



AMELES DECOLOR (CHARPENTIER, 1825) (DICTYOPTERA: MANTIDAE), THIRD SPECIES OF THE SLOVENIAN MANTID FAUNA

Stanislav GOMBOC

Šiškovno naselje 19, 4000 Kranj, Slovenija, stanislav.gomboc@siol.net

Abstract - *Ameles decolor* (Charpentier, 1825), new to Slovenian fauna, was found in the coastal area of Slovenia, on Brič near Dragonja river, close to Croatian border in Istria. In Croatian coastal region, this species is usually common late in the season. 3 specimens, 2 males and one nymph, were observed coming to the UV light trap for Lepidoptera observation in the evening of August 14th 2017 and 9 adults were observed on August 18th 2018 on the same locality. As immature and mature specimens were found on more spots in the locality, we assume that a small population already thrives there, as females and nymphs are brachypterous. In 2017 specimens were observed on two light traps located in a small patch of a dry south-oriented meadow, surrounded with sub-Mediterranean forest. In 2018 more specimens were observed on the remaining grassland patches in succession across the locality. Although we were looking for this species intensively since many years, this is the first confirmed report of the species in Slovenia. Other two mantid species occurring in Slovenia are *Mantis religiosa* (Linnaeus, 1758), which is common and is extending its territory due to the influence of global climate change and raising temperatures and *Empusa fasciata* Brullé, 1839, which is declining due to abandonment and urbanisation of meadows in the seaside areas. The last one is present mainly in the warmer coastal part of the country.

KEY WORDS: mantids, Mantodea, Mantidae, Slovenia, fauna, new records

Izvešček - *AMELES DECOLOR* (CHARPENTIER, 1825) (DICTYOPTERA: MANTIDAE), TRETJA VRSTA BOGOMOLKE V SLOVENSKE FAVNI

Na Briču ob Dragonji na Primorskem smo našli bogomolke vrste *Ameles decolor* (Charpentier, 1825), ki je nova vrsta za favno Slovenije. Lokacija je tik ob hrvaški meji, kjer je vrsta razširjena v večjem delu Istre. V priobalnem pasu Hrvaške je vrsta navadno pogosta, pojavlja pa se kasneje v sezoni, navadno od julija naprej. 3 osebk, 2 samci in ena nimfa, so opazovane pri UV svetlobni pastki za Lepidoptera opazovanje zvečer 14. avgusta 2017 in 9 odraslih na 18. avgusta 2018 na isti lokaciji. Ker so nezrele in zrele osebe najdene na več mestih v lokalnosti, predpostavljamo, da tam že obstaja majhna populacija, saj so samice in nimfe brachypterous. Leta 2017 so osebe opazovane na dveh svetlobnih pastkah, ki sta v majhnem delu suhega južnega meana, obkroženega s submediteransko goščavo. Leta 2018 so opazovane na preostalih travnatih delcih v sukcesiji po lokalnosti. Čeprav smo iskali to vrsto intenzivno že več let, je to prvi potrjen poročilni zapis vrste v Sloveniji. Druge dve vrsti mantid, ki sta prisotni v Sloveniji, sta *Mantis religiosa* (Linnaeus, 1758), ki je pogosta in se razširja zaradi vpliva globalne klimatske spremembe in povišanih temperatur, in *Empusa fasciata* Brullé, 1839, ki se upada zaradi opuščanja in urbanizacije meana v obalnih predelih. Poslednja je prisotna predvsem v toplejši obalni deli države.

2 samčka in eno ličinko smo opazovali zvečer, 14. avgusta 2017, na UV svetlobnih šotorih za opazovanje močnih metuljev, 9 osebkov pa nam je uspelo najti 18. avgusta 2018 na več mestih iste lokacije podnevi. Zaradi najdb ličinke in brezkrilih samic na več mestih iste lokacije predvidevamo, da se vrsta na lokaciji razmnožuje, saj brezkrila samica in ličinka ne moreta leteti. Leta 2017 smo prve primerke opazovali na dveh od 11 svetlobnih šotorov, naslednje leto pa na več mestih preostanka zaplat travišč v sukcesiji. Traviščna vegetacija kot tudi submediteranski prisojni gozd ležita na južnem prisojnem pobočju, 200 m nad dolino Dragonje in sta toplejša od preostalega dela območja. Čeprav smo vrsto iskali že vrsto let, je to prva potrjena najdba za Slovenijo. Drugi dve vrsti bogomolk v Sloveniji sta navadna bogomolka - *Mantis religiosa* (Linnaeus, 1758), ki je pogosta in širi areal zaradi vpliva klimatskih sprememb z globalnim segrevanjem in krpasta grabežljivka - *Empusa fasciata* Brullé, 1839, ki je ogrožena vrsta in izginja zaradi opuščanja in zaraščanja travnatih površin ob morju in zaradi pozidave turistično zanimivega območja ob obali. Krpasta grabežljivka je prisotna le na najbolj termofilnih legah Primorja, en podatek pa je potrjen tudi z Goriškega krasa.

KLJUČNE BESEDE: bogomolke, Mantodea, Mantidae, Slovenija, favna, nove najdbe

Introduction

So far, only two mantid species were known in the Slovenian fauna (Us, 1967, 1992; Gomboc, 2000). *Mantis religiosa* (Linnaeus, 1758), which is widely distributed and is spreading its territory in the last 20 years due to the influence of climate change with warmer temperatures (personal observation in Gorenjska and Štajerska region) and *Empusa fasciata* Brullé, 1839, which is a rare and cryptic species. The territory of *E. fasciata* is declining as many meadows in the coastal region were abandoned and overgrown with shrubs and forest in recent 20 years (personal observations). The urbanisation of the seaside area interesting for tourist accommodations is the second main reason for declining of *E. fasciata*. This species is present at the coast (Gomboc, 2000) with one find in Goriški kras in recent years. Climate change with unstable winters and late spring storms with snow at the end of April in 2016 and 2017 at the coast are also affecting the abundance of *E. fasciata* in recent years. Since several years, we have been observing this phenomenon in Sečovelje Salina Nature Park and on the south slopes of Osp climbing areas, where *E. fasciata* was formerly common. After 2013, when we found many nymphs in the Sečovelje Salina Nature Park, species abundance declined due to cold winter storms. We found one larva here in 2018.

In the past years we were looking intensively for another species, *Ameles decolor* (Charpentier, 1825) in Slovenia, which is common in the Croatian part of Istria, but without any success, although we spent more than 200 field days in the Slovenian part of Istria. There was, however, a posted photo of *A. decolor* on the web page BioLib.cz by Blaž Šegula from Hrastovlje (Šegula, 2005), but without any collected material on which we could confirm presence of the species as *A. decolor* or *A. hel-*

Fig. 1: Male of *Ameles decolor* on light trap, Slovenia, Istria, Dragonja, Brič, August 14th, 2017. Foto: S. Gomboc.



dreichi Brunner von Wattenwyl, 1882, which are closely related. As climate changes are promoting the spread of some Mediterranean Orthoptera species (*Aiolopus thalassinus* (Fabricius, 1781), *Aiolopus strepens* (Latreille, 1804), *Anacridium aegyptium* (Linnaeus, 1764) (personal observations, Stani, 2016, Zuna-Kratky *et al.*, 2017), we were looking also for presence of *A. decolor* in the region. The search was finally successful in 2017 and in 2018 we found additional specimens on Brič hill above the Dragonja river, close to the Croatian border.

In Europe 8 *Ameles* species are present, mainly in the Mediterranean area (Agabiti *et al.* 2010, Battiston *et al.*, 2000; Battiston & Fontana, 2005, Harz & Kaltenbach, 1976). This number remains the same also after the revision of some species of *Ameles* (Battiston *et al.*, 2018), where one species was synonymised and one relocated to the genus *Ameles*. Battiston *et al.* (2018) also discussed status of some species and difficult separation characters inside the genus also in cases of brachypterous males, which makes identification even more difficult. In Italy 5 *Ameles* species are known (Battiston *et al.*, 2000; Battiston & Fontana, 2005, Stoch, 2003), in Croatia only 3 (Kranjčev, 2013; Rebrina *et al.*, 2014). In the nearest part of Croatia in Istria all 3 species, *A. decolor*, *A. heldreichi* and *A. spallanzania* (Rossi, 1792; Rebrina *et al.*, 2014) are occurring. The closely related *A. heldreichi* and *A. decolor* can be reliably separated on a few morphological characters, like the eye shape in male, pronotum index ratio and the examination of male genitalia (Agabiti *et al.* 2010, Battiston *et al.*, 2000; Battiston & Fontana, 2005). Just external morphological characters are not always sufficient for reliable identification, so we also dissected collected male specimens.



Fig. 2: Female of *A. decolor* on Brič, August 18th, 2018. Foto: S. Gomboc

Material and methods

In 2017 specimens of *A. decolor* were observed at UV light traps, used for observing night active moths. These were pyramid-like tents with UV Philips LD/05

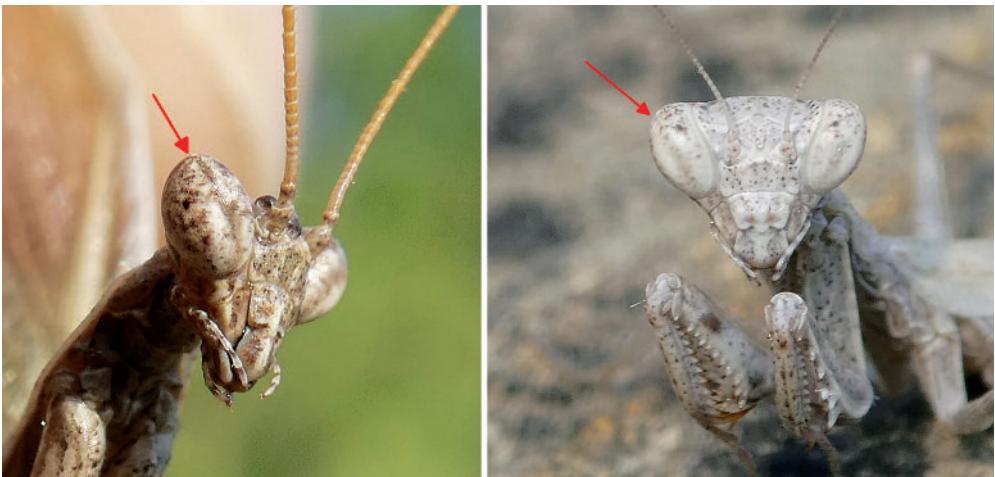


Fig. 3: Eye shapes of *A. decolor* male (left) and female (right), Brič, August 18th, 2018. A rounded shape of composite eyes supports the species identification as *A. decolor*. Foto: S. Gomboc

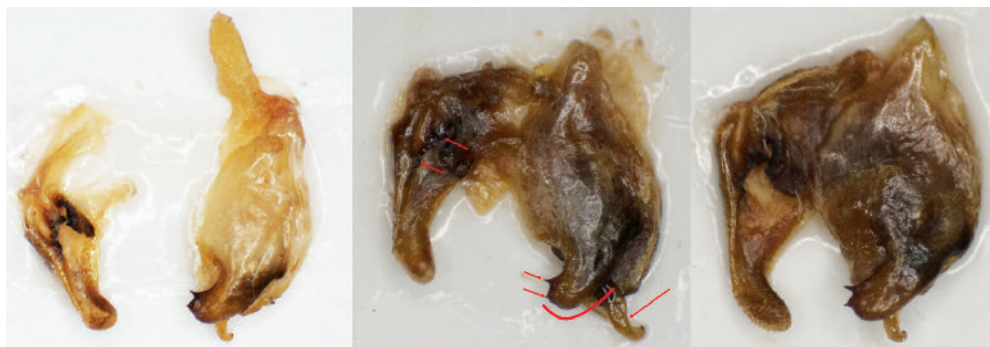


Fig. 4: Male genitalia of collected specimens: left – male from Brič, August 14th, 2017, middle – male nr. 2 from Brič, August 18th, 2018 (red line and arrows indicate the identification characteristics described in results), right - male nr. 3 from Brič, August 18th. Foto: S. Gomboc

light tubes. Three specimens were observed on only two of 11 light traps arranged in a length of 600 m, following macadam forest road.

To confirm identification and presence of species in Slovenia further specimens we searched for on the same locality in August 2018 during the daytime. All remaining grassland patches in succession on the locality were surveyed and few specimens could be confirmed on a few spots on the locality. Butterfly net was used to catch specimens, especially flying males, which could fly for shorter distances and were difficult to catch. 3 additional male specimens were collected to prove species identification. Photos of habitat and specimens were taken using Lumix DMC TZ80 and Sony a55 cameras.

Coordinates of all specimens were collected and detailed distribution maps are created in ARC GIS PRO (fig. 5 and 6). As basemap layers for distribution maps Digital Orto photo of Slovenia from 2016 and Digital Terrain Model was used and slightly modified (map source: The Surveying and Mapping Authority of the Republic of Slovenia 2018: <http://egp.gu.gov.si/egp/>).

Specimens were identified based on detailed photos of morphological characters and collected specimens, which were used for dissection and preparation of genitalia. Olympus stereomicroscope SZ60 was used for specimens identification and for photography of dissected male genitalia in combination with Sony a7 digital camera. Dry specimens are stored in the authors private collection. For identification, keys of Battiston *et al.* (2000), Battiston & Fontana (2005) and Agabiti *et. al* (2010) were used, as well as specimens in the authors' comparative collection.

Results

On August 14th 2017 three specimens of *A. decolor*, 2 males and 1 nymph were observed during the night observation of Lepidoptera on the south slope of the Brič hill above the Dragonja river, next to the Croatian border in Istria (WGS84: 1 male –

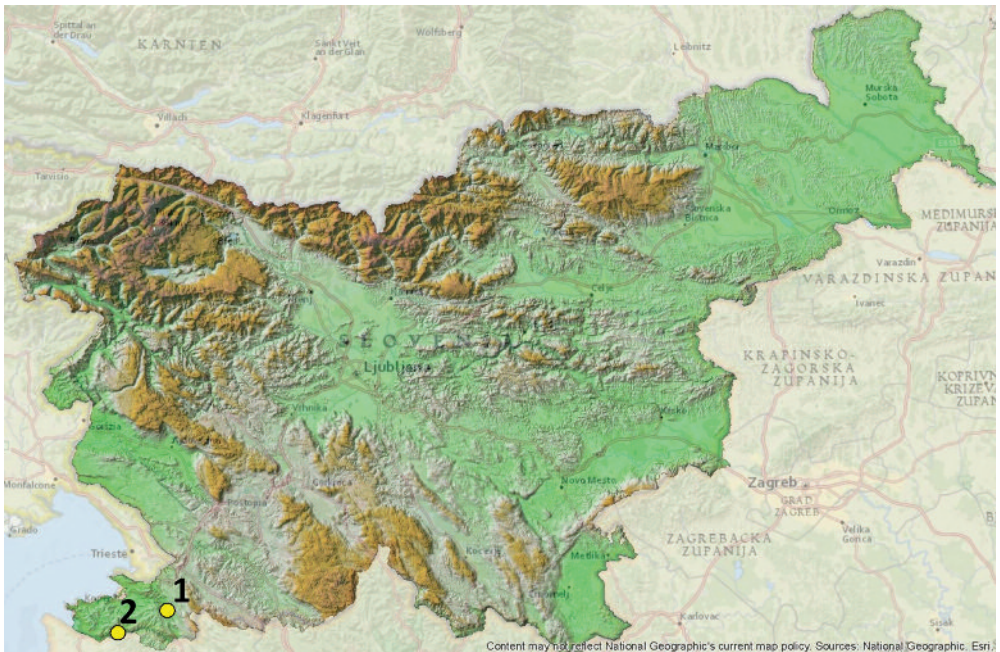


Fig. 5: Map of Slovenia with the records of *A. decolor*: 1 – Hrastovlje 2005, 2 – Brič 2017 and 2018.

45.46269854 N, 13.73388311 E, 208 m; 1 male and 1 nymph – 45.46279516 N, 13.73448195 E, 220 m). This is the first confirmed record of *A. decolor* in Slovenia. The locality is not far from the coast of the Adriatic Sea in the Mediterranean part of Slovenia. All specimens were attracted to UV lights, which were placed on the south slope of the hill, in a submediterranean dry patch of grassland in succession, surrounded with the south oriented sub-Mediterranean shrubs and oak forest. A small stripe of grassland is situated next to the macadam road leading to Brič estate with vineyards and olive groves on the top of the hill.

Specimens of *A. decolor* were observed on the UV light traps shortly after dusk, from 20.20 to 21.00 hour. This was a warm night with many observed insects.

On August 18th 2018 additional 9 adult specimens of *A. decolor* were confirmed on the same locality, 5 males and 4 females. They were difficult to find in dry remaining grassland patches next to the macadam forest road and on the steep slope of the south exposed hillside. Specimens were found on the lower herb and grass vegetation, surrounded by shrubs and young trees like *Cotinus coggygria*, *Spartium junceum*, *Pinus nigra*, *Quercus cerris*, *Quercus petraea*, *Quercus pubescens*, *Ostrya carpinifolia*, *Cornus sanguinea*, *Ligustrum vulgare* and others. During the longer heat period in August, the remaining grassland vegetation was almost dry. The specimens were found only based on movements in vegetation, as they were similar colours as dried meadow plants. Finding of specimens at multiple sites (fig. 6) on the

same locality supports the presumption that the species is already established on the site.

Investigation of collected specimens and photos showed that they all have rounded compound eye shape, which is typical for *A. decolor*, without the distinct ocular spine like in *A. heldreichii*. The male genitalia of all 4 male specimens also confirmed typical form for *A. decolor* (fig. 4). The apex of hypophallus is rounded on outside margin with two smaller inner tooth in the inner margin. Ventral left phallomers are long, with long elongated phalloid apophysis (character description according to Battiston & Fontana, 2005 and Agabiti *et. al.*, 2010).

Table 1: Exact decimal coordinates of *A. decolor* specimens found on Brič, August 18th, 2018.

WGS84 N	WGS84 E	Altitude m (a.s.l.)	Comment
45.46295484	13.73860685	208	1 male
45.46296398	13.73861943	208	1 female
45.46312537	13.73856468	219	1 male
45.46322533	13.73865197	219	1 female, 1 male
45.46322872	13.73895884	221	1 female, 1 male
45.46338365	13.73913443	227	1 female
45.46356089	13.74296724	256	1 male

Discussion

With *A. decolor* 3 mantid species are now confirmed for Slovenia. In the neighbouring Mediterranean Croatia 7 mantid species are present (Rebrina *et al.*, 2014), in Italy 12 (Battiston *et al.*, 2010; Stoch, 2003; Wikipedia, 2017), in Austria only *M. religiosa* (orthoptera.at, 2017). All together 30 mantid species are present in Europe (Battiston *et al.*, 2010; Wikipedia, 2017).

As males, females and a nymph of *A. decolor* were found on the locality and the females are brachypterous, the population should exist here for some time. This is also proved by the find of additional specimens in 2018. The location is isolated from the nearby meadows, which are not close to the forest road itself. This additionally speaks in favour of the longer existence of the species at the locality, which was not visited by us before 2017. This also shows that species can be present at other thermophile sites next to the Croatian border in Istria. In addition, the specimen on the photo by Blaž Šegula (Šegula, 2005) from Hrastovlje could be *A. decolor*, but just the photo itself is not enough for species confirmation as it is closely related to *A. heldreichii*. Anyhow, we have used this data in the distribution map in the paper (fig. 5). As adults appear relatively late in the season, from July onwards, search for additional specimens in the region should focus on the period from July to September. In September and October 2017, we performed additional night observations with light



Fig. 6: Detailed map of *A. decolor* specimens distribution on Brič: green dots - August 14th, 2017; red circles - August 18th, 2018.

traps on the same locality, but no additional specimens of *A. decolor* were found, probably because of a small suitable habitat on the locality and a small number of present specimens.

In July and August 2018 we have searched in some similar habitats for presence of *A. decolor* in the Koper surroundings, Sečovlje Salina Nature Park, slopes on Sv. Peter near Dragonja and also the Dragonja valley but without confirming the presence of species on that localities. As specimens are cryptic and similar to the colour of dry plants, they are difficult to spot in the vegetation. On Brič we saw that they prefer dry and sunny places. Even here, they were very local and difficult to find. Because the localities in Slovenia are at the very edge of the species distribution, *A. decolor* will not be common and easy to find. It can also be present on already visited localities, which look similar to that on Brič, but we could not confirm this during our survey. In addition, *A. heldreichii* could also be expected in Slovenia, as it is present in Croatian Istria (Rebrina et al., 2014). This closely related species is not easy to separate from *A. decolor*. At least one male specimen per location should be collected to confirm species identification. Both species can even hybridise, which makes identification even more difficult.

The population of *A. decolor* on Brič is already endangered as the remaining meadow, where specimens were found, is already abandoned and in succession, to be overgrown with shrubs and forest. The locality was more open with larger meadow



Fig. 7: Habitat of *A. decolor* on Brič, August 18th, 2018. The orange arrows indicate the exact location of 3 observed specimens. Foto: S. Gomboc

on the same slope in 1994 (Digital Orto photo from 1994, The Surveying and Mapping Authority of the Republic of Slovenia). Other meadows in the Dragonja valley, where species could occur, are in a similar state as many farmers are not keeping animals on the farms or they are turned into the fields or olive plantations, which bring more income.

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