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Egyptian locust (*Anacridium aegyptium*) (Acrididae: Cyrtacanthacridinae) in the Pannonian part of Croatia

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Abstract

Egyptian locust (*Anacridium aegyptium*) is a large Mediterranean grasshopper species. It was recently found in Zagreb, the capital of Croatia. This record represents the second record of *A. aegyptium* for Pannonian Croatia. The first record is 120 years ago. Since only one individual was found, two hypotheses are proposed: either (i) it was introduced from Mediterranean part of the country, or (ii) it was one of the first individuals of a newly established Pannonian population.

Zusammenfassung

Die Ägyptische Knarrschrecke (*Anacridium aegyptium)* ist eine große mediterrane Heuschreckenart. Ein Exemplar wurde zuletzt in Zagreb, der Hauptstadt Kroatiens, gefunden. Es ist das zweite Mal in der Geschichte, dass *A. aegyptium* im pannonischen Teil Kroatiens nachgewiesen wurde. Das erste Mal war vor 120 Jahren. Weil nur ein Tier gefunden wurde, werden zwei Hypothesen vorgeschlagen: (i) das Tier wurde aus dem mediterranen Teil des Landes eingeschleppt oder (ii) es ist eines der ersten Individuen einer neu gegründeten pannonischen Population.

Introduction

Egyptian locust (*Anacridium aegyptium* (Linnaeus, 1764)) (Orthoptera: Caelifera) is one of the largest grasshopper species (male 3.50 cm long, female up to 6.50 cm) in Europe. The species inhabits Mediterranean Europe and North Africa. In Europe it is common in Iberian and Apennine peninsulas, Mediterranean part of the Balkans, as well as Mediterranean islands and Crimea (HOCHKIRCH et al. 2016a, CHINERY 2007). Together with the occasionally recorded species *Schistocerca gregaria*, *A. aegyptium* constitute Croatian members of the subfamily Cyrtacanthacridiae (SKEJO et al. 2018), a subfamily whose members cause well known swarm even mentioned in the Bible. The distribution of the species is well known along the Adriatic coast, as they damage agricultural crops (SKEJO et al. 2018). The Egyptian locust (Croatian *egipatski skakavac*) is widespread in the Mediterranean part of Croatia (SKEJO et al. 2018), as well as in the Dinaric Alps (e.g. REBRINA et al. 2015). So far there are no confirmed findings of *A. aegyptium* in Pannonian region of Croatia that are of recent date. There is only a doubtful record from Srijem (Szerém) by PUNGUR (1899). In the end of April, in Zagreb, the capital of Croatia, situated in the Pannonian region, an adult female of *A. aegyptium* was found. This article aims to present and discuss new record of the Egyptian locust in Pannonian part of the country.

Material and methods

Collection and identification

The individual found in Zagreb was caught and dry-preserved in author's private entomological collection. The genus *Anacridium* include 13 species and two additional subspecies (CIGLIANO et al. 2019). Adult individuals are brown-gray, while nymphs are green, yellowish or brown. The species can be identified by characteristic stripe eyes with vertical black and white stripes. The tibiae are greyish and the underside of the hind femora is reddish (IVKOVIĆ et al. 2016, CHINERY 2007). With the exception of *Schistocerca gregaria*, the species cannot be confused with any other species of the Croatian fauna (SKEJO et al. 2018). Adults of the Desert Locust, *S. gregaria*, unlike *A. aegyptium*, usually exhibit bright yellow (males) or dull yellow (females) coloration with the green-yellow translucent forewings having many brown spots. Size of *S. gregaria* males are up to 5.0 cm, females up are to 6.0 cm. *S. gregaria* is common in Africa and Middle East, while in Europe it is considered as vagrant species (HOCHKIRCH et al. 2016b, CIGLIANO et al. 2019). Furthermore, mid keel is elevated in *A. aegyptium* in whole pronotum, while visible only in the metazona in *S. gregaria* (SIEDLE et al. 2016).

Distribution and habitat

A. aegyptium is Mediterranean species inhabiting North Africa, the Mediterranean parts of Europe and neighbouring Asia. The species prefers warm and dry habitats and can usually be found near Mediterranean macchia and vineyards (IVKOVIĆ et al. 2016, HOCHKIRCH et al. 2016a, SKEJO et al. 2018).

iNaturalist browsing

In order to check if there are other recent findings of *A. aegyptium* in Pannonian Croatia, or close to Zagreb, or anywhere from which the individual could come to Zagreb, online website for naturalists' records – iNaturalist – was consulted. Altogether 44 observations of *A. aegyptium* exist from Croatia (Fig. 2) and their distribution corresponds to published distribution of the species in Croatia (SKEJO et al. 2018).

Results and discussion

On April 24, 2019, at midday along the road Slavonska avenija in medium tall grass in Zagreb (suburb Savica) (45°47'41.6"N 16°01'54.7"E) an adult female of *A. aegyptium* was found (Fig. 1). This year (2019) the end of April in Zagreb was dry and warm, just perfect for *A. aegyptium*. There are altogether 44 records of the species in iNaturalist (Fig. 2), of which 30 from 2018 and 2019 (Table 1). So far, no records were known near Zagreb. It is not uncommon for *A. aegyptium* to be taken north CHINERY (2007). So, the first hypothesis is that the recorded female came by transport to Zagreb. This hypothesis likely explains this finding, as there are not nearby populations from which *A. aegyptium* could occupy Zagreb (Fig. 2).

In recent years we are witnesses of upcoming climate change. Global warming affects all inhabitants on Earth, and especially the smallest. Increasing temperature is favoured by species usually residing in warm areas. There are a few cases of the Orthoptera spread to the north, in the places that were not inhabited by them

before. Examples are the Southern Oak-Bush-cricket (*Meconema meridionale*) and European Tree-cricket (*Oecanthus pellucens*), species which currently rapidly expand their range across Europe (VLK et al. 2012, SUTTON et al. 2017, PONIATOWSKI et al. 2018). Maybe *A. aegyptium* was also able to expand its range in the course of climate change.

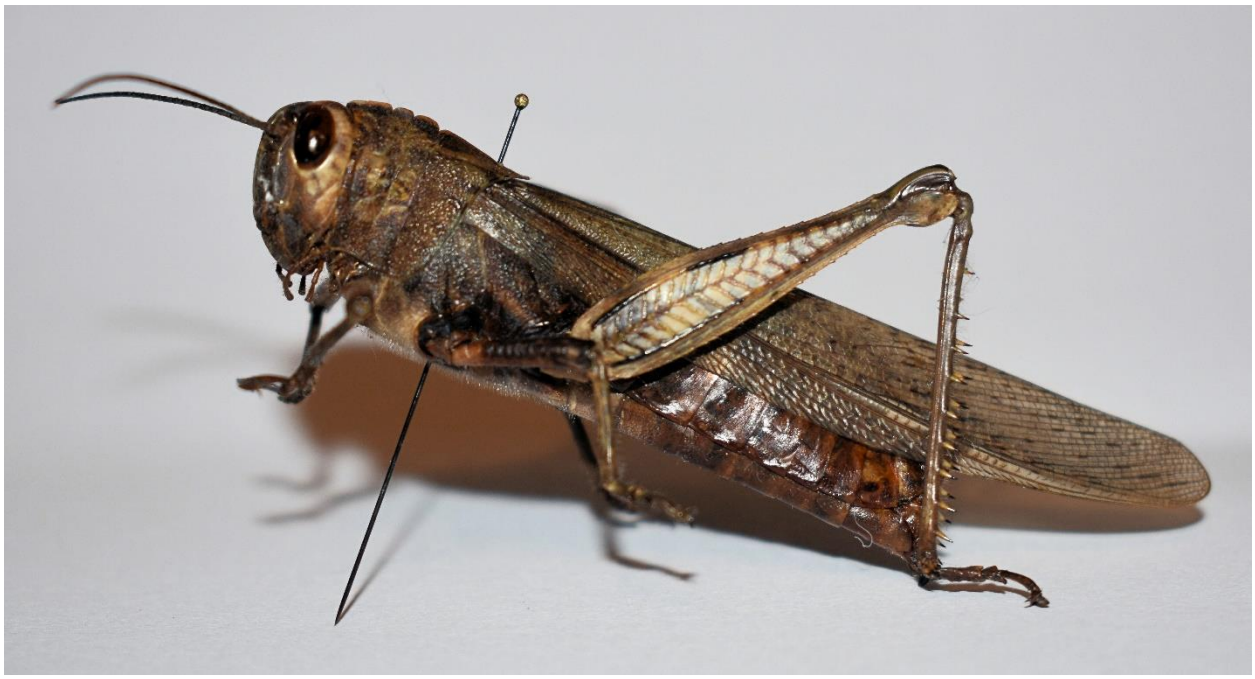

Figure 1: Female of *Anacridium aegyptium* recorded in Zagreb in 2019 - dry preserved. Photo Marko Pavlović.

Figure 2:
Approximate distribution map of Egyptian locust in Croatia based on data from iNaturalist. The map corresponds to distribution presented in SKEJO et al. (2018). As time pass, whole Mediterranean region will be covered by dots. Zagreb record is isolated from others.

Table 1: List of all the records of *A. aegyptium* from iNaturalist for Croatia, from 2018 and 2019. Record presented in this study is bolded. Records are sorted chronologically, from oldest to newest. No records close to Zagreb are known. The table presents life stage for each record, locality where the species was observed, date, photographer, and iNumber (each observation can be checked with link www.inaturalist.org/observations/(*here copy iNumber***)**/.

Life Stage	Locality	Date	Photographer	iNumber of observation
adult	Murter	30.VI.2018.	apeterlongo	19497509
adult	Jurandvor, Krk	06.VII.2018.	mnauky	24668971
adult	Split	11.VII.2018.	antonjo	14257931
adult	Zaton	12.VII.2018.	karl_johnsson	13360923
nymph	Babin Kuk, Dubrovnik	13.VII.2019.	siobhan9	28720168
nymph	Punat, Krk	14.VII.2018.	marttoms	24008916
nymph	Pučišća, Brač	17.VII.2018.	bucuk	17797152
nymph	Split	17.VII.2018.	antonjo	14439544
adult	Karlobag	06.VIII.2018.	alex_slovakia	15284206
nymph	Splitsko-Dalmatinska	15.VIII.2018.	albertcardona	15443679
adult	Lopar	16.VIII.2018.	ciabri	15490729
adult	Jelsa, Hvar	20.VIII.2018.	albertcardona	15730313
nymph	Splitsko-Dalmatinska	22.VIII.2018.	albertcardona	15916546
nymph	Pučišća, Brač	26.VII.2018.	bucuk	17797121
adult	Zadar	29.VII.2018.	milaphe	14940291
nymph	Zadar	29.VII.2018.	milaphe	14940170
nymph	Tisno	29.VII.2018.	milaphe	14940100
adult	Split	30.VIII.2018.	antonjo	16023811
nymph	Soline, Sali	04.IX.2018.	locke92	16201466
adult	Sv.Grgur, Lopar	19.IX.2018.	juke-saps	25102006
adult	Orlec	19.IV.2019.	jakob	22778607
adult	Cres, Cres	21.IV.2019.	jakob	22962203
adult	Osor	24.IV.2019	jakob	23376035
adult	Zagreb	26.IV.2019.	marko_pavlovic	26316845
adult	Veli Lošinj, Lošinj	27.IV.2019.	botanico	23456762
adult	Podgora	09.VI.2019.	simontonge	28859250
nymph	Mala Banda, Povlja	09.VI.2019.	vladimirstarostenkov	28487657
adult	Konjevrate	28.VI.2019.	jepbird	29169753
adult	Skradin	29.VI.2019.	juhatuomola	27884111
adult	Hvar, Hvar	21.VII.2019.	ji27	29222299

However, how *A*. *aegyptium* come to Zagreb remains open. According to the literature and iNaturalis, it is likely that colonisation of Pannonia is not (yet) in progress, as we were not been able to observe any new populations in the inland - i.e. outside the Mediterranean part of the country. Thus, the most likely explanation is the introduction of the individual by freight traffic as has been described by FISCHER et al. (2016). There are examples of exotic species coming with various goods to Europe, and a good one is record of *Acanthacris ruficornis* (Fabricius, 1787) in flower shop in Germany a few years ago (REINHARDT & KÖHLER 2014).

A record of *A. aegyptium* from Zagreb is not unique case in SE Europe. Namely, GOJZNIKAR et al. (2018) reported *A. aegyptium* from Ljubljana, the capital of Slovenia. This was the first confirmed record for the Slovenian inland in more than 50 years (GOJZNIKAR et al. 2018). The authors speculated that this is also likely not a case of recent natural colonisation, but of accidental transport of the species. GOJZNIKAR et al. (2018) pointed out that cold winters in Slovenia probably sweep away populations that try to establish. But how long? In the course of global warming, winters getting warmer, which likely increases the reproductive success of the species within the Pannonian part of the country.

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