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Massive web aggregation of *Tetragnatha nitens* (Audouin, 1826) in the lagoon of Orbetello (Tuscany, Italy)

(Arachnida: Araneae: Tetragnathidae)

Abstract

A massive web aggregation of *Tetragnatha nitens* (Audouin, 1826) is reported from the lagoon of Orbetello. This gregarious behaviour is likely associated with a large swarming of chironomids, which are usual prey of this species. The record of *T. nitens* herein reported is the first one for continental Tuscany.

Key words: Chironomidae, gregarious behaviour, new record, spider, tetragnathids, *Zelus renardii*

Riassunto

[*Eccezionale aggregazione di tele di Tetragnatha nitens (Audouin, 1826) nella laguna di Orbetello (Toscana, Italia)*]

Viene riportata un'eccezionale aggregazione di *Tetragnatha nitens* (Audouin, 1826) presso la laguna di Orbetello con la formazione di ragnatele in comunicazione che si estendono e ricoprono ampie superfici. Tale comportamento gregario è probabilmente legato ad una grande proliferazione di prede costituite da ditteri chironomidi. Il dato qui riportato costituisce la prima segnalazione di *T. nitens* per la Toscana continentale.

Introduction

Tetragnatha nitens (Audouin, 1826) is a spider of the family Tetragnathidae with a cosmopolitan distribution (see LEVI, 1981; OKUMA, 1983; WORLD SPIDER CATALOG, 2022).

In Europe *T. nitens* is recorded from some Mediterranean countries (see NENTWIG *et al.*, 2022). In Italy it is known for a large part of the country, although the records are scattered (see PANTINI & ISAIA, 2019). In particular, the species is recorded from Emilia-Romagna (ZANGHERI, 1966; FABBRI *et al.*, 2015; CECCOLINI *et al.*, 2018), Elba Island (DI CAPORACCO, 1950), Campania (IJLAND & VAN HELSDINGEN, 2014), Calabria (CAFFI, 1895), Sardinia (GARNERI, 1902), and the island of Pantelleria (HANSEN, 1991; PESARINI, 1995).

In certain conditions *T. nitens* occurs in large numbers and in this case the spiders engage a gregarious behaviour and build webs covering large areas (FABBRI *et al.*, 2015; CECCOLINI *et al.*, 2018; NAJIM, 2019). In Italy this phenomenon had been so far observed only recently, with three documented episodes recorded in 2015, 2016, and 2018 in lagoon areas of Romagna (FABBRI *et al.*, 2015; CECCOLINI *et al.*, 2018). This contribution deals with a similar event that occurred on the opposite side of the Italian peninsula, on the Tyrrhenian Sea.

Material and methods

We collected the specimens with the help of the usual field equipment (tweezers, tubes, etc.). Most of the specimens are preserved in 70% ethyl alcohol, some specimens are stored in pure alcohol (96.4%) for possible genetic analysis. The material is deposited in the collections of the authors (F. Cianferoni and F. Graziani in Florence and F. Ceccolini in Rassina, Arezzo, Italy).

The specimens were subsequently examined under the stereomicroscope for specific identification mainly based on the arrangement of the teeth of the chelicerae and the structure of the male palps (see CASTANHEIRA *et al.*, 2019) in order to exclude other close species, in particular *Tetragnatha bogotensis* Keyserling, 1865 (= *T. nitens kullmanni* Wiehle 1962), recorded from Sardinia (see CASTANHEIRA *et al.*, loc. cit.).

Microscope images were taken by the first author with a Leica M205 C stereomicroscope and dedicated software Leica LAS 4.3 version for Z-stacking at the Natural History Museum of the University of Florence. Post-processing was made with Adobe Photoshop CS3 Extended 10.0 version.

Results

Tetragnatha nitens (Audouin, 1826) (Fig. 1)

Material examined: Orbetello (GR), Laguna di Ponente (= western lagoon), Laguna di Levante (= eastern lagoon) and city centre, 22.X.2022, several adults (Fig. 1) and immatures, Fabio Cianferoni, Francesca Graziani & Filippo Ceccolini leg. (preserved in the collections of the authors).

Additional material subject of the contribution: Orbetello (GR), Laguna di Ponente, near to the Mulino Spagnolo (= Spanish mill), 1.IX.2022, many adults, immatures, and egg sacs, photos (Fig. 2) by Maria Capezzuoli; *idem*, 14.X.2022, *idem*, photos by Stefania Capitani; *idem*, 22.X.2022, *idem*, photos (Fig. 2) by Fabio Cianferoni, Francesca Graziani & Filippo Ceccolini.

Photos of spider webs extended over large areas from the same site, in the Laguna di Ponente (Orbetello, Grosseto), were taken by Maria Capezzuoli on 24th and by Stefania Capitani on 29th August 2022 and posted on the Facebook page “La

Laguna di Orbetello..un'Oasi tra le Oasi..”.

The news was even reported by some pages on (more or less local) newspapers and websites: e.g. “Il Giunco.net - il quotidiano della Maremma” (www.ilgiunco.net - 23 August 2022), “Il Tirreno - Grosseto” (25 August 2022), “La Nazione - Grosseto” (26 August 2022), “la Repubblica - Roma” (28 August 2022), “Today Storie” (www.today.it - 11 September 2022); “Corriere della Sera - Roma” (13 September 2022); “Il Dolomiti” (www.ildolomiti.it - 15 September 2022); “Maremma oggi” (www.maremmaoggi.net - 10 October 2022) but without reporting any identification of the spider (only in one site is indicated the correct genus name *Tetragnatha*; a Facebook user, in a comment on M. Capezzuoli’s original post, indicated the correct species of the spider - however a reliable identification at species level is possible only with a microscopic study).

According to one of the sources, the webs from Orbetello occurred both on the side of the Laguna di Ponente (near to the Mulino Spagnolo) and Laguna di Levante. This was verified by our samplings on the vegetation on the edge of both lagoons. The observations by Maria Capezzuoli and Stefania Capitani are mainly from the Laguna di Ponente where the phenomenon appeared limited to tens of metres. There, the webs covered vegetation (including bushes, palms, etc.) and other objects along the way (e.g., railings, cars) (Figs. 2-3).

According to newspapers, websites (see also the discussion), and the mentioned observers, the webs seem to have appeared after the first half of August 2022 (M. Capezzuoli, pers.com.).

Our findings of 22 October 2022, revealed a much more extensive colonisation of this small town. The day before, a strong wind destroyed most of the spectacular webs on the vegetation, but many thousands of adults, immature specimens and egg sacs were still present not only on the riparian vegetation along the lagoons, but also in the town. Each shrub, bush, and plant was colonised by thousands of adults and egg sacs (Fig. 3). Each palm (e.g., planted *Phoenix canariensis* Chabaud) leaf and shrub frond (e.g., *Tamarix gallica* L.) housed tens of adults and egg sacs (until 7-8 per 10 square centimetres in the densest points). Walls of the buildings, business showcases, garage doors, bus platforms, a fountain were covered with tens and hundreds of individuals and sacs (Fig. 2) with spiderlings ready to emerge.

Considerations on the distribution of the species

The type of *Tetragnatha nitens*, considered lost (LEVI, 1981), was collected in Egypt (AUDOUIN, 1826), whilst the types of other taxa today considered synonyms come from various South American countries (see CASTANHEIRA *et al.*, 2019). According to the WORLD SPIDER CATALOG (2022) the species is native to tropical and subtropical Asia and introduced in the other areas where it occurs today.

However, the species should be considered at least cryptogenic. If the assertion reported in the WORLD SPIDER CATALOG (2022), not accompanied by further data, is correct, the species should have been introduced and have had time to spread widely to all continents (obviously except Antarctica) and many oceanic islands before the 19th century. It seems more likely that it is actually a species with a large original range, maybe tropics and subtropics, perhaps introduced only in some of the continents where it currently occurs. In fact, in the contribution of NENTWIG & KOBELT (2010) on the alien spiders occurring in Europe, *T. nitens* is not included, making assume that the authors consider the species native at least in this area. The occurrence of other similar species of *Tetragnatha* with tropical and subtropical distribution, including *T. bogotensis* Keyserling, 1865 very close to *T. nitens*, both in the New and Old World (see CASTANHEIRA *et al.*, 2019) leave the question of the native range of these species still open. The Italian records, scattered and rather sporadic (see PANTINI & ISAIA, 2019), seem to highlight a probable lack of research of the species in the country.

Comments on the described phenomenon

An exceptional swarm of chironomids (Diptera, Chironomidae) was observed in the same site (Orbetello) and other surrounding areas in July and especially the first half of August 2022. This phenomenon, which had more media attention due to inconvenience to tourists and commercial activities, was reported by several newspapers and websites, e.g. “Il Giunco.net - il quotidiano della Maremma” (www.ilgiunco.net - 19 July and 8 August 2022), “MaremmaOggi” (www.maremmaoggi.net - 8 August 2022), “Open” (www.open.online - 8 August 2022), “Sky Tg24” (11 August 2022); “ANSA” (16 August 2022). Several disinfestations organized by administrative authorities followed (at least five).

Our findings (22 October 2022) revealed the presence of these non-biting midges (most of them dead) in old webs of *T. nitens*. These masses of chironomids were dominated by two species of different size.

It is plausible that global warming, which caused drought and exceptional heat in the spring and summer 2022, may have powered these huge swarmings of chironomids.

As already hypothesised (FABBRI *et al.*, 2015; CECCOLINI *et al.*, 2018), it is also likely that the high reproduction of these spiders, with the consequent phenomenon of the webs, is to connect to lagoon chironomid swarmings. Indeed, also the previous records of *T. nitens* in Italy are from coastal areas (see PANTINI & ISAIA, 2019).

In fact, it is logically plausible that spiders undergo super-reproduction due to the exceptional food resource represented by chironomids and that they build these intercommunicating webs to intercept them.

Due to the ongoing climate change it is probable that phenomena of this type

(periodic swarms of chironomids and massive aggregations of spiders) become more and more constant and less exceptional.

Moreover, during our samplings we recorded the co-occurrence of isolated specimen belonging to other species (mainly families Araneidae, Theridiidae, and Pholcidae) in the same areas of the specimens of *T. nitens* (mainly on outside walls of buildings and a monumental fountain). However, they apparently were not associated or did not interact with those of *T. nitens*.

What does not appear random was the occurrence of several specimens of *Zelus renardii* Kolenati, 1857 (see CIANFERONI, 2022 for further information on this record), an alien predatory insect of the family Reduviidae (Hemiptera, Heteroptera), plausibly favoured by the massive presence of trophic resources (likely represented by young *T. nitens*). An adult specimen of *Z. renardii* partially wrapped in a web was also observed. It could be a prey of *T. nitens* (or other co-occurring spiders), but to establish if this is an occasional episode or not, further observation will be needed.

The exceptional heat of autumn 2022 has undoubtedly favoured the massive reproduction of this spider species, still in progress at the end of October (Orbetello, 22/10/2022: T min = 19 °C; T max = 25 °C). Mating specimens (Fig. 2f) and many ovigerous sacs with newly hatched spiderlings have also been observed.

Faunistically, the record of *Tetragnatha nitens* from Orbetello represents the first one for continental Tuscany, since this species was reported so far only for Elba island by DI CAPORACCO (1950).

We found it useful to prepare this contribution in order not to lose this interesting record and associated data and to allow it to enter the specialised scientific literature (see e.g. PANTINI & ISAIA, 2019).

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Fig. 1 - Adult specimens of *Tetragnatha nitens* (Audouin, 1826) from Orbetello (Grosseto, Italy). a) Left male chelicera, inner view. b) Right male chelicera, lower view. c) Left female chelicera, inner view. d) Right female chelicera, lower view. e) Left and right male palps, two different views. Scale bars: 1 mm. Photos: Fabio Cianferoni.



Fig. 2 - Specimens of *Tetragnatha nitens* (Audouin, 1826). a) Adult male (left) and female (right) on a wall of building. b) Adult male, c) adult and immature specimens of both sexes, d) specimens and egg sacs, on a parked car. e) Specimens (mainly adults) on a bus stop platform; the arrow indicates a specimen of *Zelus renardii* Kolenati, 1857. f) Mating (female above and male below); business showcase. Photos: Fabio Cianferoni (a, f); Maria Capezzuoli (b-d); Francesca Graziani (e).



Fig. 3 - a-e) Webs of *Tetragnatha nitens* (Audouin, 1826) on vegetation. f) Adult, immature specimens, and egg sacs on a leaf of a planted palm tree. Photos: Maria Capezzuoli (a-d); Stefania Capitani (e); Francesca Graziani (f).

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