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Two new distribution records of carpenter Moth-*Holcocerus gloriosus laudabilis* (Lepidoptera: Cossidae) and Stink Bug (*Bagrada (Nitilia) amoenula*) (Heteroptera: Pentatomidae) in Al Ain, United Arab Emirates

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Abstract

We present here the first distribution records of two insect species for Abu Dhabi, United Arab Emirates (UAE) namely the Carpenter Moth (*Holcocerus gloriosus laudabilis*) and the Stink Bug (*Bagrada (Nitilia) amoenula*). These species were collected in a light trap from two different sites in Al Ain, Ain Al Fayda and a wadi on the western side of Jabal Hafit Mountain in Al Ain during regular seasonal wildlife trapping carried out by the Wildlife Assessment and Monitoring (WAM) invertebrate team of the Environment Agency - Abu Dhabi (EAD). We report a new Stink Bug species from UAE for the first time. The record represents the western limit of the distribution of the species in the Palearctic Region. The determining range expansion of insect species is vital to evaluate their impact on new ecosystems and communities.

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Introduction

The Carpenter Moth (*Holcocerus gloriosus laudabilis*) is a re-find for UAE and a first record for Abu Dhabi Emirate, from a site at Ain Al Fayda in Al Ain. For the sub-species *laudabilis* of *Holcocerus gloriosus*, the UAE and Oman represent the south-western extent of distribution. The only record for the UAE dates back to 1998 (Legrain and Wiltshire, 1998), with sampling areas outside of Abu Dhabi Emirate. The nominotypical subspecies *gloriosus* (Ershov, 1874) occurs in Central Asia (Turkmenistan, Uzbekistan, Kazakhstan, North Afghanistan, North Iran), being replaced further south by spp. *mesopotamicus* Watkins & Buxton (Iraq, South Iran, South Afghanistan) and ssp. *laudabilis* (Jordan, Israel, Egypt (Sinai), Saudi Arabia, Bahrain, Oman and UAE) (Hacker, 2016). This fascinating moth species was collected in a light trap. The moth is approximately 20 mm long with white wings having multiple light brownish spots scattered all over on the forewings. Also a few spots scattered on the apical area. Yakovlev, 2015 gives the variation of the forewing length with 12–20 mm for males and 16–21 mm for females and describes the forewings as white with small brown points at the veins and the hindwings as white. Cossidae moths usually lay large numbers of eggs on trees or shrubs into crevices or under the bark through an extensible ovipositor and the larvae live in the roots, trunks or branches and require from 1 to 4 years to emerge as imago. Wiltshire reported its “Larvae in roots of desert plants” (Hacker, 2016). Adults have been recorded on wing from February to May in Israel (Yakovlev, 2015), which is towards the end of the cold season, just after the months of main precipitation. In UAE, adults have been recorded in the mid of June 2021, whereas all other Cossidae species in UAE are usually on the wing from end of October to beginning of March, peaking in December and January, after the main winter rains. The unusual pattern of heavy rain in Al Ain from mid-April to beginning of June 2021, which might have increased the soil moisture, could have effects on pupal development which could influence the dynamics of the emergence of these moths and populations.

Materials and methods

The samples were collected from a survey site Ain Al Fayda (Fig. 1) in Al Ain and Dam Wadi, Jabal Hafit (Fig. 4) by using the collection method from nocturnal light trapping in different ecosystems. The habitat is characterised by the areas of undulating sandy desert with dunes less than 20 metres in elevation from the local minima, and with significant cover of dwarf shrubs (*i.e.*, woody perennials less than 1 m high, often less than 50 cm). The used lamp is a high-pressure mercury vapour lamp that emits a combination of bluish white light and ultraviolet light. The light was deployed by either suspending it above or placing it in a purpose-built holder on top of a white sheet. Flying insects as well as crawling insects are then attracted to the light and can be hand-collected as they arrive. The specimens were processed and dry pinned as per standard protocol (Gullan and Cranston, 2010). Images of the species studied were generated using 5d Mark III and Canon Macro lens Leica. Voucher specimens are deposited in the reference collections of the Invertebrate Collection of Environment Agency - Abu Dhabi (ICEAD), Abu Dhabi, UAE. Identification of plant species of the collection habitat was done with the help of identification keys in relevant floras (Jongbloed, *et al.*, 2003). Location and distribution map of in UAE is shown in (Fig. 3).



Fig. 1. Survey site Ain Al Fayda, Al Ain

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Fig. 2. Carpenter Moth (*Holcocerus gloriosus laudabilis*) **A.** Adult Female, **B.** Adult Forewings folded.

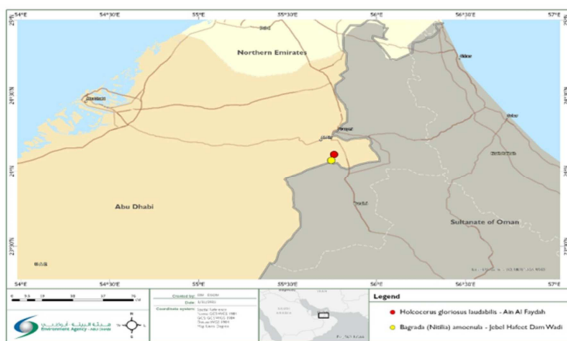


Fig. 3. Location and distribution map of species in UAE. The red circle (●) indicates the new distribution record of the species *Holcocerus gloriosus laudabilis*. The yellow circle (●) indicates the distribution of the species *Bagrada (Nitilia) amoenula* in the UAE.



Fig. 4. Habitat of *Bagrada (Nitilia) amoenula*, in Dam Wadi in Jabal Hafit.

The Stink Bug was caught from the habitat “Mountains rocky terrain and wadis” under the habitat classification code (6000), “Mountain slopes, screes, and associated wadis” fall under (6100) (according to EAD’s habitat map classification) which is characterised by the mountain terrain including

rocky foothills, associated wadis and temporary water courses. Wadis refer to the upper and middle reaches of the wadi system before it merges into the flood plain and open terrain (EAD, 2020).

Results

Carpenter moths (Lepidoptera, Cossidae) are a family of ditrysian lepidopterous insects, numbering 971 described species relating to 151 genera (Nieukerken, et al., 2011). Ten species of 6 genera have so far been reported for the UAE (Hacker, 2016; Yakovlev, 2018). Cossidae are one of the most primitive families of Lepidoptera. Their biology has been studied very little. Data on the trophic relationships of caterpillars are known for 8 % species of fauna in the Old World (Yakovlev, 2011) and (Yakovlev, 2012). Carpenter moths of the genus *Holcocerus* Staudinger, 1884 are palearctic and inhabit the deserts and semi-arid regions from Central Asia to the western Sahara. The species are tropically connected to fruticose and fruticulose plants, the caterpillars boring trunks and roots. The life history of the majority of species of Carpenter moths is unknown.

During a mid of June 2021 fieldtrip, two individuals of these moth species were attracted to the light trap set up in the area and flew from the *Tetraena* sp. Plants, close to light trap sheet spread. Photographs of the moths were taken and the specimens were collected in plastic containers for observation and identification.

Identification of Lepidoptera species was hitherto difficult due to lack of summarizing and well-illustrated literature, instabilities in taxonomy resulting in a number of taxonomic problems including not recognised synonyms etc. Besides, mounted specimen of most Cossidae suffer from fat infiltration, so that the wing pattern becomes non-recognisable over time. The identification of the species was confirmed by Roman Viktorovich Yakovlev, entomologist (South-Siberian Botanical Garden, Altai State Uni., ul. Chkalova 57-81, RU-656049 Barnaul Russia). It is (Lepidoptera: Cossidae) *Holcocerus gloriosus laudabilis* Staudinger, 1899 (Fig. 2 A & B).



Fig. 5. *Bagrada (Nitilia) amoenula*. **A.** Adult, Dorsal View. **B.** Head and Thorax, View.

Bagrada (Nitilia) amoenula (Walker, 1870) (Fig. 5), belonging to Strachiini tribe (Heteroptera: Pentatomidae) were recorded and collected from Ain Al Fayda, during the month of June year 2021. *B. (Nitilia) amoenula* was the first record for the fauna of UAE. They are recorded from desert halophytes such as *Zizyphus* and *Tetraena* sp. Eremian, known from North Africa, Egypt, Saudi Arabia, Israel, Iraq, Yemen, and Sudan.

North Africa, Near East, Iran, Iraq, Arabian Peninsula, Sudan. Distribution in the Palaearctic region: North Africa- Algeria, Egypt, Libya and Morocco; Asia -Iraq, Israel, Saudi Arabia, Turkey, Yemen; Extralimital- Sudan (Rider 2006). *B. amoenula* was cited by Fent *et al.* (2010) for the first time from South-eastern Anatolia Region (Adiyaman, Şanlıurfa) and is recorded for the first time from Eastern Anatolia (present study) showing that the distribution of the species expands to Armenia. From Iran recorded for the first time in duplicate papers by Samin *et al.* (2011) and Sakenin *et al.* (2011) from Kurdistan: Kamyaran; confirmed occurrence in Iran. Also recorded the distribution in Iran. Fars (Linnavuori, 2012), Kordestan (Sakenin *et al.*, 2010; Samin *et al.*, 2011 a), Iran (no locality cited) (Aukema *et al.*, 2013).

Host plants are desert halophytes such as *Zizyphus* sp. (Rhamnaceae) and *Tetraena* sp. (Zygophyllaceae) (Linnavuori 2012), in Moroccan and Sahara Desert collected on *Calotropis* sp. (Asclepiadaceae), and *Pituranthos* sp. (Myrtaceae) (Derjanschi & Péricart 2005).

Recorded on desert halophytes such as *Zizyphus* sp. and *Tetraena* sp. Eremian, known from North Africa, Egypt, Saudi Arabia, Israel, Iraq, Yemen, and Sudan. From Iran recorded for the first time in duplicate papers by Samin *et al.* (2011) and Sakenin *et al.* (2011) from Kurdistan: Kamyaran; confirmed occurrence in Iran. Hosts of *B. (Nitilia) amoenula* sp.), Asclepiadaceae (*Calotropis* sp.), Rhamnaceae (*Zizyphus* sp.) and reports Zygophyllaceae (*Tetraena* sp.) species. Climatic records indicate that rainfall was most abundant in late summer or early winter, from November to March (Sakkir, *et al.* 2015).

The adult looks like a ladybug with wide back stripes diagonally across it. The late instar of the *Bagrada* bug is completely brownish black base and some white and orange stripes. Scutellum light coloured, the base of scutellum finger-shaped two brownish bands and orangish patches. The adult measures 5–7 mm and 3–4 mm wide at its broadest point. Its upper surface has a mixture of black, white and orange markings.

Discussion

Our findings indicate that the number of species from Order Heteroptera known from UAE has increased. The number of Pentatomid stink bugs has increased to 10 species with *Bagrada (Nitilia) amoenula*. The number of Carpenter moth has known from Abu Dhabi has increased to 4 species, previously this moth was collected between the periods of 1988 and 1996 from the Dhaid/Masafi areas in the UAE. The unusual mid-year occurrence of the Carpenter moths may have been triggered by some strong rainfalls between end of April and end of May 2021. Future sampling in the area may prove, that this species has a flying pattern similar to the other Cossidae species in UAE. The knowledge of insect biodiversity of Abu Dhabi is not well known when compared to the faunas of other countries of the Arabian Peninsula. Since the studies and investigations of insect fauna of UAE have been in the developing stage for the past ten years, the probability of finding insect species that are new to science is very high. Probably in the deserts and protected areas, more species of insects are yet to be discovered and identified and have been driven to

extinction without ever being known to science due to continuous habitat loss by development projects. New species records show that Abu Dhabi Emirate has a unique biodiversity of insect fauna. Increase in the number of new records every year shows that much more of the diversity remains, yet to be discovered. In the past years several 'new species' of invertebrates have been identified by the efforts of EAD in collaboration with international experts. The specimens of newly recorded species are currently a part of the Insect Collection of Environment Agency, Abu Dhabi.

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