromorphs, they could be easily differentiated from heteromorphs. 5. Finally, field observations and mate choice experiments showed that males rarely attempt to mate with heteromorphic females and prefer andromorphs. Together, this study's results suggest that the observed colour variation in *A. pygmaea* females is ontogenic and is associated with sexual maturity." (Authors)] Address: Joshi, S., Res. Collections, Nat. Centre for Biological Sciences, Bangalore, India. E-mail: shantanu@ifoundbutterflies.org

17468. Joshi, S.; Sawant, D. (2020): Description of *Bradinyoga konkanensis* sp. nov. (Odonata: Anisoptera: Libellulidae) from the coastal region of Maharashtra, India. *Zootaxa* 4779(1): 65-78. (in English) ["*Bradinyoga konkanensis* sp. nov. is described based on three males and one female collected from the coastal region of Maharashtra, India. Important characters are illustrated and compared with morphologically similar species *B. geminata* (Rambur, 1842), *Indothemis carnatica* (Fabricius, 1798), and *Indothemis limbata* sita Campion, 1923. *B. konkanensis* sp. nov. is so far the only Western Ghats endemic Odonata species associated with lateritic coastal habitats." (Authors)] Address: Joshi, S., Res. Collections, Nat. Centre for Biological Sciences, Bangalore, India. E-mail: shantanu@ifoundbutterflies.org

17469. Joshi, S.; Subramanian, K.A.; Babu, R.; Sawant, D.; Kunte, K. (2020): Three new species of *Protosticta* Selys, 1885 (Odonata: Zygoptera: Platystictidae) from the Western Ghats, India, with taxonomic notes on *P. mortoni* Fraser, 1922 and rediscovery of *P. rufostigma* Kimmins, 1958. *Zootaxa* 4858(2): 151-185. (in English) ["Three new species of *Protosticta* Selys, 1885 (Odonata: Zygoptera: Platystictidae) from the Western Ghats biodiversity hotspot in India: *P. cyanofemora* sp. nov. (wet evergreen forests in Shendurney Wildlife Sanctuary, Kollam, Kerala and Kalakkad Mundanthurai Tiger Reserve, Tirunelveli, Tamil Nadu), *P. myristicaensis* sp. nov. (Myristica swamp at Kathalekan, Shivamogga, Karnataka) and *P. sholai* sp. nov. (montane sholas of Upper Manalar, Meghamalai Wildlife Sanctuary, Theni, Tamil Nadu) are described and illustrated. We compare these three new species with other *Protosticta* spp. from the Western Ghats based on new material and provide comprehensive differential diagnoses with determination key for males of all species occurring in the Western Ghats. The taxonomic validity of *P. mortoni* Fraser, 1922 is established with fresh specimens from Hassan, Karnataka, and rediscovery of *P. rufostigma* Kimmins, 1958 is reported from Kanyakumari Wildlife Sanctuary, Tamil Nadu." (Authors)] Address: Joshi, S., Res. Collections, National Centre for Biological Sciences, Bangalore, India. E-mail: Shantanu@ifoundbutterflies.org

17470. Joshi, S.; van der Poorten, N.; Sumanapala, A.; Nielsen, E.; Patel, J.; Nielsen, B.; Sawant, D.; Sherif, M. (2020): New records of polymorphism in Asian Libellulid dragonflies (Insecta: Odonata). *International Journal of Odonatology* 23(4): 337-356. (in English) ["Polymorphism has rarely been reported from the Libellulidae family. Here, we report female-limited polymorphism in females of five species of the Libellulidae and a gynandromorph male of *Brachythemis contaminata* from South Asia. We describe the morphological variation between andromorph and heteromorph females, and collate records of andromorph females from various sources. Yearly number of andromorph female of *Crocothemis servilia*, *Urothemis signata* and *Neurothemis signata* was calculated using records from published literature and unpublished sources, and social media." (Authors)] Address: Joshi, S., Res. Collections, National Centre for Biological Sciences, Bangalore, India. E-mail: Shantanu@ifoundbutterflies.org

17471. Jung, S.-W.; Park, H.-R.; Uy, J.C. (2020): Distribution and biological quality assessment on benthic macroinvertebrates of Wolchulsan National Park, South Korea. *Korean Journal of Marine Criminal Investigation* 4(1): 39-47. (in Korean, with English summary) ["This study presents the distributional pattern and species diversity of benthic macroinvertebrates during the period from April to October, 2018 in Wolchulsan National Park. As a result, a total of 131 species of benthic macroinvertebrates (68 families, 16 orders, 4 phyla) were observed in Wolchulsan National Park. Among the Insecta, Trichoptera (35 spp.: 26.72%) was the most diverse group followed by Ephemeroptera (23 spp.: 17.56%), Odonata (16 spp.: 12.21%), Coleoptera (11 spp.: 8.40%), Diptera (10 spp.: 7.63%), Hemiptera (9 spp.: 6.87%), Plecoptera (8 spp.: 6.11%), and Megaloptera (3 spp.: 2.29%). In addition, Platyhelminthes (1 sp.: 0.76%), Mollusca (6 spp.: 4.58%), Annelida (3 spp.: 2.29%), and Crustacea (6 spp.: 4.58%) were collected. In the result of the Ecological score of benthic macroinvertebrate community (ESB) indicate that almost all sites were evaluated excellent or good for the environmental status, while the sites 9 and 11 showed relatively lower indices (32 and 41 marks)" (Author)] Address: Jung, S.-W., DASARI Res. Institute of BioResources, Daejeon, 34127, South Korea

17472. Kagimoto, B. (2020): A record of *Trachemys scripta elegans* (Wied-Neuwied, 1839) (Red-eared slider turtle) catching and eating an adult of *Anax parthenope julius* Brauer, 1865. *Tombo* 62: 114-115. (in Japanese, with English summary) ["*T. scripta elegans*, was introduced to Japan from North America, and has been designated as invasive alien species by Ministry of the Environment. This species is omnivorous, and supposed to inflict damage on aquatic creatures, including Odonata. However, there has been only one report so far that this turtle fed an adult Odonata. At the moat at Hiroshima castle, Hiroshima Prefecture, the author observed the turtle attacking an adult of *A. parthenope julius*, that dropped onto water surface, where upon the turtle bit it and dragged it under water in only about 13 seconds." (Author)] Address: not stated

- 17473.** Karube, H.; Kaga, R. (2020): First record of *Sympetrum fonscolombii* (Selvs, 1840) from Daito Islands, Okinawa Prerecture. Tombo 62: 136. (in Japanese, with English summary) [8-X-2019, on Minamidaiojima Island of Daito Islands.] Address: Karube, H., Kanagawa Prefect. Mus. Nat. Hist., 499 Iryuda, Odawara, Kanagawa, 250, Japan. E-mail: paruki@nh-kanagawa-museum.jp
- 17474.** Karube, H.; Sano, S.; Phanara, T. (2020): New record of *Chlorogomphus arooni* Asahina, 1981 (Odonata: Chlorogomphidae) from Cambodia. Tombo 62: 70-72. (in English, with Japanese summary) ["*C. arooni* is for the first time recorded and illustrated from Cambodia. This species was originally described from peninsular Thailand, later additionally recorded from northern Thailand and Malay Peninsula. This is also the first record of the family Chlorogomphidae from Cambodia." (Authors)] Address: Sano, S., Kannonzaki Nature Museum, Yokosuka, Kanagawa Pref., Japan. E-mail: sano-gengoroh@kannonzaki-nature-museum.org
- 17475.** Karube, H.; Phan, Q.T.; Ngo, Q.P. (2020): Additional records of Vietnamese Odonata. III. Odonata from central Vietnam, with description of a new species of *Heliogomphus* (Odonata: Gomphidae). Tombo 62: 38-52. (in English) [45 anisopteran species from central Vietnam are recorded. Odonate fauna of central Vietnam is rich, consisted by northern and southern elements and central endemic species, each distribution of which overlaps in the central. In this study, it is revealed that the distributions of many species expand to the northward and/or southward than before known. In addition, a new species of *Heliogomphus aluoiensis* sp. nov. is described and illustrated. This new species is related to *H. bidentatus* Kompier & Karube, 2019." (Authors)] Address: Karube, H., Kanagawa Prefectural Museum of Natural History, Odawara, Kanagawa, Japan. E-mail: paruki@nh.kanagawa-museum.jp
- 17476.** Kasuya, M. (2020): Records of *Mnais pruinosa* Selys, 1853 adults in Kakitagawa, Shizuoka Pref. from December 2018 to January 2019. Tombo 62: 137-139. (in Japanese, with English summary) ["In winter, from late December 2018 to January 2019, we found adults of *M. pruinosa* (Izu population) on the river bank of spring water upwelling from a riverbed at Kakitagawa, Doniwa, Shimizu-cho, Shizuoka Prefecture. The water temperature remains almost constant at about 15 °C throughout the year, and the bank was surrounded by evergreen forest. The mean daily minimum temperature for December 2018 was about 2.5 °C higher than that for an average year, which may have stimulated adult emergences in winter in this species." (Author)] Address: not stated
- 17477.** Kim, D.G. (2020): Research history of *Nannophya Rambur* (Odonata: Libellulidae): A recently discovered species in addition to *Nannophya koreana* Bae in Korea. Korean Journal of Environmental Biology 38(2): 308-314. (in English) ["The *Nannophya* species in Korea was thought to consist of only *N. pygmaea*. Previous studies on the species, including life history and development, conservation and restoration, habitat characteristics, genetic studies, distribution, behavior, and taxonomy have been conducted. However, a new *Nannophya* species, *N. koreana*, was recently discovered in Korea. Moreover, this new species was found to inhabit both Korea and Japan. Thus, the previous studies should be reevaluated in relation to the new species, *N. koreana*, and the latter should be treated as an endangered species worldwide given the current population instability." (Author)] Address: Kim, D.G., Smith College of Liberal Arts, Sahmyook University, Seoul 01795, Republic of Korea. E-mail: ecology@syu.ac.kr
- 17478.** Kita, H. (2020): Reproductive behavior of *Ischnura aurora* Brauer, 1865 at a puddle on an asphalt-paved parking in Guam. Tombo 62: 111-113. (Japanese, with English summary) ["*I. aurora* is a species that is famous by wind-borne long distance dispersal. I observed this species at a small puddle on an asphalt paved parking in Guam. At this place, mate searching by adult males, oviposition into emergent plants and mate refusal posture by females were observed. Present result may suggest that such an environment is among the variety of the habitats utilized by this species." (Author)] Address: E-mail: kita1114-age@u01.gate01.com
- 17479.** Kobylecki, P. (2020): Dragonflies (Odonata) observed near Wyliny-Ruce (Poland, Podlasie). Odonatrix 16_21: 4pp. (in Polish, with English summary) ["The observations were conducted in the ponds and rivers near Wyliny-Ruce village in 2014-2020. In total, 34 dragonfly species were recorded, including protected *Leucorrhinia pectoralis* (Charpentier, 1825)." (Author)] Address: Kobylecki, P., ul. Liryczna 8, 04-410 Warszawa, Poland. E-mail: fario@poczta.fm
- 17480.** Kobylecki, P. (2020): Dragonflies (Odonata) of Rembertów. Odonatrix 16_3 (2020): 5 pp. (in Polish, with English summary) ["The observations were conducted on peatbogs, ponds and other water bodies, a canal and a small river east of Warsaw in 2016-2019. In total, 28 odonate species were recorded, including two protected species: *Sympetma paedisca* and *Leucorrhinia pectoralis*." (Author)] Address: Kobylecki, P., ul. Liryczna 8, 04-410 Warszawa e-mail: fario@poczta.fm
- 17481.** Koroiva, R.; Neiss, U.G.; Fleck, G.; Hamada, N. (2020): Checklist of dragonflies and damselflies (Insecta: Odonata) of the Amazonas state, Brazil. Biota Neotropica 20(1); e2019-0877, 2020: 18 pp. (in English, with Spanish summary) ["Here we provide a checklist of the odonates from Amazonas state, Brazil. We registered 324 species and 101 genera, making Amazonas the Brazilian state with the most Odonata species recorded. The families with the highest number of species were Coenagrionidae with 32 genera and 101 species, followed by Libellulidae with 28 genera and 100 species and Gomphidae with 12 genera and 45 species. Some regions of Amazonas state remain poorly explored, such as the southern area, and large municipalities, such as São Gabriel da Cachoeira. This work underlines the importance of the biological diversity from Amazonas state and the Amazonian Biome for Odonata species richness in Brazil and shows that many areas in the world's largest tropical forest have not yet been sampled." (Authors)] Address: Fleck, G., Lagorce 07150, France

17482. Kotabe, A.; Minowa, D.; Saito, K. (2020): A record of *Anax ephippiger* (Burmeister, 1839) from Shizuoka Prefecture in 2019. *Tombo* 62: 133-134. (in Japanese, with English summary) ["In the autumn of 2019, we recorded two males and one female of *A. ephippiger* from Hamamatsu City, Shizuoka Prefecture, Japan." (Authors)] Address: E-mail: rick-enjohnthebeats@yahoo.co.jp

17483. Kovalenko, Y. (2020): Some information about dragonfly fauna (Odonata) of the Yagorlyk Reserve. EU integration and management of the Dniester River Basin. Chisinau: Eco-TIRAS, 2020: 151-152. (in Russian) [Google translate: In the aspect of biodiversity monitoring, various "resource taxa" are used, in relation to wetlands, one of such taxa is dragonflies [1]. This a group of insects, despite the mobility and mass migrations of some species, according to some According to [2], they hardly master new water bodies [1]. Dragonflies are known for being beautiful and wonderful flyers and also an important group of animals in freshwater ecosystems. In Bern of the Convention on the Protection of Flora and Fauna, they occupy the lion's place in the European list rare species of insects. In Moldova, where many water bodies dry up, most rivers, ponds and lakes are heavily polluted, the state of the dragonfly fauna should be alarming [3]. Despite the potentially high species diversity of dragonflies in ideal ecological conditions of the reserve "Yagorlyk", this group of insects in the reserve is practically it has not been studied. In the article by B.I. Osecimsky [4] 5 species are indicated: *Calopteryx splendens*, *Ischnura elegans*, *Platycnemis pennipes*, *Aeshna juncea*, *Symptetrum vulgatum*. During the period from March to August 2020, 7 species of dragonflies were found in the reserve. The counts and trapping were carried out in the natural boundaries: Sukhoi Yagorlyk, Balta, Tsybulevka and Litvina. Also explored a section of the coast of the Yagorlyk backwater near the old bridge, where the ideal conditions for hunting dragonflies.] Address: Kovalenko, Y., State reserve "Yagorlyk", Goyany, Dubossary district 4518, Transnistria, Moldova. E-mail: dimid86@list.ru

17484. Krasutsky, B.V.; Gashek, V.A. (2020): New finds of insects from the Red Book of the Chelyabinsk region. *Vestnik of Orenburg State Pedagogical University. Electronic Scientific Journal* 2(34): 33-50. (in Russian, with English summary) ["The article provides the information about new places of detection, abundance and bioecological features of 20 species of the insects from the Red Book of the Chelyabinsk region and 4 species of Appendix 3 to it: ... III category: *Ophiogomphus cecilia*, ... The main threats to many of them are significant recreational loads, grazing and logging in the species habitats." (Authors)] Address: Krasutsky, B. V., Chelyabinsk State University, Russian Federation, 454001, Chelyabinsk, ul. Bratfeyev Kashirinyk 129. E-mail: boris_k.63@mail.ru

17485. Krieg, M.; Mohseni, K. (2020): Transient pressure modeling in jetting animals. *Journal of Theoretical Biology* 494, 7 June 2020, 110237: 14 pp. (in English) ["Highlights: • A circulation based model calculates internal pressure dynamics in jellyfish, dragonfly larvae, and squid much more accurately than standard models. • The model is validated for low-inter-

mediate Reynolds numbers. • Body motions of a jellyfish species are optimized for acceleration at the onset of jetting for survival purposes, whereas, velar morphology towards the end of jetting decreases energetic cost. • Impulsive velocity programs in squid improve efficiency by offsetting peaks in pressure and boundary surface velocity thus decreasing total energetic cost. • Dragonfly larvae hindgut geometry reduces refilling work by inducing impingement prior to generation of negative thrust. Abstract: There are many marine animals that employ a form of jet propulsion to move through the water, often creating the jets by expanding and collapsing internal fluid cavities. Due to the unsteady nature of this form of locomotion and complex body/nozzle geometries, standard modeling techniques prove insufficient at capturing internal pressure dynamics, and hence swimming forces. This issue has been resolved with a novel technique for predicting the pressure inside deformable jet producing cavities (M. Krieg and K. Mohseni, *J. Fluid Mech.*, 769, 2015), which is derived from evolution of the surrounding fluid circulation. However, this model was only validated for an engineered jet thruster with simple geometry and relatively high Reynolds number (Re) jets. The purpose of this manuscript is twofold: (i) to demonstrate how the circulation based pressure model can be used to analyze different animal body motions as they relate to propulsive output, for multiple species of jetting animals, (ii) and to quantitatively validate the pressure modeling for biological jetting organisms (typically characterized by complicated cavity geometry and low/intermediate Re flows). Using jellyfish (*Sarsia tubulosa*) as an example, we show that the pressure model is insensitive to complex cavity geometry, and can be applied to lower Re swimming. By breaking down the swimming behavior of the jellyfish, as well as that of squid and dragonfly larvae, according to circulation generating mechanisms, we demonstrate that the body motions of *Sarsia tubulosa* are optimized for acceleration at the beginning of pulsation as a survival response. Whereas towards the end of jetting, the velar morphology is adjusted to decrease the energetic cost. Similarly, we show that mantle collapse rates in squid maximize propulsive efficiency. Finally, we observe that the hindgut geometry of dragonfly larvae minimizes the work required to refill the cavity." (Authors)] Address: Krieg, M., UHM Ocean and Res Eng, 2540 Dole St, Honolulu, HI 96822, USA. E-mail: kriegmw@hawaii.edu

17486. Lancer, B.H.; Evans, B.J.E.; Wiederman, S.D. (2020): The visual neuroecology of Anisoptera. *Current Opinion in Insect Science* 42: 14-22. (in English) ["Highlights: • Dragonflies are highly successful aerial predators that rely almost exclusively on vision to drive behaviour. • Regional specialisations of the dragonfly eye assist in different behaviours. • The neuronal target tracking system is finely tuned for predicting the location of small targets in both background visual clutter and swarming conditions filled with distractors. • Once a target has been observed, the dragonfly may implement a number of distinct pursuit strategies for target capture. Dragonflies belong to the oldest known lineage of flying animals, found across the globe around streams, ponds and forests. They are insect predators, specialising in ambush attack as aquatic larvae and rapid pursuit as adults. Dragonfly adults hunt amidst swarms in condi-

tions that confuse many predatory species and exhibit capture rates above 90%. Underlying the performance of such a remarkable predator is a finely tuned visual system capable of tracking targets amidst distractors and background clutter. The dragonfly performs a complex repertoire of flight behaviours, from near-motionless hovering to acute turns at high speeds. Here, we review the optical, neuronal, and behavioural adaptations that underlie the dragonflies' ability to achieve such remarkable predatory success." (Authors)] Address: Wiederman, S.D., Adelaide Medical School, The University of Adelaide, Adelaide, 5005 South Australia, Australia

17487. Lee, S.-D.; Bae, S.-H.; Lee, G.-G. (2020): Understanding the impact of environmental changes on the number of species and populations of Odonata after creating a constructed wetland. *Korean Journal of Environment and Ecology* 34(6): 515-529. (in Korean, with English summary) ["Constructed wetlands undergo biological and physical changes such as an increase in the proportion of arid plants due to the natural succession process after formation. It can adversely affect not only the purification function but also the habitat of species. As such, this study aims to identify environmental factors affecting biodiversity and propose management plans based on the monitoring results of physical environmental changes and the emergence of species in seven constructed wetlands selected based on the water depth and surrounding conditions among the lands purchased by the Nakdong River basin. We examined the environmental conditions and emergence of the Odonata, which is a wetland-dependent species, to predict the trend of changes in biodiversity and abundance. The results showed that the open water area decreased as the emergent plants spread to the deep water in 2015 compared to 2012 when they were initially restored to a depth of 0.2 to 1 m. While a total of 54 dragonfly species were observed, the habitat diversity, such as vegetation, water surface, and grassland, remained similar to the initial formation of the wetlands despite the expansion of the emergent plants. On the other hand, the number of Agrionidae species, which prefer areas with fewer aquatic plants, decreased between 2012 and 2015 due to the diminished water surface. The p-values of the differences in the number of species and population between wetlands by year were 2.568e-09 and 1.162e-08, respectively, indicating the statistically significant differences. The decrease in open water surface was found to have the greatest effect on the biodiversity and habitat density of dragonflies. The time-series survey of constructed wetlands confirmed that the spread of *Phragmites communis*, *P. japonica*, *Typha orientalis*, etc., caused a decrease in species diversity. It suggests that environmental management to maintain the open water surface area is necessary." (Authors)] Address: Lee, S.-D., Dept. of Landscape Architecture, Gyeongnam National University of Science & Technology, 52725, Korea. E-mail: ecoplan@gntech.ac.kr

17488. Legros, V.; Rochat, J.; Reynaud, B.; Strasberg, D. (2020): Known and unknown terrestrial arthropod fauna of La Réunion Island, Indian Ocean. *Journal of Insect Conservation* 24: 199-217. (in English) ["A major part of La Réunion Island has been included on the World Heritage List of the

United Nations Educational, Scientific and Cultural Organization (UNESCO) for its unique landscapes and its outstanding biodiversity. However, there is a lack of knowledge on the arthropod diversity. For this reason, an up-to-date census of Réunion's terrestrial arthropods was undertaken. Of the 3369 species that are reported from Réunion (23 Odonata), 31% are endemic to the island and 40% are endemic to the Mascarenes. A diversity ratio between the numbers of described and expected species in the world was established and then applied to the numbers of reported species in Réunion to estimate the total expected numbers of species on the island. The results predict that between 6751 and 10,812 species of terrestrial arthropods are present in Réunion and that 62% of species remain to be discovered. However, some groups appear underrepresented as expected for Darwinian islands that should be originally composed by species with abilities to colonize remote places. Considering the global biodiversity decline and the numerous threats on Réunion's natural habitats, this article emphasizes the crucial need for conservation of terrestrial arthropods and strongly encourages an increase in the list of protected arthropods." (Authors)] Address: Legros, V., UMR PVBMT, Univ. of La Reunion, Pole de Protection des Plantes, 7 chemin de l'IRAT, 97410 Saint-Pierre, La Reunion, France. E-mail: legros.vincent@wanadoo.fr

17489. Lewandowska, E.; Lewandowska, K.; Buczynski, P. (2020): Reproductive success of Wandering Glider *Pantala flavescens* (FABRICIUS, 1798) (Odonata: Libellulidae) recorded in Lake Rakutowskie (central Poland). *Odonatrix* 16_11 (2020): 7 pp. (in Polish, with English summary) ["The successful reproduction of *P. flavescens* was recorded in the extensive, shallow phytolittoral of Lake Rakutowskie near Włodawek (central Poland). On August 12, 2020, three males were observed during their maiden flights. This is the third known locality of this species in Poland; above all, however, it is the northernmost locality in the entire Palaearctic where reproduction of this species has been confirmed. The new data is analysed in the context of published information on the occurrence of *P. flavescens* in Europe. This is changing dynamically, with increasing numbers of sightings, especially in central and east-central Europe, and ever more records of its successful reproduction. This dragonfly will surely be encountered more and more frequently in central Europe. It will also be worthwhile carefully observing its habitat preferences, especially its reproductive sites." (Authors)] Address: Buczynski, P., Dept of Zool., Maria Curie-Skłodowska University, Akademicka 19, PL-20-033 Lublin, Poland. E-mail: pawbucz@gmail.com

17490. Ihamdi, M.L.; Al Idrus, A.; Santoso, D.; Hadiprayitno, G. (2020): Community structure and diversity of Odonata in Suranadi Natural Park, West Lombok Indonesia. *Biodiversitas* 21(2): 718-723. (in English) ["The importance of the ecological role of odonates is not followed by adequate scientific information on Odonata communities, especially in the Suranadi Natural Park (SNP). The study aimed to monitor the existence and community structure of Odonata in the SNP area every six months in period. The data collection technique was using a survey method by following the transect line, namely the waterway transect line (WTL), plantation border transect (PT) and

settlement border transect (ST). Data collection was done 4 times from April to May 2019, once every 2 weeks. The sampling was done twice in the morning from 08.00 to 11.00 AM and in the afternoon from 03.00 to 05.00 PM. Data were analyzed using the relative frequency equation and Diversity Index. The results showed that there were 16 species of odonates consisting of the family Libellulidae (11 species), Platycnemididae (1 species), Chlorocyphidae (1 species), and Coenagrionidae (3 species). *Orthetrum sabina*, *Neurothemis ramburii*, *Diplacodes trivialis*, *Gynacantha subinterrupta*, *Copera marginipes*, and *Pantala flavescens*, are species that are present in all of each observation sites. The waterway transect has the highest diversity index (2.027), followed by settlement transect (1.367), and the lowest is plantation transect (1.131)." (Authors)] Address: Hadiprayitno, G., Dept of Biology Education, Fac. of Teacher Training & Education Science, Univ. Mataram. Jl. Majapahit 62, Mataram 83125, West Nusa Tenggara, Indonesia. E-mail: gitohadiprayitno@unram.ac.id

17491. Lis, C.; Moore, M.P.; Martin, R.A. (2020): Warm developmental temperatures induce non-adaptive plasticity in the intrasexually selected colouration of a dragonfly. *Ecological Entomology* 45(3): 663-670. (in English) ["1. When the breeding environment fluctuates across generations, reproductive traits may evolve plasticity that optimises the balance between survival and mating success for the prevailing environment. 2. For sexually selected colouration, this balance can depend on environmental temperatures. Accordingly, breeding colouration often co-varies with temperature through space and time. However, whether such traits exhibit plasticity in response to environmental temperatures is poorly understood. 3. In the present study, *Pachydiplax longipennis* was reared under ambient or experimentally warmed conditions and tested for plasticity in its intrasexually selected wing colouration. Although wing colouration improves male territorial success, these advantages are smaller under warmer conditions than cooler conditions. It was therefore predicted that males reared under the ambient thermal conditions of the study site (Cleveland, Ohio) would develop more wing colouration than those reared under experimentally warmed conditions. 4. Contrary to this prediction, males reared in warm larval temperatures produced more wing colouration. Thus, although the secondary sexual colouration of this species displays some thermal plasticity, it does not appear to be adaptive relative to the known thermal variation of intrasexual selection in this population. 5. Given that the environment often determines the strength and direction of sexual selection, future studies should consider the potential for non-adaptive, and even maladaptive, developmental plasticity in the sexually selected traits of insects." (Authors)] Address: Moore, M.P., Living Earth Collaborative, Washington University, St Louis, MO 63110, U.S.A. E-mail: moore.evo.eco@gmail.com

17492. López-Díaz, J.A.; Gómez, B. (2020): Los Odonata (Insecta) en la entomofilia - The Odonata (Insecta) in entomophilately. *Dugesiana* 27(1): 3-10. ["A global review of the postage stamp inventory is presented with the representation of Odonata as biological organisms. To this end, an exhaustive search was carried out in literature specialized in

entomophilately, in addition to the use of the internet. 426 stamps issued by 113 countries were found, in addition to 102 postal documents (postmarks, first day envelopes, souvenir sheets). The first record of an Odonata in a postage stamp is made by Japan in 1923, while the years 2000, 2011 and 2013 stand out when emitting the greatest number of stamps with these insects. Taxonomically, a total of 182 species is recorded, representing 3.06% of the species recognized for the order. Of the stamps issued, 6.59% represent species in some risk category based on the IUCN." (Authors)] Address: López-Díaz, J.A., Inst. Cien. Biol., Univ. de Ciencias y Artes de Chiapas, Tuxtla Gutiérrez, Chiapas, México. E-mail: juanlodi44@gmail.com

17493. Lopez Colon, J.I.; Bahillo de la Puebla, P. (2020): Odonatos del Salar de los Canos, Vera (Almería) (SE de la Península Ibérica) (Insecta, Odonata). *Archivos Entomológicos* 22: 95-103. (in Spanish, with English summary) ["Odonata from Salar de los Canos, Vera (Almería) (SE Iberian Peninsula) (Insecta, Odonata). *Trithemis kirbyi ardens*, *Ceriagrion tenellum*, and *Anax parthenope*, are recorded from Salar de los Canos, a salt wetland in Vera, Almería (SE Iberian Peninsula). The Odonata checklist of that salt wetland is also provided." (Authors)] Address: López Colón, J.I., Plaza de Madrid, 2, 1ºD. E-28523 Rivas-Vaciamadrid, Spain. E-mail: lopezicolon@gmail.com

17494. López-Estrada, E.K.; Barona Fernández, J.; Cardo-Maeso, N.; Montejano, S.T.; Díaz-Martínez, C. (2020): *Onychogomphus cazuma* sp. nov. from Spain: Molecular and morphological evidence supports the discovery of a new European dragonfly species (Odonata: Gomphidae). *Odonatologica* 49(1/2): 125-154. (in English) ["*Onychogomphus cazuma* Barona, Cardo & Díaz sp. nov. is described from the mountainous inland area of Valencia in central-eastern Spain. The new species presents a combination of morphological characters that distinguishes it from all other species of the genus and can be readily identified by the morphology of the male appendages and the female vulvar scale, and by the shape of the median lobe of the prementum and the labial palps of the exuvia. Molecular analysis of two genetic markers, one nuclear and one mitochondrial (PRMT and COII), supports the full species rank for this new taxon, which is sister to the north-western African endemic *O. boudoti*. Despite its small known distribution and the vulnerability of its habitat, available data are still insufficient to place this new species into an IUCN Red List of Threatened Species category." (Authors)] Address: López-Estrada, Karen, Museo Nacional de Ciencias Naturales, MNCN-CSIC, José Gutiérrez Abascal, 2, 28006 Madrid, Spain. E-mail: lo-karen21@gmail.com