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Praying mantids on Ugljan Island: First comprehensive survey on mantid diversity and alien species

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ABSTRACT. Ugljan Island, located in Northern Dalmatia, Croatia, is known for its diverse habitats but has remained largely unexplored in terms of its Mantodea fauna. This study presents the first survey of praying mantids on this island. A total of 23 mantid individuals and 12 oothecae representing six species (*Ameles decolor*, *Ameles spallanzania*, *Empusa fasciata, Iris oratoria, Mantis religiosa*, and *Hierodula patellifera*) were documented for the first time from this Island. Notably, the presence of *Iris oratoria* on Ugljan represents one of the northernmost records of this species along the Adriatic, supporting evidence of its gradual range expansion northward. Additionally, the detection of *H. patellifera* further confirms the ongoing spread of this invasive species along the Adriatic coastline. These findings contribute valuable new data on Croatia's mantid biodiversity and underscore the need for continued monitoring to track species movements and the effects of environmental change on regional insect populations.

Keywords: Adriatic archipelago, biodiversity, first record, Mantodea

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INTRODUCTION

Ugljan Island, often called the "Olive Island", is part of the central Adriatic archipelago along the Croatian coast. Known for its mosaic of Mediterranean habitats ranging from olive groves and pine forests to rocky shores and urbanized areas, Ugljan provides a rich ecological setting for a variety of arthropod species, including praying mantids (order Mantodea). Globally, the order Mantodea comprises over 2,400 described species (Otte et al., 2024). Within Croatia, the mantis fauna has expanded considerably in recent years, largely due to the increasing presence of invasive species (Rebrina et al., 2014; Martinović et al., 2022; Gomboc et al., 2024). Recent data indicate that ten mantid species are now documented in Croatia, seven of them native and three introduced (Martinović et al., 2022; Gomboc et al., 2024).

In this context, Ugljan Island stands out as a particularly valuable site for studying both mantid diversity and the dynamics of alien species introductions in the Mediterranean region. Its proximity to the Croatian mainland, combined with frequent human activity and high tourism levels, makes it especially susceptible to biological invasions. This vulnerability is reflected in recent records of three exotic mantid species (*Hierodula patellifera* Serville, 1839, *Hierodula tenuidentata* Saussure, 1869, and *Sphodromantis viridis* (Forsskål, 1775)) along the Croatian coast, confirming the region's growing exposure to alien species dispersal (Martinović et al., 2022). The diverse habitats of Ugljan Island provide a valuable environment for both native and introduced mantid species, creating ideal conditions for examining species interactions, ecosystem health, and habitat connectivity. As such, this study serves as an important foundation for future research on these ecological dynamics. Their spread is further facilitated by the accidental transport of egg cases (oothecae) via packaging, vehicles, and the trade of

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plants and produce. With the rise of global trade and travel, the appearance of additional alien mantid species capable of surviving in Mediterranean climates is expected to continue (Battiston et al., 2022; Connors et al., 2022; Gomboc et al., 2024).

Despite Ugljan's ecological richness and its potential as a sentinel site for monitoring biological invasions, no dedicated faunistic survey of its mantid fauna had been conducted prior to this study. Previous data, limited to occasional observations from citizen science platforms like iNaturalist, had recorded only three species on the island. This study addresses that gap by providing the first survey of the Mantodea on Ugljan Island, documenting six species in total, including new records of both native and alien mantids. These findings not only contribute valuable data on species distribution but also highlight the ongoing spread of invasive species, offering crucial ecological and biogeographical context for the future monitoring and management of mantid populations in the Adriatic region. Moreover, mantids have been recognized as reliable indicators of biodiversity (Battiston et al., 2020), underscoring the importance of studying their distribution and dynamics. Particular attention should also be given to the ecological impacts of alien mantids, whose spread may alter native community structures and biodiversity, making constant monitoring and assessment essential.

MATERIAL AND METHODS

Fieldwork was conducted across 11 locations on Ugljan Island (Fig. 1) from October 13 to October 17, 2024, to observe and document Mantodea species. The surveyed areas were predominantly situated on the mainland-facing side of the island and included a variety of habitats such as olive groves, maquis, garrigue, meadows, and an evergreen oak forest (Fig. 2). These diverse environments were systematically searched using direct visual observation techniques. To detect mantids, vegetation was gently tapped or brushed with a stick to encourage movement, making individuals more conspicuous. Additionally, thorough examinations of vegetation and the undersides of stones were carried out to locate oothecae (mantid egg cases). All observed mantids were photographed and subsequently released at their capture sites, with the exception of *Hierodula patellifera*. A selection of oothecae was collected for further analysis. Species identification was performed using a specialized identification key for Euro-Mediterranean mantids (Battiston et al., 2010), ensuring accurate classification of both observed individuals and collected oothecae.

The taxonomic framework followed in this study is based on the system proposed by Schwarz and Roy (2019), with classification from family to species level organized according to the structure outlined by Otte et al. (2024). Habitat and live specimen photographs were captured using an iPhone 14 Pro. For the distribution mapping, occurrence data collected by the first author during fieldwork were used, resulting in a total of 35 records. These were then plotted using QGIS software, version 3.22. The following abbreviations are used for the names of the zoological institutes and museums: ZMB – Zoological Museum of Berlin, Germany; BMNH – British Museum of Natural History, London; LSUK – Linnean Society, London, United Kingdom; MNHN – Muséum national d'Histoire naturelle, Paris, France.

RESULTS

A total of 23 mantids and 12 oothecae, representing 6 species, were documented during the survey. The majority of individuals were identified as juvenile *Ameles spallanzania*. Additionally, a single adult female of *Ameles decolor* was observed in a rocky olive grove near Kali, alongside four old *Ameles* sp. oothecae discovered under rocks. Among these six species, *Mantis religiosa* was widely distributed across the island, with six adult females and six oothecae observed, primarily in olive orchards. All six species are new records for the study area. We found a single old ootheca of *Iris oratoria* under a rock in Kukljica. This may suggest that the species occurs on Ugljan, but since no live individuals were observed, the record should be taken with caution. If confirmed, it would be the first evidence of *I. oratoria* on the island and one of its northernmost records in Croatia. Three out of 11 surveyed locations in this island showed no evidence of mantodea presence: an evergreen oak forest near Kukljica, a maquis habitat at the northernmost surveyed location, and a logged area near Sutomišćica.

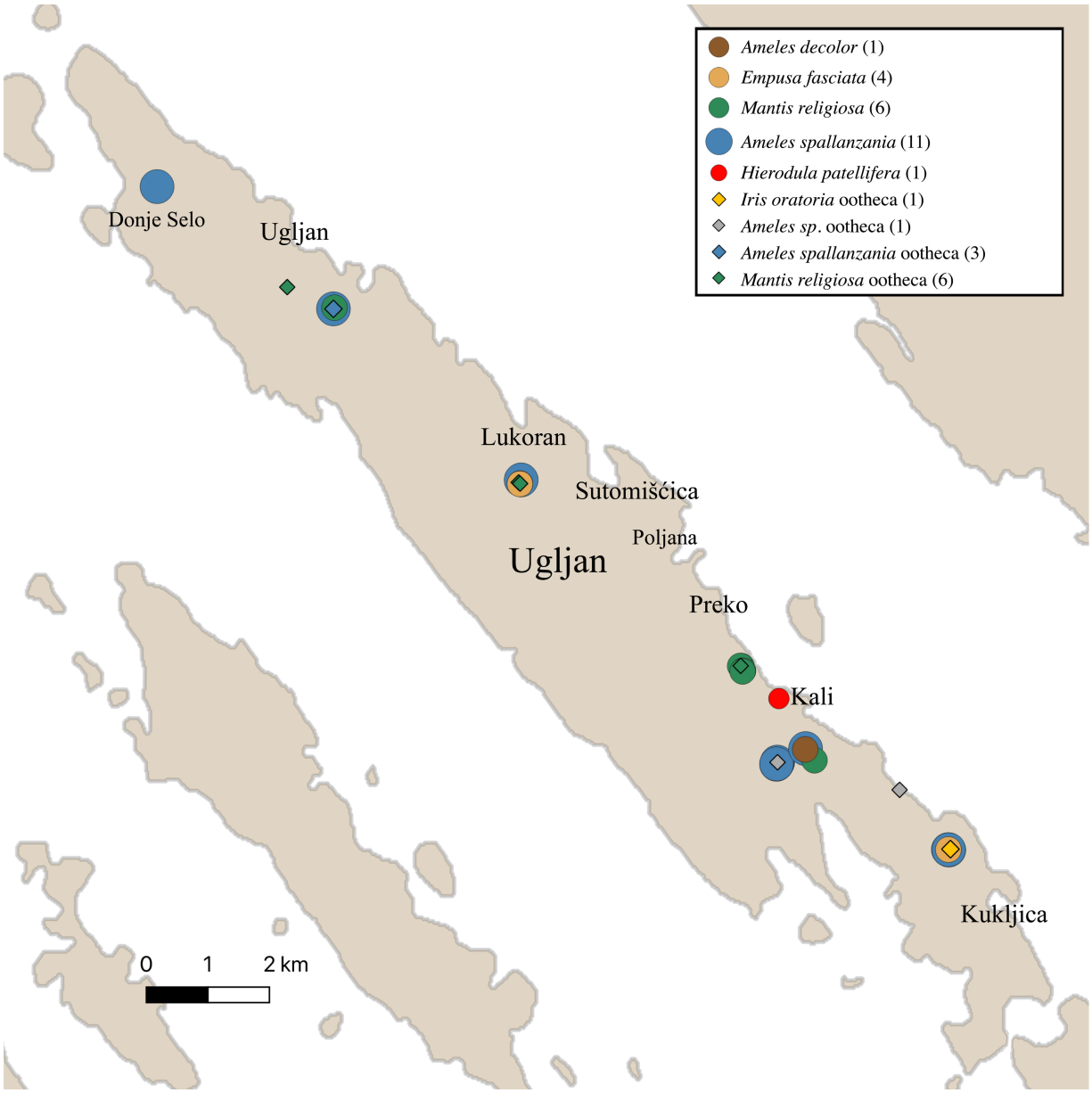

Figure 1. Occurrence of different species on the island based on the records obtained during the fieldwork of the first author.

Taxonomy

Class Insecta Linnaeus, 1875

Order Mantodea Latreille, 1802

Family Amelidae Westwood, 1889

Tribe Amelini Westwood, 1889

Genus *Ameles* Burmeister, 1838

***Ameles decolor* Charpentier, 1825** (Fig. 3B)

Ameles decolor Charpentier, 1825:90. Holotype ♂ (ZMB). – South France.

Material examined. 1 ♀, *Croatia, Ugljan island,* Kali, 44°03'21.6"N 15°12'36.0"E, 13-X-2024, Lovro Ćurić.

Global distribution. Albania, Algeria, Croatia, France, Greece, Italy, Slovenia, Spain (Kaltenbach, 1963; Agabiti et al., 2010; Romanowski & Romanowski, 2014).

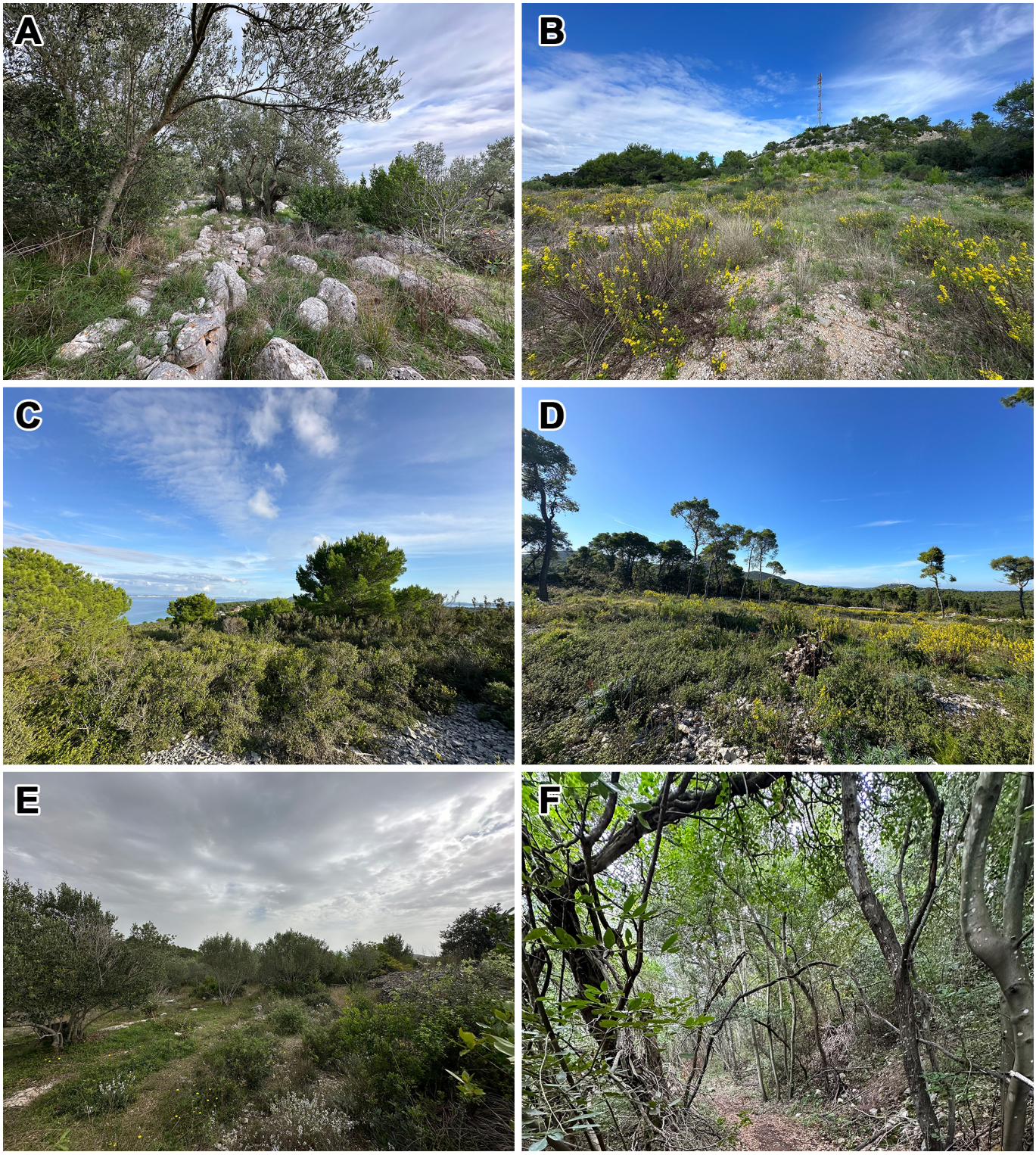

Figure 2. Selection of habitats that were examined. **A.** Olive grove (Kali), species found: *Ameles decolor*, *Ameles spallanzania*, *Mantis religiosa*. **B.** Garrigue/meadow (Lukoran), species found: *Ameles decolor*, *Empusa fasciata*, *Mantis religiosa*. **C.** Maquis (Donje Selo), no species found. **D.** Deforested maquis/garrigue (Sutomišćica), no species found. **E.** Olive grove (Kukljica), species found: *Ameles decolor*, *Empusa fasciata*, *Iris oratoria*, *Mantis religiosa*. **F.** Evergreen oak forest (Kukljica), no species found.

Remarks. *Ameles decolor* was first recorded in Croatia during a 2013 field study on the Pelješac Peninsula (southern Dalmatia), as documented by Romanowski and Romanowski (2014). Specimens identified as *A. cf. decolor* were observed at seven coastal and interior sites, including Kučište, Divna, and Perna Bay,

primarily in xerothermic grasslands and coastal vegetation. However, the study noted taxonomic uncertainty, as some individuals showed morphological traits (e.g., apical eye tubercles) suggesting possible misidentification with *A. heldreichi*, necessitating further research (Romanowski & Romanowski, 2014). The species' presence in Croatia was later confirmed in coastal regions near the Dragonja River (bordering Slovenia) by 2018, as noted in broader biogeographic assessments. These records highlight Pelješac as a critical area for understanding the distribution and sympatry of *Ameles* species in the Adriatic (Gomboc, 2018).

Ameles spallanzania Rossi, 1792 (Fig. 3A)

Ameles spallanzania Rossi, 1792:102. Paralectotype ♂♂, (ZMB). – Italy (Questioned due to loss of original type).

Note. The types of *A. spallanzania* are lost, and the species has developed a particularly intricate synonymic history over time. The specimens preserved in ZMB are paralectotypes of *Ameles brevis* Rambur, 1839, a taxon that is probably synonymous with *A. spallanzania*. Consequently, these paralectotypes have often been regarded as the closest available evidence of the original type material, a view notably supported by Ehrmann (2002), whose interpretation was subsequently followed by several authors. To resolve the absence of the original types, Agabiti (2010) designated neotypes for *A. spallanzania*. While this step provided nomenclatural stability, the newly designated neotypes differ from the *A. brevis* paralectotypes in ZMB, raising questions about their relationship to Rambur's material and to the true identity of *A. spallanzania*. In summary, Ehrmann's reliance on the *A. brevis* paralectotypes and Agabiti's designation of neotypes each represent legitimate, though contrasting, attempts to address the problem of the missing types. Nevertheless, neither interpretation can be regarded as definitively representing the original *A. spallanzania*.

Material examined. 5 nymphs: 3 ♀♀, 2 ♂♂, Croatia, Ugljan Island, Kali, 44°03'18.0"N 15°12'18.0"E, 13-X-2024; 1 ♀, nymph, Ugljan Island, Lukoran, 44°05'42.0"N 15°09'07.2"E, 14-X-2024; 1 ♂, nymph, Ugljan Island, Muline, 44°07'14.2"N 15°06'52.2"E, 14-X-2024; 1 ♀ nymph, Ugljan Island, Ugljan, 44°08'16.8"N 15°04'40.8"E, 15-X-2024; 3 nymphs: 2 ♀♀, 1 ♂, Ugljan Island, Kukljica, 44°02'31.2"N 15°14'20.4"E, 16-X-2024, Lovro Ćurić.

Global distribution. Portugal, Spain, France, Italy (including Sicily and Sardinia), Malta, Albania, Croatia (Dalmatia), Slovenia, Greece, Algeria, Tunisia, Morocco, and Libya (Agabiti et al., 2010).

Remarks. *Ameles spallanzania* has been documented in Croatia since the early 20th century. Its presence on Brač Island (Central Dalmatia) was first reported by Werner (1920), and later confirmed by Kaltenbach (1963). Between 2002 and 2011, annual field surveys consistently recorded this species at multiple locations across Brač Island. Further evidence of its distribution comes from a 2013 survey on the Pelješac Peninsula (Southern Dalmatia), where *A. spallanzania* was observed at eight out of nine surveyed sites, predominantly in dry grasslands and garrigue habitats. These findings confirm that *A. spallanzania* is a long-established and well-documented species in Croatia, with stable populations concentrated in Central and Southern Dalmatia, notably on Brač Island and the Pelješac Peninsula (Kment, 2012; Romanowski & Romanowski, 2014).

Family Eremiaphilidae Saussure, 1869

Subfamily Iridinae Westwood, 1889

Tribe Iridini Westwood, 1889

Genus *Iris* Saussure, 1869

Iris oratoria (Linné, 1758) (Fig. 3H)

Mantis oratoria Linné, 1758:426. Holotype ♂, (BMNH). – Africa.

Material examined. Old ootheca, Croatia, Ugljan Island, Kukljica, 44°02'31.2"N 15°14'20.4"E, 17-X-2024, Lovro Ćurić.

Global distribution. Albania, Bulgaria, France (including Corsica), Greece (including Crete, Ionian Islands, Cyclades), Italy (including Sicily and Sardinia), Spain (including Balearic Islands), Portugal, Malta, Cyprus, North Macedonia, Serbia, Montenegro, Croatia, Slovenia, Turkey (including Anatolia),

Israel, Lebanon, Syria, Jordan, Palestine, Iran, Iraq, Egypt, Libya, Tunisia, Algeria, Morocco, Chad, recently colonized in Romania, and has been introduced to southwestern United States (California, Arizona, Nevada, Texas) (See remark for more) (Romanowski & Romanowski, 2014; Schwarz & Ehrmann, 2018; Battiston et al., 2021).

Remarks. The Mediterranean mantis, *Iris oratoria*, is often considered a broadly distributed generalist; its actual distribution is more fragmented and locally variable than earlier checklists suggested. In the Mediterranean, stable northernmost records are confirmed from Provence (France) and coastal Croatia (Kment, 2012; Romanowski & Romanowski, 2014). In Italy, the species is mainly associated with Tyrrhenian coasts, with recent confirmations for Campania, Calabria, Sicily, and Sardinia, but older records elsewhere have not been reconfirmed (Fontana et al., 2005; Battiston et al., 2021). Its presence has also been recently validated for Libya (Battiston et al., 2021) and for several Mediterranean islands and islets, suggesting an underestimated and evolving range. Some countries appear to have been colonized only in recent decades, likely driven by climatic shifts and human-mediated dispersal. For example, records from Romania and parts of Central Europe are recent and likely represent ongoing colonization rather than long-established populations (Schwarz & Ehrmann, 2018; Battiston et al., 2021). It has a documented history in Croatia beginning with precise records from Korčula Island in the early 1960s. The earliest confirmed specimen was collected in September 1961 in the area between Vela Luka and Blato, followed by additional specimens in August 1964 near Vela Luka, Miljata. After several decades without further verified data, the species was again recorded on Brač Island in 2011, with multiple specimens collected in August and September at Sumartin, Manjana camp (Kment, 2012).

While *Iris oratoria* had been previously listed in Croatian faunal records, these entries lacked precise locality data or were based on misidentifications. Therefore, the confirmed sightings on Korčula in the 1960s and Brač in 2011 represent the first reliable and documented occurrences of this species in Croatia. These findings are of particular importance, as they not only validate the presence of *Iris oratoria* in Dalmatia, but also provide a crucial reference point for future monitoring of its distribution, particularly with regard to its potential northward spread along the Adriatic coast (Kment, 2012). Since the ootheca found from the study area and shown in Figure 3H is very old and damaged, we suggest considering this record as more probabilistic.

Family: Empusidae Burmeister, 1838

Subfamily: Empusinae Burmeister, 1838

Tribe: Empusini Burmeister, 1838

Subtribe: Empusina Burmeister, 1838

Genus: *Empusa* Illiger, 1798

***Empusa fasciata* Brullé, 1832** (Fig. 3G)

Empusa fasciata Brullé, 1832:3. Probably lost. – Jerusalem (Battiston et al., 2010).

Material examined. 3 presubadult ♂♂, Croatia, Ugljan Island, Lukoran, 44°05'42.0"N 15°09'07.2"E, 14-X-2024; 1 presubadult ♀, Ugljan Island, Kukljica, 44°02'31.2"N 15°14'20.4"E, 17-X-2024, Lovro Ćurić.

Global distribution. Italy (northeastern regions), Slovenia, Croatia, Bosnia & Herzegovina, Montenegro, Albania, Kosovo, Greece (including Crete), Bulgaria, Romania, Cyprus, Turkey, Ukraine (Crimea, Krasnodar), western Iran (Ehrmann, 2002; Battiston et al., 2010; Musliu et al., 2025).

Remarks. *Empusa fasciata* was first documented in Croatia in 1920, with its initial record attributed to Werner (1920) and later confirmed by Kaltenbach (1963). These early observations were primarily associated with the Dalmatian islands, particularly Brač Island, where the species has continued to be regularly observed in subsequent years. In more recent years, *Empusa fasciata* has been recorded at several locations across southern Croatia, particularly on the Pelješac Peninsula. During surveys conducted between July and August 2013, the species was found at six different sites on the peninsula, with a total of 16 specimens documented. These records further confirm the species' presence in a range of habitats, including both coastal and inland areas (Romanowski & Romanowski, 2014).

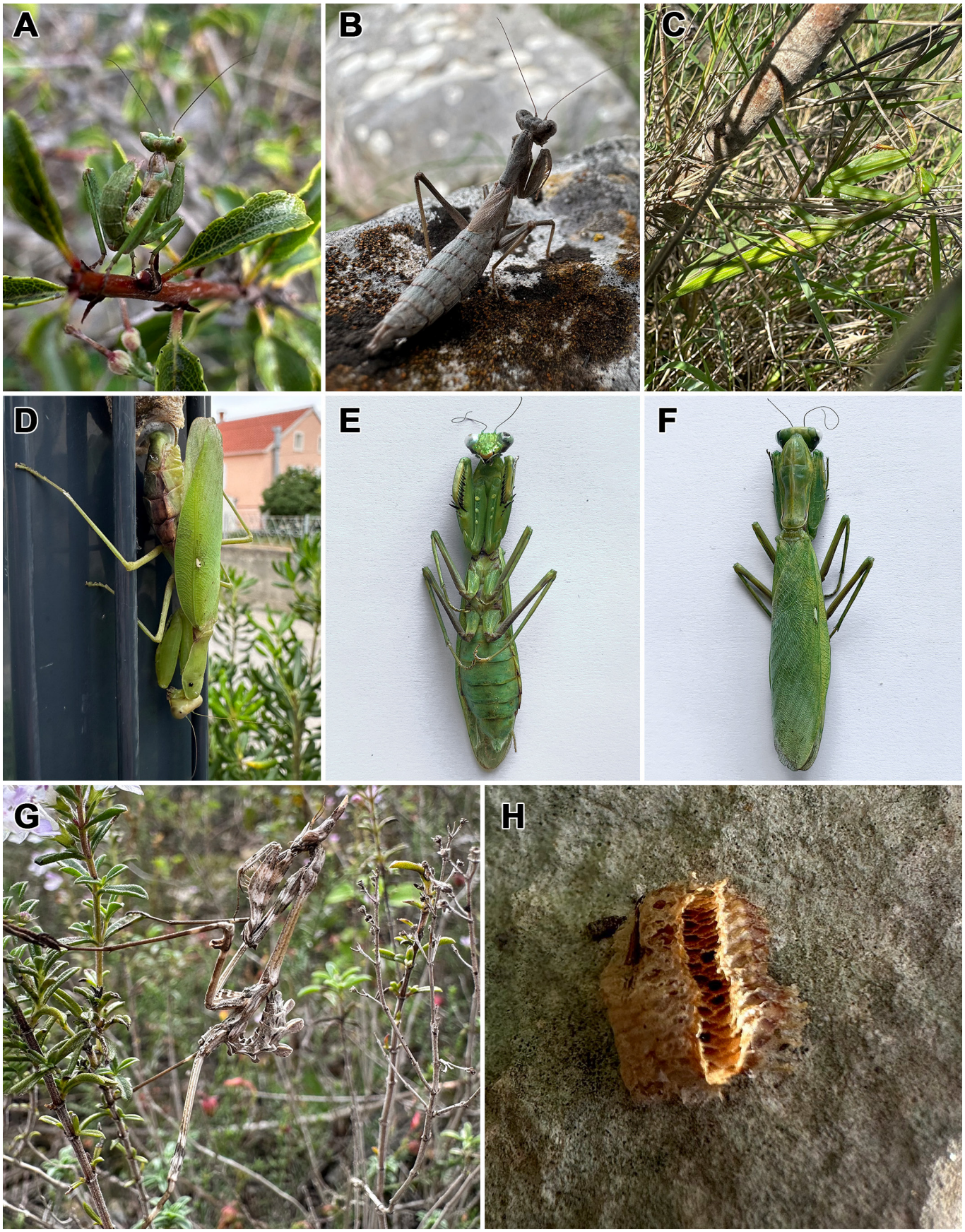

Figure 3. Observed mantis species. **A.** *Ameles spallanzania* nymph mimicking a green leaf; **B.** *Ameles decolor* adult female; **C.** *Mantis religiosa*, adult female. **D.** *Hierodula patellifera*, laying an ootheca behind an already existing one on a metal fence; **E.** *Hierodula patellifera*, ventral view; **F.** *Hierodula patellifera*, dorsal view; **G.** *Empusa fasciata*, presubadult female on *Thymus* sp.; **H.** Old ootheca, under a stone probably of *Iris oratoria*.

Family Mantidae Latreille, 1802

Subfamily Mantinae Latreille, 1802

Genus *Mantis* Linné, 1758

***Mantis religiosa* (Linné, 1758)** (Fig. 3C)

Gryllus religiosus Linne, 1758:426. Holotype ♂, Paratypes ♀♀ (LSUK).–Africa.

Material examined. 4 ♀♀, Croatia, Ugljan Island, Kali, 44°04'04.8"N 15°11'49.2"E; 1 ♀, Ugljan, Croatia, 44°07'12.0"N 15°06'50.4"E, 15-X-2024; 1 ♀, Ugljan Island, Ugljan, 44°07'12.0"N 15°06'50.4"E, 16-X-2024, Lovro Ćurić.

Global distribution. Europe: southern and southeastern Spain, southwestern and southern France, Italy (Tuscany, Elba), Switzerland (Valais), southwestern Germany (Upper Rhine), eastern Germany (Saxony), southeastern Czechia, southeastern Slovakia, southeastern Austria, Slovenia, Croatia (Dalmatia, Krk, Vis, Cres, Lokrum), North Macedonia, Greece (Macedonia, Corfu), western Romania (Banat), southern Ukraine (Black Sea coast), southwestern Russia (Black Sea coast), southern Russia, Armenia, Azerbaijan, eastern Georgia; Asia: western Turkey, western Yemen, northwestern and northeastern Iran, southwestern Turkmenistan, southern Uzbekistan, eastern and southeastern Kazakhstan, northern India (Punjab), southeastern Russia (Amur), eastern China (Shandong), southern China (Macau), Taiwan, Laos (Vientiane), southern Thailand (Cha-Am), western and northeastern Malay Peninsula, Java). Africa: Gran Canaria, Guinea-Bissau, Gambia, Togo, southern Cameroon, Egypt, Ethiopia, eastern Kenya, southwestern Tanzania, South Africa (Natal), northern and central Namibia. It has been introduced to North America (United States and Canada) and Australia (Berg et al., 2011).

Remarks. *Mantis religiosa* (the European mantis) is one of the most widespread and well-known mantid species in Croatia. Historical records indicate that this species was first documented in several regions of Croatia by the mid-20th century, with detailed accounts such as those by Kaltenbach (1963) confirming its presence. Over the years, *Mantis religiosa* has been observed across various locations, including both the mainland and numerous Adriatic islands. In 2013, surveys conducted on the Pelješac Peninsula in southern Croatia reaffirmed the continued presence of *Mantis religiosa*, alongside other mantid species. These surveys also noted that the species had already been recorded across various parts of the country in previous decades. It is considered a native and common species throughout Croatia, present both along the coast and inland (Romanowski & Romanowski, 2014).

***Hierodula patellifera* (Audinet-Serville, 1839)** (Fig. 3D–F)

Mantis patellifera Audinet-Serville, 1839:185. Holotype ♂, Paratype ♀ (MNHN).– Java.

Material examined. 1 ♀, with ootheca, Croatia, Ugljan Island, Kali, 44°03'50.7"N 15°12'17.3"E, 16-X-2024. Lovro Ćurić.

Global distribution. India, South China, Korea, Japan, Taiwan, Myanmar, Philippines, Java, Sumba, New Guinea; introduced: Hawaii (Big Island) (Ehrmann, 2002; Mirzaee et al., 2025), Italy, Croatia.

Remarks. *Hierodula patellifera* was first documented in Croatia in late November 2020. This record was based on a single female specimen found in Novigrad, located in Istria County, specifically in the Dajla residential area, where it was spotted on a palm tree near the roadside (Martinović et al., 2022). This observation marks the first confirmed sighting of this non-native mantid species in this part of Croatia and represents the westernmost record for the country. The presence of *H. patellifera* in Croatia is believed to be the result of natural dispersal from nearby northern Italy (Martinović et al., 2022), where fragmented and reproducing sub-populations have been established. While there is currently no indication that this species is exhibiting invasive behavior in Croatia, continued monitoring is advised to evaluate any potential impact on native wildlife.

DISCUSSION

The Mantodea fauna of Ugljan Island presents several noteworthy findings that contribute to our understanding of species distribution, phenology, and the ongoing spread of invasive mantids in the Adriatic region. The Adriatic coast and its archipelago form a unique transitional zone at the intersection of Central European, Mediterranean, and Balkan biogeographical regions, creating a mosaic of species composition and habitat types (European Environment Agency, 2023a; European Environment Agency, 2023b). This diverse setting creates a natural corridor for both native and non-native species, acting as a bridge between continental and insular faunas (Sherpa et al., 2023). Islands within this archipelago are especially valuable for studying the patterns of species dispersal, establishment, and ecological interactions, particularly in the case of alien species whose spread is closely tied to human activity (Zenetos et al., 2012). Ugljan Island holds particular importance in this context. Situated in Northern Dalmatia, directly opposite the large mainland port city of Zadar and connected by frequent ferry routes, Ugljan is one of the most accessible and regularly trafficked islands in Croatia. This makes it an ideal stepping-stone for alien species, especially those introduced via trade, tourism, or accidental transport factors that have been clearly linked to the spread of invasive mantids such as *Hierodula patellifera* and *H. tenuidentata* in the region. Biogeographically, the presence and absence of certain species on individual islands like Ugljan provide insight into colonization dynamics, dispersal limitations, and habitat suitability within the Adriatic archipelago.

The disparity in findings between the numerous *Ameles spallanzania* nymphs (Stage L3 and L4) and the single observed *Ameles decolor* female suggests differing overwintering strategies for these species. *Ameles decolor* appears to overwinter exclusively in the ootheca stage at these latitudes, while *Ameles spallanzania* exhibits diapause as both nymphs and oothecae. This observation aligns with iNaturalist records, which highlight seasonal variations in life stages for these species. *Ameles decolor* observations on iNaturalist between September and April show solely adult specimens or oothecae, while *Ameles spallanzania* reports also include a remarkable number of nymphs (19 out of 78 *Ameles spallanzania* observations in Croatia in the given time period are nymphs). This finding further supports existing references on the life cycle of *Ameles spallanzania* (Battiston & Galliani, 2011). The first record of *Empusa fasciata* on Ugljan likely reflects the lack of prior research on the island rather than the species' recent arrival. The second recorded location for *E. fasciata* on the island, an open, grassy olive garden, represents an atypical habitat, as this species is more commonly associated with open meadows and areas with low vegetation. This warrants further investigation to better understand its habitat preferences. The possible observation of an *Iris oratoria* ootheca on Ugljan is noteworthy, as it could represent one of the northernmost distribution points for this species along the Adriatic coast (Battiston et al., 2021). However, since the ootheca was old and damaged, the record should be treated with caution. If confirmed, it would add support to the idea that *I. oratoria* is gradually moving northward, perhaps favored by changing climatic conditions that allow it to colonize new areas. Previous confirmed records in Croatia are relatively recent, beginning in 2011 on the islands of Brač and Korčula (Kment, 2012) and later on the Pelješac peninsula in 2013 (Romanowski & Romanowski, 2014), with additional observations reported through citizen science platforms such as iNaturalist. The ecological impact of this species in northern Mediterranean ecosystems remains uncertain, underscoring the importance of further surveys and monitoring.

The detection of the invasive *Hierodula patellifera* on Ugljan was anticipated due to its rapid spread along the Adriatic coast. However, this species is less common than *Hierodula tenuidentata* and exhibits a distinct distribution pattern, with a primary hotspot in the central coastal regions (iNaturalist). The current finding represents a momentary snapshot, and it remains uncertain whether permanent distribution hotspots will develop or how extensively the species will establish in various ecological niches. Preliminary observations suggest that *H. patellifera* may prefer habitats characterized by higher vegetation, such as trees and tall shrubs. This hypothesis is supported by records of *H. patellifera* in similar environments, including a female observed on a palm tree in Novigrad (Anonymous, 2020) and subadult and adult specimens found on a *Tamarix* sp. tree on Island Iž (personal observations August,

2024). This preference for elevated vegetation may reduce direct competition with native mantis species, which typically occupy lower strata of vegetation. Instead, *H. patellifera* may primarily impact other invertebrates inhabiting these heights. Particularly noteworthy is the rapid spread of *Hierodula tenuidentata*, with its range extending from India and Iran to Central Asia and the Caucasus (Staniczek, 2023). Its recent arrival and establishment in Europe have been well documented (Martinović et al., 2022; Gomboc et al., 2024). In Croatia, *H. patellifera* and *Sphodromantis viridis* were recorded for the first time in 2020, followed by *H. tenuidentata* in 2021. The Adriatic coast—being the country's most visited region—serves as the primary introduction zone for these species, with recent records from Istria, Dubrovnik, Lopud, Šibenik, and Šolta (Martinović et al., 2022; Gomboc et al., 2024).

The taxonomic status of *H. tenuidentata* remains complex, with several records historically referring to its synonym, *H. transcaucasica*. Although the Mantodea Species File Online (Otte et al., 2024) still lists these as separate species, most recent European studies follow the synonymization proposed by Ehrmann (2011) and others (Ehrmann & Borer, 2015; Schwarz et al., 2018; Vujić & Ivković, 2023). The confusion has complicated tracking the species' spread in Europe, as different names have appeared in different countries and papers, often based solely on photographic records without clear morphological or genetic confirmation. Recent studies have shown *H. tenuidentata* expanding its range rapidly across southeastern Europe and the Mediterranean (László et al., 2023), with new populations emerging in Slovenia (van der Heyden, 2021), Greece, Bulgaria, Romania, Serbia, Bosnia and Herzegovina, Albania, and Hungary, and further west into Italy, Spain, France, and even Germany, Austria, and Switzerland (Staniczek, 2023; Moulin & Rouard, 2023). Its spread is typically facilitated by accidental human-mediated transport. Given *H. tenuidentata*'s rapid spread throughout the Balkans and Mediterranean—often through artificial means such as plant trade, shipping, and tourism (Vujić & Ivković, 2023; László et al., 2023)—it is plausible that its arrival on Ugljan is a matter of time. The island's ferry connections, increasing tourism, and frequent movement of materials between the mainland and islands create ideal conditions for oothecae or adults to be unintentionally transported. As observed in neighboring countries, once introduced, *H. tenuidentata* can quickly establish local populations, often unnoticed due to its morphological similarity to native species and confusion over its taxonomic identity. Further investigation into the ecological niches of *Hierodula* species and their interactions with native fauna across the Mediterranean is essential. Understanding these dynamics will provide valuable insights into the broader implications of their spread and inform future research priorities.

Therefore, establishing a current, evidence-based checklist of Ugljan's Mantodea fauna is not merely a local inventory but a valuable contribution to the broader biogeographical mapping of species distributions in the Adriatic and Mediterranean. It creates a crucial baseline against which future records, species introductions, and faunal shifts can be measured. Such work is essential in understanding how invasive species move through insular networks and identifying islands at risk of colonization. At the same time, mantids have been recognized as reliable indicators of biodiversity (Battiston et al., 2020), making their study particularly useful for evaluating ecosystem integrity. The continued presence of native mantid species on Ugljan is not only a sign of the island's relatively intact Mediterranean habitats but also underscores its natural value within the central Adriatic, where anthropogenic pressures are increasingly fragmenting landscapes. In summary, Ugljan Island's strategic location, high human-mediated dispersal potential, and its currently undocumented or poorly understood mantid fauna make it a priority site for faunistic study. Documenting the present composition of its Mantodea community not only contributes to local biodiversity knowledge but also serves a wider biogeographical purpose, offering insights into the mechanisms of species spread, island colonization, and ecological vulnerability in the Adriatic and beyond.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: L. Ćurić: Study conception and design, data collection, data analysis, interpretation of results, drafting the manuscript, visualization; Z. Mirzaee: data analysis, interpretation of results, drafting and revising the manuscript. The authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

A single specimen of *H. patellifera* was collected and is deposited in the private collection of the first author (LCPC), and is available upon request. The other species were only photographed.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included plants and arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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فون مانتیس‌های جزیره اوگلجان: نخستین بررسی جامع بر تنوع مانتیس‌ها و گونه‌های بیگانه

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چکیـده: جزیره اوگلیان، واقع در شمال دالماتیا، کرواسی، به خاطر زیستگاه‌های متنوعش شناخته شده است، اما از نظر فون حشرات آخوندک (Mantodea) تا حد زیادی ناشناخته باقی مانده بود. این مطالعه، اولین بررسی آخوندک‌ها در این جزیره را ارائه می‌دهد. در مجموع ۲۳ آخوندک و ۱۲ کیسه تخم (oothecae) مربوط به شش گونه (*Ameles decolor*، *Ameles spallanzania*، *Empusa fasciata*، *Iris oratoria*، *Mantis religiosa*، و *Ierodula patellifera*) برای اولین بار از این جزیره ثبت شدند. به‌ویژه، حضور گونه *Iris oratoria* در اوگلیان یکی از شمالی‌ترین گزارش‌های این گونه در امتداد دریای آدریاتیک است که شواهدی از گسترش تدریجی محدوده انتشار آن به سمت شمال را تأیید می‌کند. علاوه بر این، شناسایی گونهٔ *H. patellifera*، گسترش مداوم این گونه مهاجم را در امتداد خط ساحلی آدریاتیک تأیید می‌کند. این یافته‌ها داده‌های جدید و ارزشمندی در مورد تنوع زیستی آخوندک‌های کرواسی ارایه می‌دهند و بر نیاز به نظارت مداوم برای ردیابی حرکت گونه‌ها و اثرات تغییرات محیطی بر جمعیت حشرات منطقه تأکید دارند.

واژگـان کلیدی: مانتیس‌ها، تنوع زیستی، اولین گزارش، مجمع‌الجزایر آدریاتیک