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Article

DISTRIBUTION OF *EMPUSA FASCIATA* BRULLÉ, 1832 (MANTODEA: EMPUSIDAE) IN SERBIA

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Abstract

This study presents the distribution of the conehead mantis, *Empusa fasciata*, in Serbia based on the authors' original field records collected during the period 2006-2026. To provide a more comprehensive overview of its occurrence and distribution, these data were supplemented with citizen science database records. Within the compiled dataset, the northernmost record is from Bovan (Bovansko Lake), the easternmost from Božurato near Pirot, the westernmost from Blace, and the southernmost from Čukarka near Preševo. In the context of the species' European distribution, the Serbian localities lie within the northern portion of its documented range in the central Balkans.

KEYWORDS: conehead mantids, range, Mediterranean, color variation, nymphs

Introduction

The genus *Empusa* Illiger, 1798 (Mantodea: Empusidae) comprises a distinctive group of praying mantids characterized by their elongated, highly cryptic morphology and specialized predatory behavior. Species of this genus are distributed across Africa, mainland Europe, the Middle East, and western to central Asia, extending as far as the Indian subcontinent (Svenson & Whiting, 2004; Battiston *et al*., 2010). The name *Empusa* is derived from Greek mythology, where it signifies one of the monsters of Hades (Liddell & Scott, 1900). Roy (2004) listed 12 species of *Empusa*; however, the number of recognized species depends on the taxonomic treatment adopted (Otte *et al*., 2026). Within Europe, the family Empusidae (conehead mantids) is represented not only by the genus *Empusa* but also by the widespread North African and Middle Eastern species, the Egyptian flower mantis, *Blepharopsis mendica* (Fabricius, 1775), which reaches the southeastern margins of the continent (Battiston *et al*., 2010). Their distinctive morphology and distribution make *Empusa* species relevant to studies of mantid diversity, taxonomy, and biogeography (Roy, 2004; Battiston *et al*., 2010).
Among the three *Empusa* species reported from Europe, *E. fasciata* Brullé, 1832 is the only species currently documented from Serbia (Ehrmann, 2002; Battiston *et al*., 2010). Like the other two species, *E. pennata*

(Thunberg, 1815) and *E. pennicornis* (Pallas, 1773)*, E. fasciata* is easily recognizable by its miter-like helmet on the head. The species is also known as the crowned praying mantis. Its cryptic coloration typically includes green, yellowish, and grayish patterns that facilitate concealment among surrounding vegetation. Some specimens have violet patterns on their head, legs and the ventral side of the abdomen. This kind of coloration allows them to blend in with the violet-colored flowers of plants. Both sexes and nymphs can be colored this way. Males are easily recognizable from females by their long, feathered antennae.

Empusa fasciata is a thermophilous mantid associated with warm, dry, sun-exposed habitats, including xeric grasslands, rocky slopes, and open shrubland (Battiston *et al*., 2010). Unlike *Mantis religiosa* Linnaeus, 1758, which overwinters in the egg stage, *E. fasciata* overwinters as a nymph (Gomboc, 2000; Abu-Dannoun & Katbeh-Bader, 2007). Adults are generally observed during spring and early summer, although their appearance varies with local climatic conditions (Abu-Dannoun & Katbeh-Bader, 2007). The cryptic coloration of both adults and nymphs may facilitate concealment among surrounding vegetation, including flowering plants (Abu-Dannoun & Katbeh-Bader, 2007).

The aim of this study is to provide an updated overview of the occurrence and distribution of *Empusa fasciata* in Serbia, identify the geographical limits documented by the compiled records, and discuss climate warming as a possible factor influencing its distribution.

Materials and Methods

Distribution data are based on the authors' unpublished field records from between 2006 and 2026 (marked with an asterisk) and supplemented with records from citizen science databases iNaturalist and Insekti Srbije (Insects of Serbia). Records of *Empusa fasciata* were made primarily through *in situ* photography by the observers named in the occurrence list below. Available information included the observation date, locality, geographical coordinates, developmental stage or sex, and coloration.

Results and Discussion

The compiled dataset comprises 58 occurrence records from 2006 to 2026, representing 87 observed individuals and one ootheca. The records indicate that *Empusa fasciata* is associated mainly with xerothermic, sun-exposed habitats in southern and southeastern Serbia. A representative habitat near Niš is illustrated in Fig. 1. Observations are particularly concentrated in the Nišava River basin, whereas the northernmost record in our dataset is from the vicinity of Bovansko Lake near Bovan, north of Niš (Fig. 2). Regional studies document Mediterranean climatic influences over parts of the Balkan Peninsula, although the local climatic conditions at individual Serbian sites have not been tested here (Peneva *et al*., 2023).

Like other *Empusa* species, *E. fasciata* exhibits variation in body coloration (Battiston *et al*., 2010), including green, brown, pink, and violet forms. Such coloration may provide camouflage against vegetation and flowers (Abu-Dannoun & Katbeh-Bader, 2007). Of the 24 violet-colored individuals recorded in the occurrence list below, 17 were nymphs. Because the records were not obtained through standardized sampling, these observations should not be interpreted as estimates of the relative frequency of color forms in natural populations.



Figure 1. An example of a habitat of *E. fasciata* near the city of Niš: Lalinačka Slatina, an area with saline mineral springs. Photo: S. Stanković.

The complete list of occurrence records, including the number of individuals, sex, locality, date, observer abbreviation and specimen coloration is given below. Unpublished data are marked with an asterisk (*). N – nymph, O – ootheca, U – sex undetermined. Abbreviations of observers' names: AM = Aleksandra Mitrović, AP = Aleksandra Petrović, AS = Ana Samardžić, ALS = Aleksandra Stevčić, BM = Bogoljub Milošević, BO = Boris Okanović, BT = Bojana Trajković, GG = Goran Gejo, GM = Goran Milosavljević, IM = Ivan Medenica, IT = Ivan Tot, KM = Katarina Miljaković, LR = Ljubiša Rančić, NN = Observer not known, NV = Nenad Veljković, MG = Miloš Gajić, MGR = Miloš Grozdanović, MM = Milena Milošević, MP = Marija Petrović, MS = Milica Stamenković, MSc = Martin Schmid, MV = Mihailo Vujić, SG = Stevan Golubović, SM = Sava Mihajlović, SS = Slobodan Stevčić, SSS = Saša S. Stanković, SA = Sreten Anđelković, TG = Tomasz Grzegorczyk, VB = Veljko Blagojević, VŽ = Vladimir Žikić, ŽL = Željko Ljubov.

* 1 U, Niš, Popovac, 43°19'55.75" N 21°49'56.82" E, 20.04.2006, VŽ (common);
* 1 ♀, Sićevačka Klisura, Ostrovica, 43°18'51.10" N 22°7'42.38" E, 22.06.2011, VŽ (common);
1 ♀, Niš, Trnava, 43°25'34.2" N 21°47'26.9" E, 22.10.2013, MP (common);
*1 ♀, Prohor Pčinjski, 42°20'1.09" N 21°53'55.83" E, 10.06.2014, VŽ (violet);
* 7 ♂♂, Niš, Niška Banja, 43°17'47.09" N 22°0'33.39" E, 29.05.2015, VŽ (common);
1 U, Niš, 43°20'9.10" N 21°53'58.46" E, 28.09.2016, VB (common);
1 U, Kosovska Kamenica, Robovac, 42°34'23.74" N 21°32'47.28" E, 30.10.2016, BM (common);
* 1 N, Niš, Pantelej, 43°20'24.02" N 21°55'21.05" E, 23.04.2017, VŽ (common);
1 ♀, Leskovac, Babička Gora, 43°8'48.65" N 22°2'5.52" E, 02.06.2017, SA (common);
* 1 N, Niš, Delijski Vis, 43°17'59.60" N 21°55'40.63" E, 23.09.2017, SS (common);
* 1 N, Niš, Gabrovac, 43°16'58.54" N 21°55'51.59" E, 11.04.2018, SS (common);
* 11 ♀♀, Niš, Delijski Vis, 43°17'29.21" N 21°56'11.70" E, 22.04.2018, SS (9 common, 2 violet);
* 1 N, Niš, Banja Topilo, 43°26'57.27" N 21°52'44.40" E, 10.06.2018, VŽ (common);
1 ♀, Niš, Delijski Vis, 43°17'49.60" N 21°56'3.90" E, 11.07.2018, SS (common);
1 N, Čukljenik, 43°16'58.4" N 22°04'05.1" E, 07.04.2019, NN (violet);
1 U, Jelašnička Klisura, 43°16'47.10" N 22°3'50.72" E, 07.04.2019, AS (common);
* 3 ♂♂, 1 ♀, Niš, Lalinačka Slatina, 43°20'43.05" N 21°44'45.15" E, 30.05.2019, SSS (common);
* 1 N, Niš, Čamurlija, 43°22'13.40" N 21°50'38.05" E, 06.11.2019, SS (violet);
1 ♂, Niš, Čegar, 43°21'57.2" N 21°56'34.3" E, 08.06.2020, SG (common);
* 8 N, Niška Banja, 43°17'28.71" N 22°0'43.68" E, 17.07.2020, SS (violet);
* 1 N, Niš, Sićevačka Klisura, 43°20'49.31" N 22°5'34.40" E, 20.10.2020, SS (common);
1 N, Niš, Čegar, 43°21'55.2" N 21°56'35.9" E, 01.11.2020, MS (common);
1 N, Aleksinac, Bovan, 43°38'20.6" N 21°42'59.5" E, 12.12.2020, BT (common);
1 N, Niš, 43°19'42.3" N 21°53'39.9" E, 23.12.2020, AM (common);
* 1 N, Niš, Sićevačka Klisura, 43°20'40.32" N 22°5'9.65" E, 24.05.2021, SS (common);
1 N, Dolina Pčinje, 42°19'47.5" N 21°53'42.3" E, 16.08.2021, IT (common);
1 N, Pirot, Božurato, 43°06'24.8" N 22°34'36.2" E, 17.10.2021, ŽL (common);
* 3 N, 1 ♂, Niš, Veliki Drenovac, 43°24'15.71" N 21°45'33.29" E, 01.06.2022, SS (common);
* 1 N, Niš, Delijski Vis, 43°18'10.88" N 21°55'38.38" E, 30.08.2022, SS (violet);
1 O, Pirot, Rasnica, 43°07'09.3" N 22°32'11.2" E, 06.09.2022, MV;
* 1 N, Niš, Delijski Vis, 43°18'12.82" N 21°55'38.09" E, 13.09.2022, SS (violet);
* 1 N, Niš, Delijski Vis, 43°18'12.17" N 21°55'40.45" E, 24.09.2022, SS (common);
* 1 N, Niš, Delijski Vis, 43°17'57.12" N 21°55'55.49" E, 16.10.2022, SS (common);

* 1 N, Niš, Delijski Vis, 43°17'42.52" N 21°55'51.89" E, 22.02.2023, SS (common);
1 N, Kunovica, 43°17'54.1" N 22°05'26.8" E, 27.05.2023, AP (common);
1 N, Stara Planina, 43°17'32.5" N 22°32'44.9" E, 30.05.2023, LR (violet);
1 N, Niš, 43°19'25.9" N 21°55'58.9" E, 30.05.2023, NV (common);
1 N, Svrljiške Planine, 43°21'21.6" N 22°05'34.8" E, 05.06.2023, IM (violet);
1 ♂, Niš, Aleksandrovo, 43°18'00.7" N 21°45'03.0" E, 20.06.2023, MM (violet);
1 ♀, Niš, 43°19'37.9" N 21°55'04.5" E, 14.07.2023, KM (common);
1 ♀, Niška Banja, Koritnik, 43°17'12.79" N 22°0'38.09" E, 27.09.2023, SS (violet);
1 N, Niš, Jelašnička Klisura, 43°16'45.56" N 22°4'7.75" E, 05.04.2024, SS (violet);
1 ♀, Sićevačka Klisura, Ostrovica, 43°19'08.7" N 22°06'56.0" E, 25.05.2024, NN (common);
1 N, Niš, Radikina Bara, 43°17'8.96" N 22°0'32.09" E, 11.06.2024, SS (common);
1 ♀, Temska, 43°15'25.1" N 22°32'37.3" E, 21.07.2024, BO (common);
1 N, Niš, 43°19'14.9" N 21°56'20.6" E, 21.08.2024, MGR (violet);
1 N, Svrljig, Niševac, 43°27'36.3" N 22°05'42.4" E, 25.11.2024, MG (common);
1 N, Jelašnička Klisura, 43°16'56.5" N 22°03'50.4" E, 03.04.2025, NN (common);
1 N, Knjaževac, Rgošte, 43°32'37.6" N 22°11'55.8" E, 05.05.2025, GM (violet);
1 ♂, Blace, 43°17'37.3" N 21°17'50.0" E, 15.06.2025, ALS (violet);
1 ♂, Kosančić, 43°05'06.1" N 21°46'57.1" E, 03.07.2025, SM (common);
1 ♂, Kosančić, 43°05'21.9" N 21°46'42.8" E, 03.07.2025, SM (violet);
1 N, Preševo, Čukarka, 42°16'49.9" N 21°42'11.0" E, 28.08.2025, TG (common);
* 1 N, Niš, Kusača, 43°19'17.05" N 22°4'56.91" E, 05.04.2026, SS (common);
1 N, Niš, 43°18'33.5" N 21°56'54.5" E, 24.04.2026, NN (common);
2 N, Jelašnička Klisura, 43°16'49.7" N 22°03'55.8" E, 27.04.2026, MSc (common);
1 N, Niš, Batušinac, 43°15'55.1" N 21°49'53.4" E, 10.05.2026, NN (common);
* 1 ♂, Niš, Vinik, 43°21'07.3" N 21°54'41.7" E, 20.05.2026, GG (common);

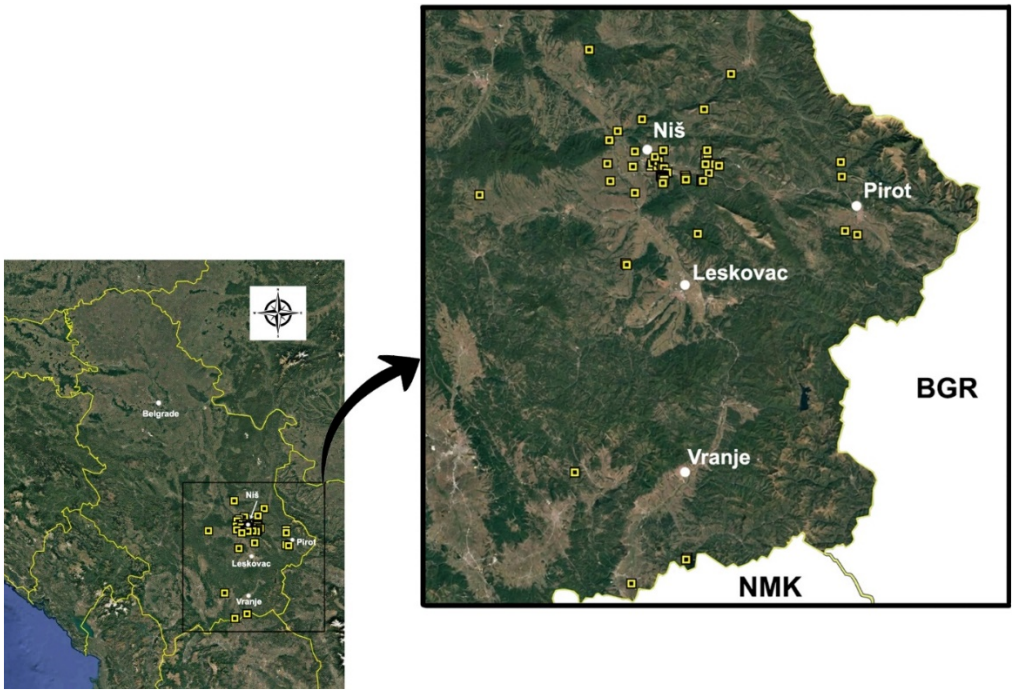


Figure 2. Distribution records of *Empusa fasciata* in Serbia (2006–2026). Yellow squares indicate recorded localities.

According to the records compiled in the present study (Fig. 2), the northernmost occurrence of *Empusa fasciata* was documented at Bovan (Bovansko Lake), in the municipality of Aleksinac. The easternmost record originated from Božurato Hill in the Pirot region, whereas the westernmost record in the dataset was obtained from Blace. Several records originate from the Pčinja River basin, while the southernmost record in the dataset is from Čukarka near Preševo. The highest concentration of records was observed in the Nišava River basin. However, this is most likely influenced by the large urban agglomeration of the city of Niš, which increases the probability of encountering the species, and the likelihood that observations are photographically documented and subsequently reported. Other parts of the species' range in Serbia remain considerably less well documented. The Nišava and Pčinja river basins contain warm valley habitats potentially favorable for this thermophilous species; the importance of local climatic conditions requires further investigation (Peneva *et al.*, 2023). The recorded Serbian localities are situated within the northern portion of the species' central Balkan distribution. The observed color forms are illustrated in Fig. 3.

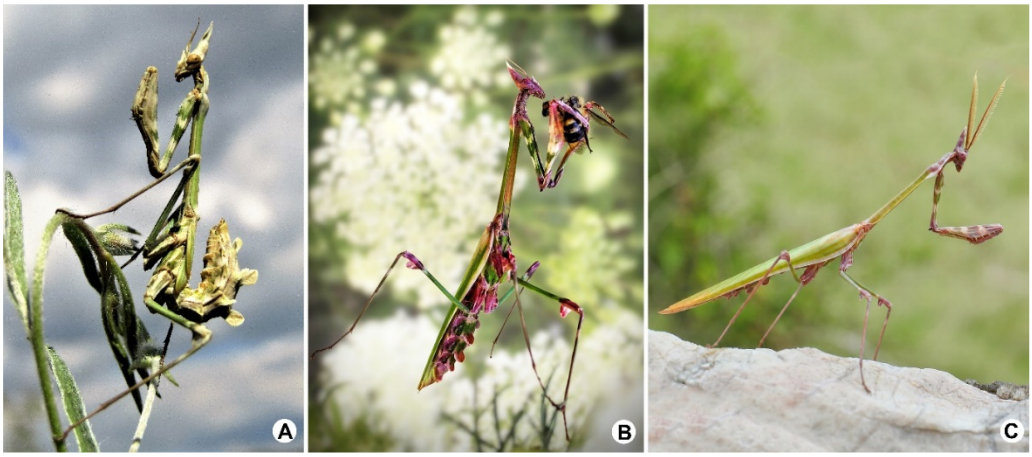


Figure 3. Habitus of *Empusa fasciata*: A – nymph (common form), B – female (violet form), C – male (violet form). Photo: S. Stevčić.

Empusa fasciata has been reported from several parts of southern and southeastern Europe, including Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Greece, Italy, Montenegro, North Macedonia, Romania, Serbia, Slovenia, and Ukraine (Battiston *et al*., 2010; Chobanov & Mihajlova, 2010). Its occurrence in North Macedonia is supported by specimen records listed by Chobanov and Mihajlova (2010). Beyond Europe, *E. fasciata* has also been reported from parts of North Africa and western Asia (Abu-Dannoun & Katbeh-Bader, 2007; Battiston *et al*., 2010).

Empusa fasciata is a predominantly Mediterranean species, with documented populations along the northern Adriatic coast, including Slovenia (Gomboc, 2000), as well as in suitable habitats farther inland in the Balkans. The Serbian records contribute to documenting the northern portion of its central Balkan range. In contrast to the more widespread *Mantis religiosa*, which overwinters in the egg stage, *E. fasciata* overwinters in the pre-adult stage (Gomboc, 2000). Winter survival at the northern margins of the range may be constrained by low temperatures, although survival limits have not been quantified for the Serbian populations. At this point, we can only speculate about the impact of climate change on *E. fasciata* and its potential range expansion into northern Serbia. Milder winter conditions could potentially increase winter survival at the northern edge of the species' range and facilitate its persistence in areas that were previously less climatically suitable. Serbia has experienced a substantial increase in air temperature in recent decades. The mean annual air temperature during 2001-2020 was 1.4°C higher than during the reference period 1961-1990 (Ministry of Environmental Protection of the Republic of Serbia, 2023).

The occurrence of *E. fasciata* at Bovan (Bovansko Lake) represents the northernmost record in our database. However, the available occurrence data do not allow us to determine whether this indicates a recent range expansion or simply better detection of a previously overlooked population. The concentration of records in warm valleys and gorges, particularly within the Nišava River basin, also suggests that local topography and the availability of xerothermic habitats remain key factors determining the species' distribution. Therefore, while climate warming may have improved conditions in the northern parts of the species' range, a northward shift in distribution cannot yet be unequivocally confirmed. To test the hypothesis of a northward shift, targeted monitoring of sites with potentially suitable xerothermic habitats located further north would be necessary.

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РАСПРОСТРАЊЕЊЕ РОГАТЕ БОГОМОЉКЕ *EMPUSA FASCIATA* BRULLÉ, 1832 (MANTODEA: EMPUSIDAE) У СРБИЈИ

ВЛАДИМИР ЖИКИЋ, СЛОБОДАН СТЕВЧИЋ И САША СТАНКОВИЋ

Извод

У раду је приказано распрострањење рогате богомољке *Empusa fasciata* у Србији на основу оригиналних теренских налаза аутора прикупљених у периоду 2006–2026. У циљу потпунијег прегледа присуства ове врсте и распрострањења, подаци су допуњени налазима из база података грађанске науке. Најсевернији налаз потиче из Бована (Бованско језеро), најисточнији из Божурата код Пирота, најзападнији из Блаца, а најјужнији из Чукарке код Прешева. Налази из Србије налазе се у северном делу документованог ареала врсте на централном Балкану.

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