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A note on libellulid dragonflies (Odonata: Libellulidae) of Khabr National Park (Kerman Province, South-East Iran)

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Abstract

In spring and summer 2008, the Odonata fauna of the Khabr National Park (Iran) was studied for the first time. Here, we present records of the representatives of family Libellulidae only. A total of twelve libellulid Odonata were found. Most of them are common species in Iran and other parts of Kerman province. Scarce Iranian species are *Trithemis arteriosa* and *Zygonyx torridus*.

Key words

Odonata, Libellulidae, Khabr National Park, Kerman province, Iran.

Introduction

The study of Odonata fauna of Iran has a long tradition; some basic information on Palaearctic species are found in publications on Iran (e.g. Selys-Longchamps 1887; Bartenev 1916, 1929; Martin 1912; Morton 1920). With the exception of Schmidt (1954) there is a gap in studying Iranian Odonata along a large period in the second part of the 20th century. More recent studies have been published by Blom (1982), Lohmann (1990, 1992), Heidari & Dumont (2002) or Ghahari et al. (2009). Heidari & Dumont (2002) claim for 95 species as the total species number for the country up to date. With 35 recorded species, family Libellulidae is the most common group all over Iran.

Own regional studies were realized in the beginning of the 21th century in the Kerman province in southwestern Iran and also includes some data from the region treated in this paper. The results of this paper focus on the Khabar National Park and



Ruchoon Wildlife refuge and condense records by visiting more localities than published in Ebrahimi et al. (2009).

Study area

"With an area of 149,982 ha, Khabr National Park ($28^{\circ}56'N$, $56^{\circ}0.2'E$) is located in Kerman Province (Fig. 1) and covers a relatively vast extent of land from the high snow-cold and tree/shrub covered Mount Khabr to tropical plains. The altitude ranges of 1,040-3,860 m a.s.l. and mean annual precipitation of 200-300 mm and temperatures between $9-21^{\circ}C$. Climate and ecological factors resulted in arid and cold semi-arid conditions.

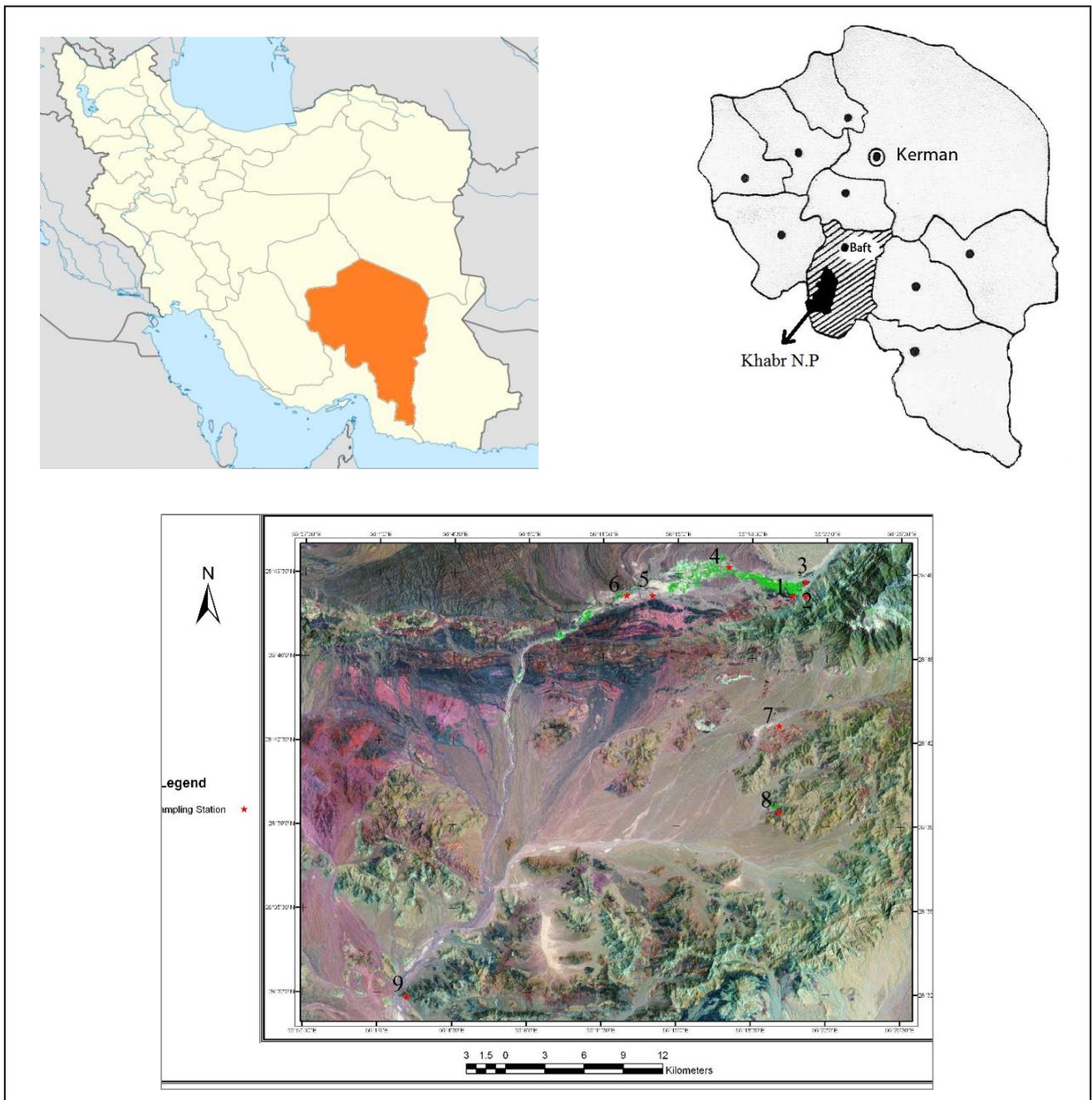


Figure 1. Position of Khabr National park in Kerman province and Iran with detailed map of studied area.



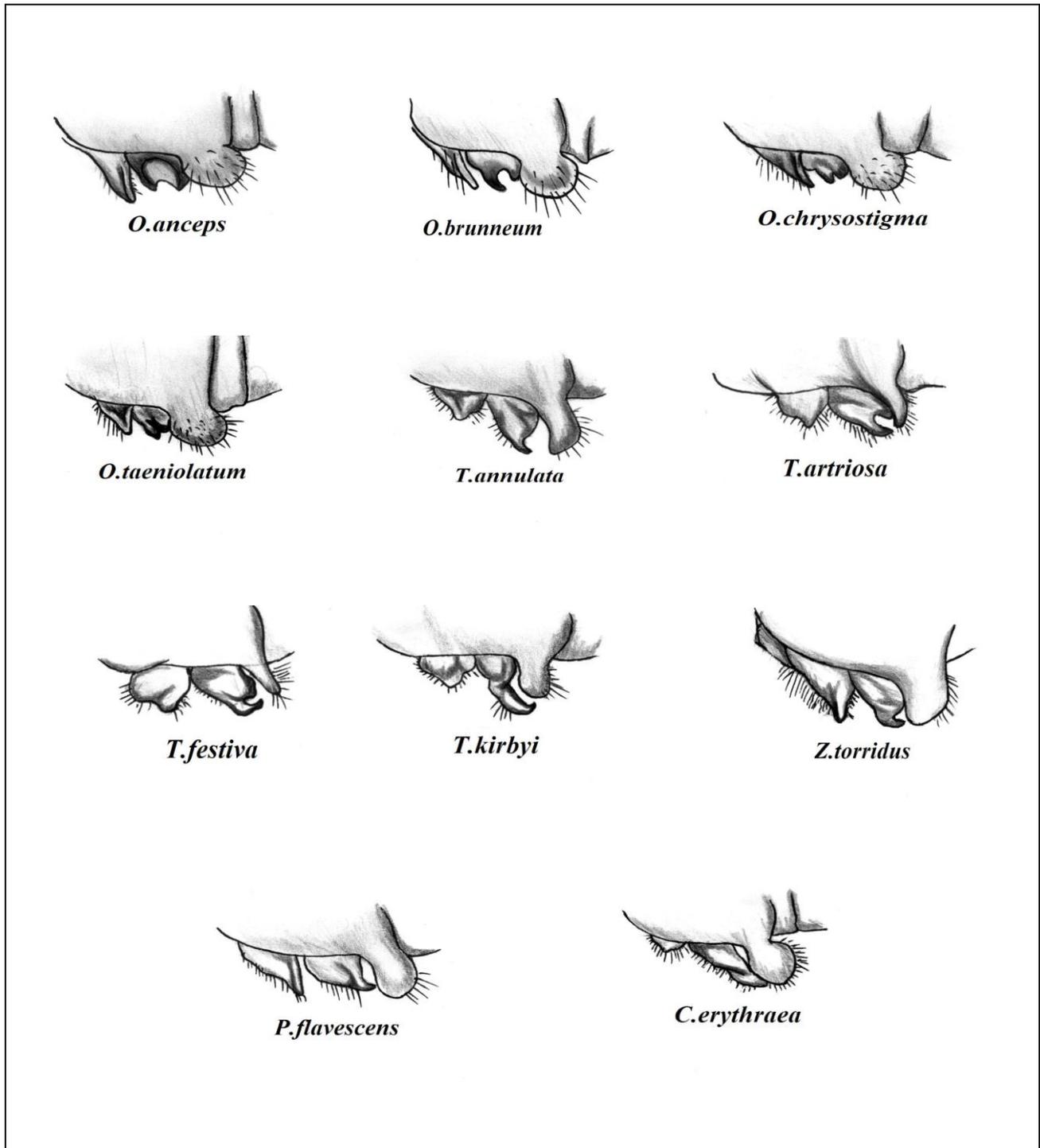


Figure 2. Male secondary genitalia profiles of libellulid dragonfly species (except *O. ransonnetii*) recorded from Khabr National park, lateral view.

Khabr Park had been managed as a protected area and, later on, as wildlife refuge since 1971 and was designated national park in 1999, thanks to its specific characteristics. KNP has been an excellent habitat because of the presence of 120 endemic plant species and some plant communities which are only found in this area. The wildlife of the park consists of 164 higher animal species; the Cheetah (*Acinonyx jubatus*, Mammalia: Felidae) is one of the endangered species of the region. "The existence of rocky mountains with permanent snow cover, interlinked peaks, the beautiful valley of Shah-evela-



yat, visit-worthy caves, frequent springs, adjacency of tropical and cold sites, beautiful forests, rich wildlife and proper access to roads have encouraged tourism, as well as scientific and research activities in the park." (Veisi et al. 2010)

Materials and Methods

In spring and summer 2008 the second author collected Odonata in the Khabr National Park during several field trips. The specimens were collected by net and transferred to the biological collection of Shahid Bahonar University of Kerman, Iran. They were dried and prepared for study. Each species was mainly identified based on wing venation and male secondary genitals as shown in Fig. 2 on the base of the present keys and guides from Dijkstra & Lewington (2006) and Dumont, (1991). One female *Orthetrum* was identified as *Orthetrum ransonnetii* (Brauer, 1865) by comparison with preserved museum specimens and Dumont's (1991) keys.

List of localities

- 1 Up the environmental Guard station of the Park: (28°48.7'N, 56°20.5'E), 2119 m a.s.l., stream
- 2 Khabr River in front of the Guard station: (28°48.8'N, 56°20.7'E), 2101 m a.s.l., river



Figure 3. Typical running water habitat in the Khabr National Park and suitable for the regional dragonfly fauna.



- 3 Khabr River lower than big pond: (28°49.3'N, 56°21'E), 2114 m a.s.l., river
- 4 Region between Khabr village and Deikhoieh village: (28°49.6'N, 56°17.5'E), 1973 m a.s.l., river
- 5 River in the valley between Deikhoieh and Ghalatoieh: (28°48.8'N, 56°13.5'E), 1753 m a.s.l., river
- 6 River between Deikhoieh and Ghalatoieh: (28°48.6'N, 56°12.3'E), 1723 m a.s.l., river
- 7 Kaht: (28°43.4'N, 56°19.7'E), 1960 m a.s.l., stream
- 8 Ruchoon: (28°39.8'N, 56°19.8'E), 1761 m a.s.l., river
- 9 Qanat (a spring) Shekarabe Orzuiyeh Wakilabad: (28°31.9'N, 56°02.1'E), 1208 m a.s.l., spring

Results

A total of twelve libellulid Odonata were recorded during the study. Thus, about 35% of the libellulid Odonata of Iran were regionally represented. Most frequent species were *Orthetrum coerulescens anceps* and *Trithemis festiva* with records from five localities for each, followed by *Trithemis festiva* with five localities. *Orthetrum chrysostigma* was collected at four and *T. arteriosa*, *Pantala flavescens* and *Zygonyx torridus* respectively at three localities. *T. kirbyi* was collected at two localities. Rare species with only one locality for each are *O. brunneum*, *O. ransonnetii*, *O. taeniolatum*, *T. annulata*, and *Crocothemis erythraea*.

List of Libellulidae species from Khabr National Park

- 1 *Orthetrum brunneum* (Fonsclombe, 1837)
Locality 8: 10.vii.2008, 13.vii.2008, 21.viii.2008.
- 2 *Orthetrum coerulescens anceps* (Schneider, 1845)
Locality 3: 14.vii.2008; Locality 5: 15.vii.2008; Locality 7: 2.vii.2008; Locality 8: 2.vii.2008, 6.vii.2008; Locality 9: 13.vii.2008.
- 3 *Orthetrum chrysostigma* (Burmeister, 1839)
Locality 3: 6.vii.2008; Locality 5: 16.viii.2008; Locality 7: 2.vii.2008; Locality 8: 2.vii.2008
- 4 *Orthetrum ransonnetii* (Brauer, 1865).
Locality 1: 31.v.2008.
- 5 *Orthetrum taeniolatum* (Schneider, 1845)
Locality 5: 10.vii.2008, 16.viii.2008.



- 6 *Trithemis annulata* (Palisot de Beauvois, 1807)
Locality 8: 9.vii.2008.
- 7 *Trithemis arteriosa* (Burmeister 1839)
Locality 7: 2.vii.2008; Locality 8: 2.vii.2008; Locality 9: 13.vii.2008.
- 8 *Trithemis festiva* (Rambur, 1842)
Locality 1: 31.v.2008; Locality 6: 10.vii.2008; Locality 7: 2.vii.2008; Locality 8: 9.vii.2008; Locality 9: 13.vii.2008.
- 9 *Trithemis kirbyi* Selys, 1891
Locality 6: 10.vii.2008; Locality 9: 13.vii.2008.
- 10 *Crocothemis erythraea* (Brullé, 1832)
Locality 8: 9.vii.2008.
- 11 *Pantala flavescens* (Fabricius, 1798)
Locality 2: 15.vii.2008; Locality 4: 3.vii.2008; Locality 5: 16.vii.2008.
- 12 *Zygonyx torridus* (Kirby, 1889)
Locality 5: 15.vii.2008; Locality 7: 2.vii.2008; Locality 8: 9.vii.2008.

Discussion

All sampling localities are located in a region with an arid climate. Locally several valleys are characterised by a more temperate climate, with permanent water bodies mainly rivers, runnels and springs. "Almost all the precipitation which falls in Iran is brought by low-pressure systems moving east-southeast from the Mediterranean Sea. During the winter months these depressions cross the country, bringing rain which decreases in amount in both easterly and southerly directions; most of it falls in the Alburz and Zagros mountains (the National Park is situated at the sotheastern fringe of the Zagros mountain), to the north and west of the Iranian plateau, respectively. ... In the eastern and southern parts of the plateau annual water surpluses do not occur, and so streams only flow here for short periods following heavy rainfall. Perennial river systems are only found around the margins draining the inward facing slopes of the Alburz and Zagros mountains. These rivers, almost all of which are relatively small, are fed by water surpluses generated in the upland regions. The National Park is situated in a region with an annual water surplus (precipitation-evapotransportation) of ca 100mm."

Trithemis arteriosa and *Z. torridus* can be found within the boundaries of the National Park, species which elsewhere are scarce in Iran. *Z. torridus* is a species of "open, fast-flowing waters, particularly waterfalls and rapids" (Dijkstra & Lewington, 2006), a habitat of special concern in semi-arid to arid regions. So far, the latter only had been discovered from southern Iran (Bandar Abbas) in 1990 (Heidari & Dumont 2002).



However, during their research in Oman Schneider & Dumont (1997) established this species in any wadi with permanently flowing water. The Arabic word Wadi refers to a dry riverbed with intermittent and often ephemeral waterbodies, whether flowing or stagnant. No published information is available on adaptive strategies of larvae to this situation (but see Johansson & Suhling 2004).

T. arteriosa may exist at the eastern borders of its geographic range. Dijkstra & Lewington (2006) characterise it as an African species but with limited expansion tendencies and local occurrence in the fringe of its distribution area. Boudot et al. (2009) discuss the species' tendency to expand in the East-Mediterranean region.

Most of the recorded libellulid Odonata are adapted to dry climates (see Johansson & Suhling 2004, Suhling et al. 2006, Martens et al. 2010). Obviously the biotopes typical of running waters and their alluvium (e.g. with shallow semi-permanent waters) contain habitats which allow the reproduction of all the species recorded. There are considerable parallels to the situation as in other countries as Namibia with running waters in deserts resp. arid regions. Considering the scarcity of suitable habitats for dragonflies, the regional diversity of libellulid dragonflies is remarkable. As a result, this protected area of the National Park is a natural reservoir for very rare Iranian species (*Trithemis arteriosa*, *Zygonyx torridus*) in the heart of the desert.

As stated before, this region is not rich in freshwater habitats and woodlands, thus has a low potential for Odonata species. In addition it receives a low annual precipitation, long periods of hot and dry climate. Consecutive droughts with low precipitation cause reduction of running and shallow waters. On the other hand, the local inhabitants and their cattle provide their needs from the regional underground waters with a tendency to overexploitation and devastation of water sources (e.g. Moosavirad et al. 2013). This threat is also visible for Odonates because of their dependence on freshwaters and indicated by species with some physiological adaptation in temporary water habitats.

Zygonyx torridus which is reported as a vulnerable taxon in Europe (Kalkman et al. 2010) is a very scarce species in Iran and in the National Park. The records of *Z. torridus* from Iran (Kunz et al. 2006, this paper) indicate Iran as a bridge to populations on the Indian subcontinent with the doubtful subspecies *isis* described by Fraser (1936). In spite of this regional scarcity the species is believed to be an effective migrant with the ability to successfully colonize new habitats (Kunz et al. 2006, Dijkstra & Lewington, 2006). For more details on the current taxonomic status see Kunz et al. (2006), who treat the taxon as monotypical.

It should be emphasised that some libellulid dragonflies from the studied region (as well as almost certainly in rest of the country), are threatened with extinction. The main reason for the extinction of odonate species being extra habitat destruction and water pollution (Kalkman et al. 2008), special efforts must be made and appropriate measures must be taken to manage the freshwater resources of the Khabr National Park in order to protect the local fauna and flora.



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