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A social beauty: distribution, ecology and conservation of *Iris oratoria* in the Central Mediterranean Region (Insecta: Mantodea)Roberto BATTISTON^{a,*}, Elvira CASTIGLIONE^b, William DI PIETRO^c, Stefano LAZZARETTI^d, Francesco MANTI^e, Arnold SCIBERRAS^f^aMuseo di Archeologia e Scienze Naturali 'G. Zannato', piazza Marconi 17, 36075 Montecchio Maggiore (VI), Italy – roberto.battiston@comune.montecchio-maggiore.vi.it^bAssociazione di promozione sociale "Emozione Natura", via Reggio Campi, Attraversamento Terreti, n 3, 89126 Reggio Calabria (RC), Italy – elvira.castiglione@hotmail.it^cAssociazione Culturale 'Arthropoda Live Museum', Via Maestri del Lavoro 10, 20099 Sesto San Giovanni (MI), Italy – william.dipietro10@gmail.com^dWBA World Biodiversity Association onlus, c/o Museo Civico di Storia Naturale Lungadige Porta Vittoria 9, 37129 Verona (VR), Italy – fobos_90@hotmail.it^eAssociazione di promozione sociale "Emozione Natura", Via Reggio Campi, Attraversamento Terreti, n 3, 89126 Reggio Calabria (RC), Italy – framanti@libero.it^fAnimal kingdom LTD, 136 ditch street pla1234, Poala, Malta – bioislets@gmail.com

*Corresponding author

Abstract

The distribution and knowledge on the Mediterranean mantid *Iris oratoria* (Linnaeus, 1785) are here updated. Despite its beautiful appearance and presence in the social media, the scientific knowledge on its real distribution is poor and incomplete and this may affect its conservation at local scales. Citizen science records have been here compared with traditional science records, and updated with many new and original localities: this species is reported for the first time for Libya, Calabria and many Mediterranean islands and islets. The ecological preferences have been explored in a retrodunal transect to investigate the preferred vegetation patterns for this species. The general value of citizen science records in evaluating the real distribution of a species have been tested here, using *Iris oratoria* as a case study for further investigations.

Key words: Citizen science, Europe, islands, Italy, mantis, map, population.**Introduction**

The Mediterranean mantid *Iris oratoria* (Linnaeus, 1785), is a widespread species, known to occur, as the common name suggests, in almost all the Mediterranean basin, but ranging also East in the Persian area. It is present in Iran (Pashaie & Mirzaee 2017) but its presence in Pakistan and India still needs confirmation and updating (Mukherjee et al. 1995; Ehrmann 2002; Battiston et al. 2010; Kment 2012). This species is also present in the South West of the USA, artificially imported in the early XX century (Anderson 2018).

If the distribution of this generalist and adaptable species is very wide and this strongly influences its ecology and conservation, its local occurrence inside this wide range and even in the Mediterranean area, is poorly

known. More research on the taxonomy, population size and trends, distribution, life history, ecology and threats have been indeed recently encouraged (Battiston 2020).

The knowledge on the distribution of this species in the Central Mediterranean is fragmented. Excluding Central European records, occasional and not related to confirmed populations (Schwarz & Ehrmann 2018), this species reaches its stable northernmost confirmed localities, in the coastal areas of Provence (Voisin 2003) and Croatia (Kment 2012; Romanowski & Romanowski 2014). Kment (2012) also reported some records for the Iberian Peninsula, France, Greece and Turkey. In Italy it is reported mostly for the Tyrrhenian coasts and in Southern Italy it is formally recorded just for Campania, Puglia and Sicily and Sardinia, with very old records not beyond the eighties of the last century (Fontana et al. 2005). Between Europe and



Fig. 1 – Presence records of *Iris oratoria* in the Central Mediterranean region, from the original records here presented (orange dots), collecting records from preserved specimens in museum collections and literature (red dots), from occasional records not related to confirmed populations (blue dots) and from citizen-science observations (green dots). Base map: OpenStreetMap.



Fig. 2 – The strip transect at the Dune di Giovino (southern Italy, Calabria) in a retrodunal area (left) and a sub-adult male of *Iris oratoria* on *Artemisia vulgaris*.

Africa, recent investigations in the Maltese archipelago (Battiston et al. 2020; Cassar 2020) did not report the presence of this species for that Country. A recent overview on the mantids of Tunisia (Ouni et al. 2018) stated that *I. oratoria* is, on a general level, well present in North Africa even if, despite the wide range of distribution, this species is locally reported as not abundant. Moreover, in the last years the arrival of some Asian mantids in Central Europe (Battiston et al. 2018, 2019) and the spreading of other Afro-Mediterranean species (Battiston et al. 2020) in the

Mediterranean, lead to re-discuss the impact of mantids on local ecosystems and the need of a detailed knowledge of their occurrence.

Some recent findings after field investigations in Southern Italy (Campania and Calabria) and a new collection of records from the Mediterranean area, pointed out that the presence of this species is probably underestimated, evolving and needs to be updated, in relation to the ecology of a charismatic predator. Despite its cryptic appearance and uncommon presence in nature, this species is indeed beautifully colored

and well present in social media pictures and memes. Its presence in citizen science may be used as a case study to evaluate the power of social mapping of uncommon species by citizen science related projects.

Materials and Methods

The presence of *I. oratoria* in Italy, from North to South has been here investigated during a field expedition held in August 2020 by the authors. 15 different localities from Lombardia to Calabria, suitable for Mantodea have been examined in detail with sweeping nets and light traps, to evaluate the presence of these insects. One locality, a peculiar retrodunal environment on the Ionic coast of Italy near the city of Catanzaro, has been surveyed with a geographical and ecological approach. A strip transect (700m x 70m) in the natural reserve Dune di Giovino, one of the few coastal areas of the region with an almost intact retrodunal environment, has been examined, bush by bush, by three of the authors for about two hours evaluating the presence of mantids in relation to the vegetation.

Other presence records (Fig. 1) for the Mediterranean area (here intended as the countries bordering the Mediterranean sea) were obtained also by other occasional field investigations made by the authors in other Mediterranean localities in different years, from the digitized specimens records of 22 different European museum and private collections (source: GBIF), literature (Fontana et al. 2005; Okely et al. 2020 and previously cited literature) and citizen science relate projects (Banco de Datos de Biodiversidad de la Comunitat Valenciana, BioDiversity4All, Energias de Portugal, iNaturalist, Inventaire National du Patrimoine Naturel, Naturgucker, Système d'Information et de Localisation des Espèces Natives et Envahissantes).

The affordability of citizen-science webGIS projects in representing the real distribution of a species had been evaluated verifying each observation of *I. oratoria* recorded in iNaturalist for the Euro-Mediterranean area and classifying them as “correct”, “incorrect” and “undeterminable”.

Results

France: Toulon, 16 Jun 2003 leg. Sciberras, 1 male.

Greece: Nea Kameni, 8 Sep 2009, leg. Sciberras, 1 female. Palea Kameni, 10 Sep 2009, leg. Sciberras, 1 male. Delos, 13 Sep 2009, 1 male, leg. Sciberras. Preveto, 10 Oct 2011, leg. Sciberras, 1 male. Corfu, 23-25 Aug 2014, leg. Sciberras, 3 males. Gravia, 27 Aug 2014, leg. Sciberras, 1 male. Rhodes, 9 Oct 2014, leg. Sciberras, 3 males, 1 female.

Italy: Campania, Caserta, San Felice a Cancellio, 40°59'20.00"N 14°25'54.00"E, 26 Aug 2020, leg. R. Battiston, W. Di Pietro, 1 male, 2 females, 2 oothecae. Calabria, Reggio di Calabria, Santa Domenica di Terreti,

38°07'29.4"N 15°44'27.3"E, 28 Aug 2020, leg. R. Battiston, W. Di Pietro, E. Castiglione, F. Manti, 1 sub-adult, 1 male. Calabria, Catanzaro, Dune di Giovino, 38°50'04.5"N 16°39'11.2"E, 27 Aug 2020, obs. R. Battiston, W. Di Pietro, S. Lazzaretti, 8 sub-adults. Sicily, Lampedusa, 16 May 2010, leg. Sciberras, 2 males. Lampione, 11 May 2010, leg. Sciberras, 1 male. Sicily, Filicudi, 6 Jul 2011, leg. Sciberras, 1 male. Sicily, Rosolini village, 8 Sep 2001, leg. Sciberras, 2 males, 1 female. Sicily, Ustica, 6 Aug 2012, leg. Sciberras, 1 male. Sicily, Isola delle femmine, 9 Sep 2011, leg. Sciberras, 1 male. Sardinia, Bosa, 9 Jun 2012, leg. Sciberras, 2 females. Sardinia, Isola Santa Maria, 12 May 2015, leg. Sciberras, 1 male.

Libya: Tripoli National Park, 7 Aug 2008, leg. Sciberras, 1 male.

Spain: Salamanca, 3 Sep 2005, leg. Sciberras, 1 female. Minorca, 8 Aug 2009, leg. Sciberras, 1 female.

In the investigation area of Dune di Giovino (Italy, Calabria) 8 sub-adult individuals were observed in a total area of about 5ha. It should be noticed that all the individuals were found in the late afternoon deep inside bushes of *Artemisia vulgaris* L., (Fig. 2) none of none them outside the retrodunal area or on other kinds of vegetation.

As frequency of encounter, during the field expedition from North to South Italy, over the 15 visited localities 14 were suitable for mantids (at least one of the 6 species observed was found), *I. oratoria* was found in only 3 of them (21%).

On 689 observations recorded on iNaturalist (December 2020) for the Euro-Mediterranean area 637 of them were correct, 21 incorrect, and 31 undeterminable.

Discussion

Iris oratoria confirmed to be widely distributed in the Central Mediterranean region, despite its rare and fragmented presence in traditional scientific sources of records. Its distribution seems to be however fragmented and its presence locally uncommon even if sometimes, relatively abundant. The relative abundance of individuals in the natural reserve Dune di Giovino, if compared to other localities, and the marked preference of the bushes of *Artemisia*, suggest indeed that this species, even if considered as a generalist mantid, have specific ecological needs in terms of habitat. Habitat preferences and in particular the preference for natural environments, characterised by a sclerophyllous vegetation has been observed in other species of Mediterranean mantids (Battiston et al. 2020). The link to *Artemisia* seems, at present, restricted to the case of Dune di Giovino but should be investigated in more different environments. This choice is probably more related to the bushy vegetational development of this plant, suitable for hiding and hunting of a medium sized mantid. Mantids can be considered indicators for biodiversity and environmental conservation,



Fig. 3 – Total confirmed presence records of *Iris oratoria* (red dots) over the Koppen Mediterranean Climate region (green area). Base map: OpenStreetMap.

often linked to the presence of protected areas (Battiston et al. 2020) and the presence here in a natural reserve with one of the few intact retrodunal environments of the Ionic coast, appears indicative of this trend and of the importance of the protection of coastal natural ecosystems.

These ecological preferences can also be observed proceeding North in more continental areas of Europe. While other opportunist mantid species here in the last few years are increasing their distribution, mostly because of warmer winters [e.g. *Ameles spallanzania* (Rossi, 1972) in: Battiston et al. 2020b], *I. oratoria* seems unable to colonise more humid environments outside the Mediterranean climate region (Fig. 3). The few records here considered outside this range are old or not reconfirmed, probably related to occasional occurrence or failed accidental introductions. The strict link between this species and the Mediterranean-type vegetation, even outside the Mediterranean basin (e.g. Central America) may be used to infer the presence of this species in still unsurveyed or poorly known areas (e.g. in Asia).

The presence of this species in Malta, an island particularly well studied in its mantid-fauna, where *I. oratoria* is historically recorded (Giulia 1858) but not confirmed with a local population (Cassar 2019), should be better investigated, to consider and monitor a more stable presence in the near future.

Regarding the real distribution of this species, the data available seems still inaccurate to have a good estimation. Most of the new records here presented are new for each specific locality: islands, islets, provinces or areas and this suggests that much more is still to be discovered on this species. From one side the frequent use of digital citizen-science, in the last few years, triplicates here the detail held by traditional institutions (637 citizen observations

over the 239 records from literature and museum specimens) and this detail appears to be affordable for 97% of correct identifications over 178 different users-identifiers. Both citizen and science records appear to be however biased. From the distribution map (Fig. 1), while the coasts of Southern Europe show an almost continuous presence, in North Africa it seems very discontinuous, except where it has been studied. Both in Egypt and Tunisia, for instance, where the presence of *I. oratoria* has been specifically studied (Okely et al, 2020 and Ouni et al., 2018) it appears not significantly different from e. g. Southern Italy or other European Countries. The presence of completely blank areas in North Africa, may suggest a large underestimation for all this side of the Mediterranean basin.

Knowledge affects conservation, and from this side citizen science records seems to be a good tool to evaluate and integrate scientific records, when scarce or doubtful. Most of the conservation status of praying mantids under IUCN standards (Battiston, 2015) currently come from their Extent Of Occurrence (EOO) parameter. If we compare the EOO calculated on scientific records (4,636 km²) and records from citizen science (4,905 km²) in the Mediterranean area, (Fig. 4) they are very similar even if not well overlapped. Both of them lead to a Least Concern conservation category, but both need to be considered to have a realistic idea of the species distribution in the real world.

Even if the wide distribution of this species and its conservation status as Least Concern (Battiston, 2020) can be confirmed in a large scale, the presence of fragmented and not abundant populations, as well as the relationship with specific vegetation patterns or species, should be considered in a local scale in future studies and conservation assessments.

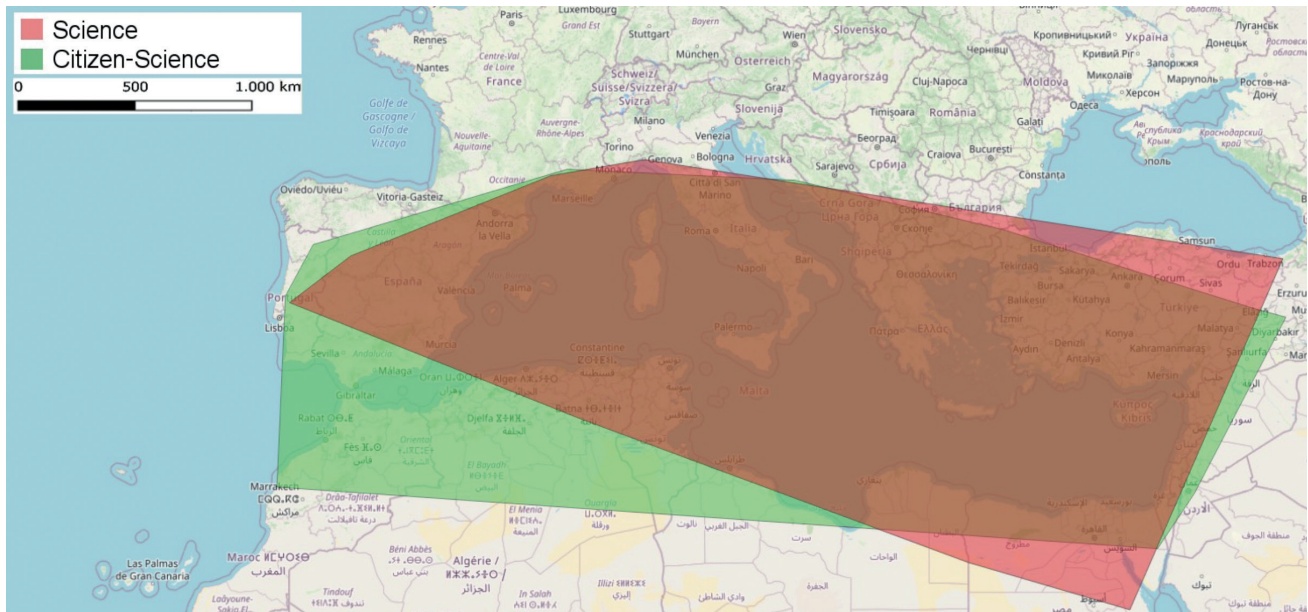


Fig. 4 – Comparison of the Extent Of Occurrence (EOO) of the Mediterranean populations of *Iris oratoria* calculated on scientific records (red polygon) and on records from citizen science (green polygon). Base map: OpenStreetMap.

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