

Design and preparation of a thematic exhibition on alien species at the Museum of Zoology of the University of Catania (Italy)

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ABSTRACT

As part of the Interreg FAST (Fight Alien Species Transborder) project, in which the Zoology Museum of the University of Catania (Italy) is involved, in the Museum main room a thematic exhibition relating to alien species, also equipped with interactive supports, has been planned. This action is part of the communication strategy of the aforementioned project, providing for the promotion of Citizen Science initiatives that bring all citizens closer to this problem, increasing their awareness and participation. Some of the most representative and iconic animals linked to this issue will be exhibited within this space. Visitors will be able to observe both vertebrates such as the Nutria (*Myocastor coypus* Molina, 1782) or the American pond turtle (*Trachemys scripta* Thunberg in Schoepff, 1792), and invertebrates such as the Red palm weevil (*Rhynchophorus ferrugineus* Olivier, 1790) or the Louisiana red crayfish (*Procambarus clarkii* Girard, 1852). Also, a large poster illustrating all the species of alien birds in Europe will complete the exhibition, which will also be accompanied by information panels in Italian and English regarding not only the animals on display but also the aims and objectives of the FAST project. Adjacent to the exhibition space an 80-inch touch screen monitor will be installed with a software, also for children, for the recognition of native and alien species, accompanied by information collected in a database on alien invasive species present in Sicily and in Malta.

KEY WORDS

Museum of Zoology; alien species; museology.

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INTRODUCTION

FAST project is part of a broader European strategy for the protection of the biodiversity. The European Commission, given that about 25% of European wild species are at risk of extinction, has adopted a new strategy until 2020 addressing the loss of the biodiversity and the degradation of the ecosystem services, as well as their restoration, as far as possible, on the Union’s territory.

According to EU Biodiversity Strategy for

2020, to which the project is inspired, biological invasions are regarded as the second most important cause that threaten biodiversity (considered the first driver on islands), and represent an environmental, economic and social problem at local and global level.

One of the objectives of the above-mentioned strategy is to fight against accidental introduction and naturalisation of alien invasive species (AIS) and harmful pathogens to indigenous plants. According to EU Biodiversity Strategy for 2030, the

release rate of AIS in Union's territory has increased in recent years. In fact, of the 1,872 species now considered endangered in Europe, 354 are threatened by alien invasive species, therefore about the 15%.

The implementation of the Union Regulation on alien invasive species and other relevant legislation and international agreements are necessary in order to minimize and, where possible, eliminate the introduction and establishment of alien species in the European environments. It also needs to control established invasive alien species and to reduce the number of red-listed species threatened by them by 50%.

The FAST project, in full coherence with the European strategy, will counter the introduction, naturalization and spread of invasive alien species that damage biodiversity in Sicily and the Maltese Archipelago. It will also implement experimental protocols for the containment and eradication of AIS within some Maltese and Sicilian Natura 2000 sites and will suggest guidelines, good practices and rules to be adopted in national and European legislation.

Schematically, the aims of project are the following:

1. Individuation of alien species regarding plants, animals and phytoplasmata already present in Sicily and Malta with identification of those at risk of introduction;
2. Identification of the ecological characteristics of each alien species and their potential impact on natural and semi-natural habitats;
3. Identification of pathways and methods of introduction and diffusion;
4. Formulation of criteria to classify alien species in an invasiveness risk scale;
5. Census of alien species present within the chosen Natura 2000 sites;
6. Identification of target AIS on which to carry out containment/eradication interventions;
7. Identification, within the chosen Natura 2000 sites, of intervention areas;
8. Preparation of action projects and related environmental impact reports, aimed to get the authorizations by the competent authorities;
9. Execution of the control/eradication and environmental restoration interventions in the chosen areas;

10. Monitoring of the actions;
11. Dissemination of results by the organization of public events.

In this context, the Zoology Museum of the University of Catania has taken a leading role in informing the public about this significant problem by setting up a thematic exhibition in its main hall dedicated to alien species, with the aim of raising awareness and actively involving the public in the fight against this growing threat.

MATERIAL AND METHODS

The design and setup of the thematic display on alien species has resulted from a multidisciplinary approach involving experts in zoology, conservation biology, environmental educators and IT technicians.

The selection of alien invasive species exhibited was based on scientific criteria considering the impact of the chosen species on local ecosystems and their relevance to the Sicilian and Maltese contexts and beyond. Furthermore, whenever possible, specimens of easily identifiable species were chosen, even by non-professionals, and generally well-known species.

The thematic display has been designed to offer a combination of static exhibitions and interactive supports to provide an engaging and informative experience for visitors. Targeted educational content has been developed, supported by bilingual informational panels, illustrating not only the systematic and ecological characteristics of the exhibited alien species, but also the objectives and activities of the FAST project.

The thematic exhibition will present a selection of animals, both vertebrates and invertebrates, which have become emblematic for defining and highlighting the importance of alien species and their impact on local ecosystems.

Among vertebrates, visitors will be able to observe specimens of Nutria (*Myocastor coypus*), Beaver (*Castor fiber*), and American pond turtle (*Trachemys scripta*), all species that have colonized and altered aquatic habitats in invaded territories significantly, causing considerable economic damage to humans and reducing the presence of many native species. These animals, originating from other

parts of the world, have been transported to new territories, sometimes intentionally but often inadvertently, due to various human activities and now represent a threat to local biodiversity. A large poster illustrating all the species of alien birds in Europe will complete the exhibition (Fig. 1).

Among the exhibited alien invertebrates, there will be specimens from existing museum collections as well as enlarged reproductions in plastic or resin of various insects, including the Red palm weevil (*Rhynchophorus ferrugineus*) of which the biological cycle is shown (Fig. 2), the Asian tiger mosquito (*Aedes albopictus*), and the Argentine ant (*Linepithema humile*). Also, some crustaceans such as the Red swamp crayfish (*Procambarus clarkii*) or the Blue crab (*Callinectes sapidus*), the latter considered one of the hundred most invasive alien species in the Mediterranean, will be showed. For each exhibited alien species, descriptions will be provided on cards in both Italian and English language, accessible via QR codes, covering not only their systematic and

ecological aspects but also the impacts on terrestrial and aquatic ecosystems, highlighting how their presence has led to a significant loss of local biodiversity and caused significant economic damage to human activities. The database of alien animal species present in Sicily and Malta includes about 570 species, among these more than 130 are to be considered as actually or potentially invasive.

All these species, often introduced accidentally or deliberately, have had devastating consequences on the surrounding environment, altering ecological balances and threatening both native animal and plant species.

An 80-inch touch screen monitor will be installed (Fig. 3) with a software, also for children, for the recognition of native and alien species, accompanied by information collected in a database on alien invasive species present in Sicily and in Malta.

For each AIS animal it will be possible to consult on the touch screen a card (see Figs. 4, 5) with at least one photo, which will report:

1. Main synonyms;
2. Common name in English;
3. Short description;
4. Place of origin and global distribution;
5. Distribution, frequency and first record for Sicily and for Malta;
6. Habitat or preferred invading habitat;
7. Introduction source;
8. Ecology;
9. Possible control methods;
10. Invasive category/local potential threat;
11. Remarks;
12. Literature.

RESULTS

The thematic display should attract a wide audience of visitors, including students, families and nature enthusiasts, who show significant interest in understanding what biodiversity is and how it is endangered by biological invasions and the possible solutions.

The use of interactive supports, such as a large 80-inch touch screen monitor, and the possibility to consult the database on invasive alien species present in Sicily and Malta should facilitate the active



Figure 1. FAST project logo and poster showing the aliens species of birds in Europe.




Figure 2. Box showing the life cycle of *Rhynchophorus ferrugineus*



Figure 3. The 80-inch touch screen monitor with the book covers on the alien invasive species in Sicily and Maltese Archipelago.

Aedes albopictus **(Skuse, 1894)**

(Arthropoda: Insecta: Diptera: Culicidae)



Main synonyms
Stegomyia nigritia Ludlow, 1910; *Stegomyia quasinigritia* Ludlow, 1911; *Stegomyia samarensis* Ludlow, 1903

Common names
Asian tiger mosquito; Tiger mosquito; Forest day mosquito.

Short description
Adults of *Aedes albopictus* can grow from 3-10 mm in body length. Most specimens are considerably smaller with males being, on average, 20% smaller than females. *Aedes albopictus* is easily recognised by the bold black shiny scales and distinct silver white scales on the palpus (mouthparts for touching and tasting) and tarsi (legs); scutum (back) is black with a distinguishing white stripe down the centre, beginning at the dorsal surface of the head and continuing along the thorax. Abdominal tergites are covered in dark scales. Legs are black with white basal scales on each tarsal segment. The abdomen narrows into a point, characteristic of the *Aedes* genus. Adult males have plumose antennae and mouthparts modified for nectar feeding.

Place of origin and global distribution
Aedes albopictus is native to the tropical and subtropical areas of Southeast Asia, including India and the Pacific Ocean. During these

last 40 years it has spread to North, Central and South America, parts of Africa, northern Australia, and several countries in Europe with an almost cosmopolitan distribution. Since its first appearance in Albania in 1979, it was reported in several European countries including Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, France (including Corsica), Germany, Greece, Italy (including Sardinia and Sicily), Malta, Monaco, Montenegro, the Netherlands, San Marino, Serbia, Slovenia, Spain and Switzerland) and Turkey.

Distribution, frequency and first record for Sicily
Aedes albopictus was recorded for the first time in Sicily in the city of Palermo (Liotta & Matranga, 2004) in 2003 and is now well-distributed and very common throughout the island.

Distribution, frequency and first record for Malta
In Malta, *Aedes albopictus* was first recorded concurrently by Buhagiar (2009) and Gatt *et al.* (2009) and since then it became a widespread and well-distributed species throughout the Maltese Islands.

Habitat or preferred invading habitat
Aedes albopictus can be found in small, still bodies of water such as rainwater which has accumulated in tyres, barrels, drinking troughs, overflow dishes for potted plants as well as tree-holes.


Introduction source
The spread of *Aedes albopictus* is associated with two primary sources; transport of old car tyres and sea-trailer horticultural imports, such as lucky bamboo (*Dracaena sanderana*) from China. Eggs are known to withstand desiccation and therefore their successful transportation in a variety of containers is possible and effective.

Ecology
As with many other mosquitoes, larvae of *Aedes albopictus* develop in freshwater, adult males feed on flower nectar while adult females require blood meals for the development of eggs. Adult females will persistently bite a wide range of vertebrates during hours of daylight, preferentially attacking mammals. The Asian tiger mosquito is known to be a significant biting nuisance, with the potential to become a serious health threat as a bridge vector of zoonotic pathogens to humans. In fact, it is a known vector of chikungunya virus, dengue virus and dirofilariasis. Eggs are drought-resistant and can be laid outside of water, such as in soil, where repeated submersions may cause them to hatch. In various regions of Sicily, the flight time has been recorded from February/March to October/November, depending on the latitude and seasonal climatic changes. Larvae are active

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Figure 4. An example of information sheets on invasive alien species in Sicily and Malta (*Aedes albopictus*).

Trachemys scripta **(Thunberg in Schoepff, 1792)**



(Chordata: Reptilia: Testudines: Emydidae)

Main synonyms
Testudo serrata Daudin, 1802; *Emys vittate* Gray, 1831; *Emys elegans* Wied, 1839; *Emys cumberlandensis* Holbrook, 1840; *Emys sanguinolenta* Gray, 1855; *Trachemys lineata* Gray, 1873

Common names
Read-eared slider turtle, Slider terrapin, Read-eared terrapin

Short description
It is a medium-sized freshwater turtle (13-20 cm in length, but adult females can even reach 30 cm), characterized by a more or less elongated red or yellow spot on both sides of the head and by the neck with yellow streaks. The plastron is yellow and may have dark green or black spots and ocelli. The carapace in the juveniles is olive green

or brown and becomes progressively darker as the age progresses. The skin is greyish, green or brown, with yellow streaks. The legs are webbed, well adapted to aquatic life. Males are generally smaller than females, with a longer and more robust tail, distinctly longer claws, and slightly concave posterior plastron.

Place of origin and global distribution
The original range includes the southeastern regions of the United States and the areas around the Gulf of Mexico. Introduced worldwide, it has been reported from the wild in Europe, Japan, Southeast Asia, West Indies, Australia, New Zealand, and America (in regions where it is not native).

Distribution, frequency and first record for Sicily
First record back to 1993 (Lo Valvo, 1998). The species is frequently reported and has a wide but fragmented distribution. To date, no evidence of the presence of reproducing populations of *T. scripta* is confirmed in Sicily. The diffusion of the species is due to the continuous release of adult or sub-adult specimens in nature. It is very probable, however, that small stabilized nucleuses are present in Sicily, thanks to favourable climatic conditions. Egg layings are documented at Lake Pergusa, and a population with an unknown number of specimens is present at the mouth of the Irmínio River.

Distribution, frequency and first record for Malta
Observed in both Malta and Gozo (Speybroeck, 2007), but without further indications. Despite several introductions, there is no evidence of reproducing population to date in the Maltese Archipelago. The reports deserve further confirmation for an assessment of the distribution and frequency of this species in the Maltese Archipelago.

Habitat or preferred invading habitat
It is a wetland-bound aquatic turtle for which nearly any type of water body can provide a suitable habitat. Its favourite habitat is represented by bends in watercourses, marshes and ponds with rich submerged vegetation, muddy bottom and the presence of sites suitable for thermoregulation, but it is also found in artificial water basins. The intentional release of specimens has occurred mainly in urban and suburban areas, but also in agricultural contexts and many natural and semi-natural environments.

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Figure 5. An example of information sheets on invasive alien species in Sicily and Malta (*Trachemys scripta*).

involvement of visitors in the recognition and reporting of invasive species in their local areas, through a citizen science approach.

This method, in which non-professionals, often in collaboration with professional scientists or scientific institutions, collect and contribute to enriching project data, was one of the main objectives of the FAST project.

The Museum of Zoology, thanks to the thematic display dedicated to alien species and the presence of various zoologist specialists participating in the project, will allow for continuous exchange of data and information between the public and scientists, enabling the project to have broader data collection and, concurrently, increased awareness and expertise among citizens on issues related to the presence of alien species.

DISCUSSION

The integration of citizen science and innovative and interactive educational tools within the thematic exhibition should represent an effective model for involving the public in the conservation of biodiversity and in the dissemination of the results of the FAST project, including actions to combat the introduction of species alien.

However, it is essential to recognize that awareness alone is not enough and concrete actions will also be necessary to manage and limit the spread of exotic species. The active involvement of local communities is essential for the success of such efforts and although thematic exhibitions such as this offer an important starting point for promoting public involvement and collaboration in the management of alien species, interventions will still need to be carried out in schools, together with events

aimed at the general public to increase the level of knowledge and awareness on this issue. Also, good practices and guidelines to contrast the introduction of alien species will be publicized in the exhibition of the Zoology Museum to indicate behaviors and practices suitable to fight the phenomenon.

CONCLUSIONS

The thematic display on alien invasive species at the Zoology Museum of the University of Catania represents an essential tool in the fight against alien species, providing the public with knowledge and practical tools to recognize and manage them.

An integrated approach to awareness and environmental education is crucial for promoting greater awareness and action in biodiversity protection. Continuing to invest in initiatives of this kind is very important to addressing the growing threat of alien species and preserving the biological richness of our ecosystems for future generations.

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