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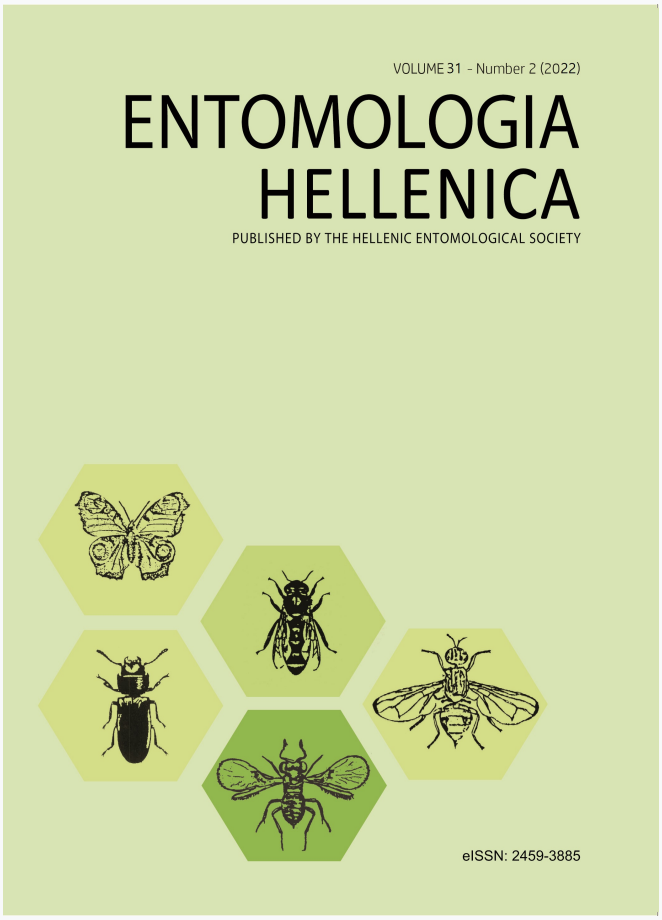

First occurrence of the black field earwig, Nala lividipes (Dermaptera: Labiduridae) in Greece

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First occurrence of the black field earwig, *Nala lividipes* (Dermaptera: Labiduridae) in Greece

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ABSTRACT

The cosmopolitan black field earwig, *Nala lividipes* (Dufour, 1820) (Dermaptera: Labiduridae) is observed for the first time in Greece. A photographic record was obtained by the first author in 2016, from Salamis Island followed by a photographic citizen-science observation from Rhodes in 2021. Despite frequent inspections and efforts to raise public awareness, no additional samples or observations have been recovered. The poor study of Dermaptera in Greece and the absence of early warning systems for alien insects, may have delayed the detection of this alien species in the country. However, given the agricultural significance of *N. lividipes*, a short description is given to assist further data collection and monitoring. Finally, the potential establishment of the earwig in Greece, along with the impacts on the native flora and fauna are discussed.

KEY WORDS: Agricultural pest, alien species, cosmopolitan, early warning systems.

Introduction

Globalization and the constant rise of international trade have led to an unprecedented rise of species translocations and a great distortion of their native ranges (Hulme 2009). Many of these alien species have been associated with socioeconomic, human health and environmental impacts (Simberloff et al. 2013; Schindler et al. 2015; Vilà and Hulme 2016), something that highlights the need to monitor their occurrence and dynamic shifts in distribution ranges.

The reported cases of introductions and translocation of earwigs (Dermaptera) are rather uncommon, supported by only seven alien earwig species being recorded in Europe (Zafeiriou et al. 2021). The small number of reported alien Dermaptera could be related to both their low species richness as well as their cryptic nature. Until now, only two alien earwigs have been recorded from Greece, namely *Euborellia femoralis* (Dohrn, 1863) and *Forficula lucasi* Dohrn, 1865 raising the Greek earwig fauna to 18 species (Haas 2015, 2018; Demetriou et al.

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2021; Fontana et al. 2021; Zafeiriou et al. 2021; Kalaentzis et al. 2022).

The black field earwig, *Nala lividipes* (Dufour, 1820) is a cosmopolitan species, presumably of Afrotropical origin, which has gradually spread across all biogeographic realms. The species is widely distributed along the Mediterranean basin with records from Algeria, France, Italy (including Sardinia and Sicily), Malta, Morocco, Portugal, Spain (including the Balearic and Canary Islands), Tunisia, and Turkey (Albouy and Caussanel 1990; Mifsud and Taglianti 2008; Rasplus and Roques 2010; Anlaş and Kočárek 2012; Pages 2012) (Fig. 1).

The alien insect-fauna of Greece has been recently updated, holding a total of 469 species (Demetriou et al. 2021) in anticipation of further additions. Citizen scientists have been supplementing our knowledge around the presence and distribution of alien species, providing photographic observations and specimens of new alien to the country insects such as the feather-legged fly *Trichopoda pictipennis* Bigot, 1876 and lantana plum moth *Lantanophaga pusillidactylus* (Walker, 1864) (Demetriou et al. 2020; Kazilas et al. 2020; Dios et al. 2021). Alientoma, an online database for the alien insects of Greece, promoting public participation in scientific research (Kalaentzis et al. 2021b, c), was utilised to track the presence of *N. lividipes* in the country. In this publication, the black field earwig *N. lividipes* is reported for Greece for the first time.

FIG. 1: Known distribution of *Nala lividipes* (Dufour, 1820) in the Mediterranean basin. Countries where the species has been previously reported are shaded red, while the new records from Greece are depicted with a dot. The map was created with QGIS, v.3.14.16. Inset: The adult, female individual observed on Salamis island, Greece.

Materials and Methods

A female individual was observed and photographed in Greece: Saronic Gulf, Salamis island, Paloukia [37.962ºN, 23.514ºE], vii/2016, alt. 25 m, observed by E. Koutsoukos, in a house garden (Fig. 2A). The observed female was identified as *N. lividipes* following the identification key of Anlaş and Kočárek (2012). The species identification was also confirmed by taxonomic expert (Dr. Petr Kočárek, pers. comm., 2021). A second observation of a female *N. lividipes* was recorded in Greece: Dodecanese, Rhodes island, [36.3848ºN, 28.1312ºE], 23/vii/2021, alt. 50 m, observed by Mr. Benoît Segerer in a hotel garden, uploaded to iNaturalist platform (iNaturalist 2021) (Fig. 2B).

Online educational material regarding the taxonomy, distribution, morphology, ecology and impacts of *N. lividipes* was uploaded to the Alientoma webpage and social media platform (Kalaentzis et al. 2021a), in order to investigate the presence of further photographic observations.

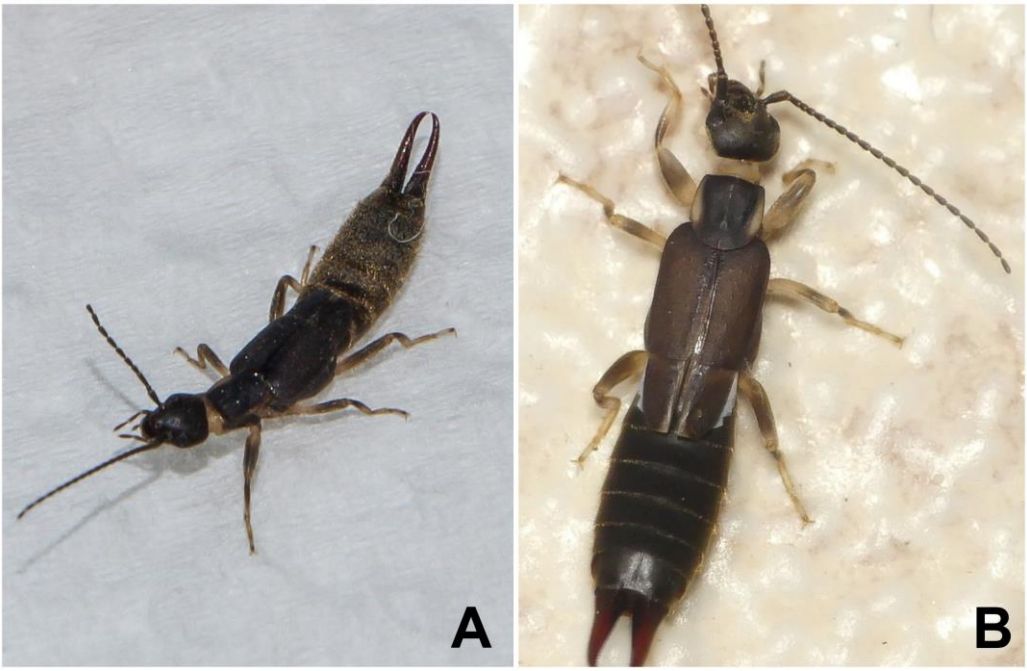

FIG. 2: Adult, female individual of *Nala lividipes* (Dufour, 1820) observed and photographed by Evangelos Koutsoukos on Salamis (A) and Mr. Benoît Segerer on Rhodes island (B).

Results and Discussion

These are the first reported occurrences of the black field earwig in Greece, which comprises the third alien species of the order Dermaptera in the country. Taking into consideration its broad distribution along the Mediterranean basin, its report in Greece comes as no surprise, although, the species is considered rather rare in Europe (Rasplus and Roques 2010). Despite of further inspections on the observation sites as well as the educational material uploaded to Alientoma, no additional material has been recovered. Consequentially, any speculations regarding the presence of established populations in the country seem

to be rather uncertain. However, the long distance between the two observation sites may indicate that the species has long been present in the country, probably remaining unnoticed due to the insufficient study and public interest in Dermaptera on a national level.

A short diagnosis of the species is provided to assist further data collection by citizen-scientists and researchers: Head and thorax dark brown, antennae with >20 segments and wings fully developed. Tegmina and wing scales brown, opaque, rugose; tegmina with a ridge along the costal margin. Abdomen darker, black with sparse pale pubescence. Overall body length with forceps <15 mm (8.5-11 mm) (Fig. 2). Female forceps slender and almost straight; male forceps curved holding small teeth basally and a larger tooth towards their apex (Mifsud and Taglianti 2008; Anlaş and Kočárek 2012).

The black field earwig is a polyphagous insect feeding mostly on decaying organic matter or plant material (i.e. seeds, stems, roots), while it has also been reported as carnivorous (Albouy and Caussanel 1990; Simpson 1993). On one hand, it is often described as a crop pest, affecting beetroot, cotton, maize, sorghum, soybean, sunflower, and winter cereal cultivations, particularly when high population density is reached (Hargreaves 1970; Radford and Allsopp 1987; Simpson 1993). On the other hand, *N. lividipes* has also been utilised in classical biological control programs, preying on crop-damaging pests (i.e. aphids and moths) (Albouy and Caussanel 1990; Binns et al. 2020). For example, in Australia *N. lividipes* is acknowledged as the main predator of *Pieris rapae* (Linnaeus, 1758) (Kapuge et al. 1987), which is a serious, accidentally introduced pest of crucifers (CABI 2021). To our best knowledge, no damages have been reported by the black field earwig in Europe. However, given the socioeconomic effects associated with the species in question, it is important to monitor its distribution and feeding habits in the invaded territories, as well as to assess its diverse effects on agriculture and native fauna.

In conclusion, this article renders *N. lividipes* the third alien earwig reported from Greece, raising the number of its Dermaptera fauna to 19 species. This manuscript is intended to alert the scientific community and the public of the potential threats of a new alien insect in Greece, using citizen science towards the implementation of early warning systems for alien and invasive alien species.

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Πρώτες παρατηρήσεις του Δερμαπτέρου *Nala lividipes* στην Ελλάδα

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ΠΕΡΙΛΗΨΗ

Το κοσμοπολίτικο δερμάπτερο, *Nala lividipes* (Dufour, 1820) (Dermaptera: Labiduridae) παρατηρείται για πρώτη φορά στην Ελλάδα. Το είδος φωτογραφήθηκε από τον πρώτο συγγραφέα το 2016, από το νησί της Σαλαμίνας ακολουθούμενο από μια φωτογραφική παρατήρηση ενός πολίτη-επιστήμονα από τη Ρόδο, το 2021. Συχνές επιθεωρήσεις στον τόπο παρατήρησης και προσπάθειες ευαισθητοποίησης του κοινού, δεν έχουν μέχρι στιγμής παράσχει επιπλέον υλικό. Η ελλιπής μελέτη των δερμάπτερων στην Ελλάδα και η απουσία συστημάτων έγκαιρης προειδοποίησης για τα ξενικά έντομα, πιθανώς να καθυστέρησαν την παρατήρηση του ξενικού αυτού είδους στην χώρα. Παρόλα αυτά, δεδομένης της γεωργικής σημασίας του είδους, δίνεται μια σύντομη περιγραφή του προς υποβοήθηση της περαιτέρω συλλογής δεδομένων αλλά και της παρακολούθησης του. Τέλος, η πιθανή εδραίωση του δερμάπτερου στην Ελλάδα, καθώς και οι επιπτώσεις στην αυτόχθονη χλωρίδα και πανίδα, είναι υπό διερεύνηση.

