

Update to the status of *Pantala flavescens* (Fabricius, 1798) and *Trithemis kirbyi* Selys, 1891 for Italy and Central Mediterranean basin (Odonata Libellulidae)

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ABSTRACT

An overview of the records of *Pantala flavescens* and *Trithemis kirbyi* for the Sicilian Channel islands and mainland Sicily, with comments on their possible status in this area, is provided. In light of the number of observed individuals, *P. flavescens* is likely to be regular in the studied area, with up to 30 individuals recorded per year since autumn 2012. *Trithemis kirbyi*, conversely, is only known from few scattered records, so that its status in the area remains to be elucidated. No evidence of reproductive behaviour nor of actual breeding in this area was hitherto found for any of the two species.

KEY WORDS

Pantala flavescens; Pelagic islands; *Trithemis kirbyi*.

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INTRODUCTION

Pantala flavescens (Fabricius, 1798) (Odonata Libellulidae) is the most widespread dragonfly species in the world, being recorded from all continents but Antarctica. It reaches northwards at least to north-eastern U.S. in North America, and to Kamčatka in eastern Asia, yet its main range is between 40°S and 40°N (Walker & Corbet, 1975). It is an outstandingly resistant, powerful flyer, and a very long distance migrant, often laying eggs during its migrations wherever suitable conditions are found (Boudot et al. 2013). Because of its rapid larval development, it is also able to exploit temporary waterbodies created by seasonal or occasional rains. During migration, the species is capable of very long sea-crossings - up to 1,000 km in a few days -

either at night or during daylight (Feng et al., 2006; Anderson, 2009; Hobson et al., 2013; May, 2013; Suhling et al., 2009, 2016; Vieira & Cordero-Rivera, 2015). It has also reached Easter Island, one of the most remote islands in the world, more than 3,500 km from South American coasts, where a breeding population occurs (Dumont & Verschuren, 1991). Despite its highly migratory nature and the wide distribution, records in Europe and North Africa are surprisingly scarce (Jacquemin & Boudot, 1999; Jödicke, 1995; Jödicke et al., 2000; Schrijvershof, 2006; Buczyński et al., 2014). In Africa, *P. flavescens* is commonly found throughout the continent including Madagascar, from the Cape of Good Hope to the southern edge of the Sahara; there are however only a few records north of the Sahara, not recorded e. g. for Libya or Western

Sahara (Boudot et al., 2013). It is more frequent in Egypt and adjacent areas of Asia Minor (Dijkstra & Lewington, 2006; Kalkman & Van Pelt, 2006; Boudot et al., 2009).

Trithemis kirbyi Selys, 1891 (Odonata Libellulidae) is widespread throughout Africa, except in rainforest areas, and in Southern Asia up to India (Dijkstra & Lewington, 2006; Boudot et al., 2009). Unlike *P. flavescens*, *T. kirbyi* is not a regular long-distance migrant, its movements being essentially erratic; yet it has recently and rapidly expanded its range northwards, spreading into south-western Europe (Chelmick & Pickess, 2008; Cano-Villegas & Conesa-García, 2009; Herrera-Grao et al., 2012; Corso et al., 2012; Boudot et al., 2013; Obrégon-Romero et al., 2013). Global warming is influencing the distribution range of numerous species of Odonata, causing northward expansions, while a tendency towards an increasing range of movements in their migratory patterns has noticed as well (Ott, 2001, 2010; Dijkstra & Lewington, 2006; Bernard et al., 2009; Vieira & Cordero-Rivera, 2015). *Trithemis kirbyi* was recorded for the first time in Sardinia in 2003 (Holuša, 2008).

Corso et al. (2012) briefly reported first records of *P. flavescens* for Italy and of *T. kirbyi* for the small Sicilian islands, in view of the present, more detailed report. All the records of the two species for Sicilian Channel islands and Sicily, updated to November 2016, are herewith listed and discussed.

MATERIAL AND METHODS

The study area, shown in figure 1 and figure 2, is represented by:

1) The Pelagie Islands (Isole Pelagie), three small islands - Lampedusa, Linosa, and Lampione - located in the middle of the Sicilian Channel, south of Sicily, halfway between Malta and Tunisia. Geographically and geologically one part of the archipelago (Lampedusa and Lampione) belongs to the African plateau, while Linosa is a volcanic island; politically and administratively the islands fall within the Sicilian province of Agrigento and represent the southernmost part of Italy. The largest island is Lampedusa, about 20 km²; the second largest island is Linosa, while the smallest is the uninhabited Lampione. The vegetation on Lampedusa and Lampione is exceedingly low

and scarce, because of extensive destruction of the formerly existing Mediterranean scrub; the latter is better preserved on Linosa. Aquatic biotopes are extremely scarce and scattered, only consisting in a few temporary, rain-fed waterbodies. The maximum altitude of the archipelago is on Linosa, with Monte Vulcano (195 m a.s.l.), followed by Lampedusa, with Albero Sole (133 m a.s.l.).

2) Northwest of the Pelagie there is the volcanic island of Pantelleria, 110 km south-west of Sicily and only 70 km north-east of Tunisia, by far the largest and highest in altitude of the Sicilian Channel islands (836 m a.s.l., ca. 83 km²). Besides having several temporary waterbodies, consisting in man-made water reservoirs and catchments, it has a permanent volcanic lake, with a dense, locally wide reed belt, potentially suitable for several Odonata; because of high salinity, however, only *Ischnura fountaineae* Morton, 1905, with the only known viable European population, is definitely known to breed here, and very few other dragonflies are supposed to do so, at least occasionally.

3) Sicily, the biggest island in the Mediterranean basin, is situated right in the centre of this “closed” sea. It has a great variety of aquatic biotopes, including coastal brackish wetlands, freshwater lentic biotopes (either natural or man-made), streams and rivers, habitats for a lot of Odonata species.

Since 2004, the islands of the Sicilian Channel were visited every year, mainly by AC, OJ and MV. The Pelagie were regularly visited in spring (February–May), summer (June–August), autumn (September–November), with a few winter visits (December–January). Pantelleria, conversely, was visited mainly in spring, with a very few visits in summer and autumn. More specifically, between April 2004 and November 2016, the Pelagie were visited for a total of almost 540 days, mostly during the autumn (see Corso et al., 2012). During these visits, all potentially suitable dragonfly habitats, over as much ground as possible, were prospected, in order to assess what dragonfly species were actually or possibly breeding in local waterbodies, and what were only regular migratories or accidental vagrants. The former ones proved extremely scarce (Corso et al., 2012). Information, although derived from more anecdotal observations, regarding the island of Djerba, Southern Tunisia, Gulf of Gabès, and the Maltese Archipelago are also reported, as these sites are geographically close and



Figure 1. The study area in the Centre of Mediterranean Basin, red circles showing the observations (and/or literature data) sites.

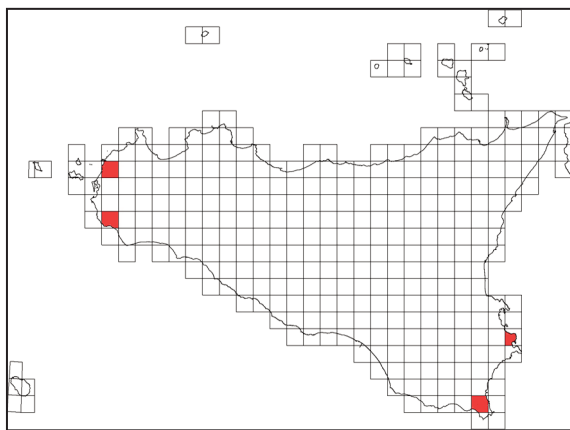


Figure 2. Map of Sicily showing the areas where *Pantala flavescens* was recorded during this study.

records from these areas are closely associated with the patterns affecting Sicily and Pelagie islands. Most of the records here reported refer to netted or photographed specimens. However, some concern field observations only, since *P. flavescens* and *T. kirbyi* are strong, fast fliers, often quite shy and difficult to catch or approach. Fortunately, both are locally unmistakable, so that their field identifica-

tion is easy and reliable (Dijkstra & Lewington, 2006). When netted, the specimens were photographed in the hand in four different positions - side view, from below, from above and a close up of secondary genitalia. To photograph the specimens we used a digital SLR camera with a 18–70 mm lens. Only a few voucher specimens were collected, currently housed in the private collections of two of the authors (AC and MP).

RESULTS

Corso et al. (2012) report the first Italian records of *P. flavescens* from the Pelagie on October 2012, with no further details. A detailed list of records is herewith provided.

Lampedusa: 1 ex. (sex?), Cala Morta, 27.X.2012. Linosa: 1 male, 28.X.2012; 1 male, 5.XI.2012; 13 exx. (mostly males), 6.XI.2012; 3 exx. (sex?), 7.XI.12; 8 exx. (mostly males), 8.XI.2012; 2 exx. (sex?), 11.XI.2012 (Figs. 3–5). Both males and females, the formers more abundant, were recorded; all individuals were apparently immature, none of the males showing bright red coloration. Only 1 male, on 6.XI.2012, was collected, and is currently housed in MP collection (Figs. 4, 5). In the following years, *P. flavescens* was regularly recorded on Linosa. At least 15 exx. were noticed from 20.X.2013 to mid XI.2013; at least 8 from late X.2014 to mid XI.2014; in 2015, 1 male was seen on 27.X, 1 on 28.X and 1 on 3.XI; in 2016, only 1 (sex?) on 22.X. Sicily mainland (Fig. 2): the first confirmed record concerns 1 male, Pantano (= marsh) Cuba (Siracusa province), 36°42'27.10"N 15°1'30.40"E, 2.XII.2012, AC (MP coll.). In the following years, further individuals were observed: 1 male, Siracusa, 37°6'37.34"N 15°13'43.28"E, 15.X.2014; 1 male, near Trapani, 37°59'34.18"N 12°31'9.52"E, 20.X.2014; 1 male, near Mazara del Vallo (Trapani province), 37°39'44.25"N 12°32'2.06"E, 18.X.2014; 1 male, Siracusa, in the very same site of the 2014 record, a mall parking area, 19.X.2016 (all by AC). Although the repeated observations on the said parking area may appear surprising at first, the warm asphalted ground could actually prove attractive to wandering individuals. Because of their relevance to the study area, observations by AC at Djerba island (Gulf of Gabès, Tunisia) are also reported. At least 20 specimens



Figure 3. First photographically documented record of *Pantala flavescens* for Italy, concerning an immature male observed at Linosa Island, Pelagie (Agrigento province, Sicily) on 18.X.2012 (M. Viganò/MISC). Figures 4, 5. The only specimen collected of *P. flavescens* in Italy up to date - 1 male netted at Linosa Island, Pelagie, on 6.XI.2012 (M. Viganò/MISC). Figures 6, 7. The first *Trithemis kirbyi* ever photographed alive in the field for Italy, at Linosa Island, Pelagie, on 16.X.2013 (Igor Maiorano/MISC). Figure 8. A mature female of *P. flavescens* collected in the Sinai desert, Egypt, October 2009, during massive migration, for comparison (A. Corso/MISC). Figure 9. An immature male of *P. flavescens* collected in the Sinai desert, Egypt, October 2009, during massive migration, for comparison (A. Corso/MISC).

(mostly males) were observed on 30.IX.2010, around the water treatment ponds of El Kantara (33°41'52.48"N 10°56'25.45"E), probably the best site for Odonata in the entire island (AC, unpubl.).

In the Maltese Archipelago, the species was recorded in the summer 2013 with three specimens observed/collected (Degabriele, 2014). It is to be stressed that no reason seems to exist, for which migratory *P. flavescens* should not occur also on Pantelleria. Lack of records may only result from no researcher presence on the island during the suitable period.

As for *T. kirbyi*, Corso et al. (2012) provided the second record for Italy, after the first from Sardinia in 2003 (Holuša, 2008), and the first regional one, of a pair observed on Lampedusa, Capo Grecale, 20.X.2012. Subsequent records were obtained. Lampedusa: 1 male observed, Albero Sole, 35°31'40.41"N 12°32'20.04"E, 6.XI.2014. Linosa: at least 6 specimens (3 males, 3 females) 35°52'10.65"N 12°51'49.77"E, 16–20.X.2013, 3 of which (2 males, 1 female) were collected (Figs. 6, 7, AC and MP collections).

CONCLUSIONS

The Pelagic islands are the only European area where the highly migratory *P. flavescens* was recorded regularly through more years (Corso et al., 2012; Buczyński et al., 2014). During this study, up to about 30 specimens were noticed - mostly collected or photographed - on Linosa and Lampedusa every autumn, since the first records by Corso et al. (2012). Some records were also obtained in Sicily mainland, in December 2012 and again in autumn 2014 and 2016. The species was recently recorded also in the Maltese Archipelago (Degabriele, 2014). Upon future studies, *P. flavescens* very likely will prove a regular migrant also here, and on Pantelleria as well. Although the species is a regular migrant also in Sicily mainland, where no doubt a number of suitable biotopes exists, there is at present no evidence of breeding in Italy; this also will be the target of future studies. *Trithemis kirbyi* is widespread and rather common throughout North Africa (Dijkstra & Lewington, 2006; Boudot et al., 2009, 2013) and is at present rapidly spreading in Spain as well (Chelmick & Pickess, 2008; Herrera-Grao et al., 2012; Obrégon-Romero et al., 2013); yet it

has only occasionally been recorded in the Sicilian Channel islands, precisely in the Pelagic (Corso et al., 2012), while no record for Sicily mainland currently does exist.

REFERENCES

- Anderson R.C., 2009. Do dragonflies migrate across the western Indian Ocean? *Journal of Tropical Ecology*, 25: 347–358
- Boudot J.-P., Kalkman V.J., Azpilicuenta Amorín M., Bogdanović T., Cordero Rivera A., Degabriele G., Dommanget J.-L., Garrigós B., Jović M., Kotarac M., Lopau W., Marinov M., Mihoković N., Riservato E., Samraoui B. & Schneider W., 2009. Atlas of the Odonata of the Mediterranean and North Africa. *Libellula*, Supplement, 9: 1–256.
- Boudot J.-P., Clausnitzer V., Samraoui B., Suhling F., Dijkstra K.-D.B. & Schneider W., 2013. *Pantala flavescens*. The IUCN Red List of Threatened Species. Version 2014.2. <www.iucnredlist.org>. Downloaded on 28 September 2014.
- Buczyński P., Shapoval A.P. & Buczyńska E., 2014. *Pantala flavescens* at the coast of the Baltic Sea (Odonata: Libellulidae). *Odonatologica*, 43: 3–11.
- Bernard R., Buczyński P., Tonzik G. & Wendzonka J., 2009. A distribution atlas of dragonflies (Odonata) in Poland. Poznan, 256 pp.
- Cano-Villegas F.J. & Conesa-García M.A., 2009. Expansión de *Trithemis kirbyi* Sélys, 1891 (Odonata: Libellulidae) en la provincia de Málaga (sur de la Península Ibérica). *Boletín de la Sociedad Entomológica Aragonesa*, 44: 569–572.
- Chelmick D. & Pickess B.P., 2008. *Trithemis kirbyi* Sélys in southern Spain (Anisoptera: Libellulidae). *Notulae Odonatologicae*, 7: 4–5.
- Corso A., Janni O., Pavesi M., Sammut M., Sciberras A. & Viganò M., 2012. Annotated checklist of the dragonflies (Insecta Odonata) of the islands of the Sicilian Channel, including the first records of *Sympetrum sinaiticum* Dumont, 1977 and *Pantala flavescens* (Fabricius, 1798) for Italy. *Biodiversity Journal*, 3: 459–478.
- Degabriele G., 2014. An overview of the dragonflies and damselflies of the Maltese Islands (Central Mediterranean) (Odonata). *Bulletin of the Entomological Society of Malta*, 6 [2013]: 5–127.
- Dijkstra K.-D.B. & Lewington R., 2006. Field guide to the dragonflies of Britain and Europe. British Wildlife Publishing, Gillingham, 320 pp.
- Dumont H.J. & D. Verschuren, 1991. Atypical ecology of *Pantala flavescens* (Fabr.) on Easter Island (Anisoptera: Libellulidae). *Odonatologica*, 20: 45–51.

- Feng H.-Q., Wu K.-M., Ni Y.-X., Cheng D.-F. & Guo Y.-Y., 2006. Nocturnal migration of dragonflies over the Bohai Sea in northern China. *Ecological Entomology*, 31: 511–520.
- Hobson K.A., Anderson R.C., Soto D.X., Paulson D.R. & Wassenaar L.I., 2013. Isotopic evidence that dragonflies (*Pantala flavescens*) migrating through the Maldives come from the northern Indian subcontinent. *Plos one* 7 (12): 1-4 (e52594)
- Herrera-Grao O.T., Bonada N., Gavira O. & Blanco-Garrido F., 2012. First record of *Trithemis kirbyi* Sélys, 1891 in Catalonia (Odonata, Libellulidae). *Boletín Asociación española de Entomología*, 36: 457–459.
- Holuša O., 2008. *Trithemis kirbyi* auf Sardinien: Erstnachweis für Europa (Odonata: Libellulidae). *Libellula*, 27: 111–115.
- Jacquemin G. & Boudot J.-P., 1999. Les libellules (odonates) du Maroc. *Société Française d'Odonatologie*, Bois d'Arcy, 150 pp.
- Jödicke R., 1995. Frühjahrsaspekte der Odonatenfauna in Marokko südlich des Hohen Atlas. *Opuscula Zoologica Fluminensia*, 134: 1–10.
- Jödicke R., Arlt J., Kunz B., Lopau W. & Seidenbusch R., 2000. The Odonata of Tunisia. *International Journal of Odonatology*, 3: 41–71.
- Kalkman V.J. & van Pelt G.J., 2006. The distribution and flight period of the dragonflies of Turkey. *Brachytron*, 10: 83–153.
- May M.L., 2013. A critical overview of progress in studies of migration of dragonflies (Odonata: Anisoptera), with emphasis on North America. *Journal of Insect Conservation*, 17: 1–15.
- Obregon-Romero R., Cano-Villegas J., Tamajón-Gómez R. & Lopez Tirado J., 2013. Primeras citas de *Trithemis kirbyi* Sélys, 1891 (Odonata, Libellulidae) en las provincias de Ciudad Real y Huelva, y nuevas aportaciones para la provincia de Badajoz (España). *Boletín de la Sociedad Entomológica Aragonesa*, 53: 88–93.
- Ott J., 2001. Expansion of Mediterranean Odonata in Germany and Europe - consequences of climatic changes - Adapted behaviour and shifting species ranges. In: Walter G-R. et al. (Eds.) 2001, "Fingerprints" of Climate Change. Kluwer Academic Publishers, New York, 89–111.
- Ott J., 2010. Effects of climatic changes on dragonflies - results and recent observations in Europe. In: Ott J. (Ed.) 2010, *Monitoring Climate Change with dragonflies*. *BioRisk*, 5: 253–286.
- Schrijvershof P., 2006. Records of *Pantala flavescens* in SW-Morocco summer 2006. Online on internet [11-XI-2006]. <<http://www.libellen.org/epallage/>>. Downloaded on 28 September 2014.
- Suhling F., Martens A & Marais E., 2009. How to enter a desert - patterns of Odonata colonisation of arid Namibia. *International Journal of Odonatology*, 12: 287–308.
- Suhling F., Martens A. & Suhling I., 2016. Long-distance dispersal in Odonata: Examples from arid Namibia. *Austral Ecology* doi:10.1111/aec.12472
- Vieira V. & Cordero-Rivera A., 2015. First record of *Pantala flavescens* from the Azores (Odonata: Libellulidae). *Odonatologica*, 44: 1–9.
- Walker E.M. & Corbet P.S., 1975. *The Odonata of Canada and Alaska*, Vol. 3. Anisoptera - three families. University of Toronto Press, Toronto.