

Can a new project remove **THE LIONFISH** from the Mediterranean?

By Demetris Kletou, Periklis Kleitou and Jason Hall-Spencer.

Biological pollution is one of the major threats to global biodiversity and it can profoundly disrupt ecosystem function. Marine invasive species are particularly difficult to control due to a lack of barriers to their spread. One of the most ecologically harmful marine invasions to date is the rapidly expanding population of non-native lionfish (*Pterois* sp.) in the western Atlantic. These fish have had marked ecological impacts throughout the Caribbean and in some areas lionfish increases have coincided with significant regional declines in native fish species biomass.

Lionfish are highly fecund; they mature within a year and then spawn every four days year-round. They can produce two million buoyant eggs per year and these develop into pelagic larvae that disperse widely on currents. The adults have anti-predatory venomous defences and an ability to prey upon a wide range of fish and invertebrates, a combination that makes lionfish rapacious invaders. The lionfish problem got out of control off Florida and in the Caribbean due to a slow management response in developing and implementing an eradication plan.

A lionfish invasion is now underway in Europe. Two decades after their first appearance in the Mediterranean, a specimen was caught off Lebanon in 2012 and in just four years, lionfish became established around Cyprus, Greece, Lebanon and Turkey.

Only two specimens were caught in Cyprus in 2013, by trammel-net fishermen. In 2014 and 2015, there were many more verified reports and now lionfish are commonly seen by fishermen and divers around Cyprus. In 2016, eleven

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Adult lionfish *Pterois miles* photographed at Cape Greco, Cyprus at 10 m depth. © MER Lab.

lionfish were seen on a single dive at Cavo Greco, an EU Natura 2000 Marine Protected Area. Our research team collected two juveniles (around 2-3 cm) from this area: the first confirmed evidence that lionfish are reproducing in the Mediterranean. The lionfish population around Cyprus forms the largest known reproductive population in the Mediterranean and poses a serious ecological threat that has raised public calls for immediate action.

Clearly, current environmental conditions are now suitable for lionfish reproduction off Cyprus. Continued warming of the Mediterranean basin increases the risk of a speedy invasion; single adult fish seen off Italy and Tunisia in 2017 confirm they are spreading westwards. To stand any chance of controlling this invasion the competent authorities and relevant stakeholders must work together to combat the problem at this early stage. Although it may already be impossible to eradicate the lionfish from the Mediterranean, it is feasible that its impact on priority habitats and biodiversity hotspots can be minimized.

However, no concrete actions are yet in place to deal with the lionfish invasion. Some view it as an attraction that will boost dive tourism and many spearfishers avoid lionfish as they do not know how to safely handle this venomous fish. Yet there is hope. An EU LIFE Nature and Biodiversity project, RELIONMED aiming to REmove LIONfish from the MEDiterranean, started in September 2017. The project includes the University of Cyprus and the University of Plymouth, as well as the private sector (Marine & Environmental Research Lab Ltd.), a local NGO (Enalia Physis) and the Department of Fisheries and



Juvenile lionfish photographed at Cape Greco, Cyprus, and right: the same individual for scale. © MER Lab.

Research digests

Marine Research of Cyprus. RELIONMED aims to set up a line of defence against the lionfish invasion by demonstrating early detection, rapid response and effective management of marine coastal habitats off Cyprus.

The four-year project plans to enlist citizen scientist and stakeholder participation in surveys that increase awareness, and motivate, train and equip divers and fishermen to participate in removals. We will assemble and equip teams to demonstrate how to remove lionfish from Marine Protected Areas and from areas where they aggregate and breed. We will also explore the market potential of lionfish products to help sustain removal efforts. The project will also develop tools and guides for managers in neighbouring countries also affected by the lionfish invasion.

As we will be learning on the job, we will need help to design and promote effective ways in which to mitigate the impacts of this lionfish invasion. Only by working together is there a chance of protecting diverse Mediterranean coastal systems, and the fisheries they support, from this invasive predator.

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Preventing a lionfish invasion in the Mediterranean through early response and targeted removal (LIFE16 NAT/CY/000832). With the contribution of the LIFE financial instrument of the European Union / www.ec.europa.eu/life



Further Reading

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Saving the Solent one oyster at a time

By Luke Helmer, Joanne Preston, Simon Harding and Morven Robertson.

Coastal and estuarine environments have been subject to anthropogenic pressures for thousands of years. However, since the industrialisation of fishing in the late 19th century, many of the habitats and species present in these exploited environments are at a very real risk of collapse. Considered alongside other detrimental impacts such as poor water quality from sources including sewage treatment plants and agricultural

runoff, the outlook can appear bleak.

Finding solutions

Restoration of native oyster populations and habitats is one of the potential solutions being explored to not only improve water quality and enhance biodiversity, but also to provide jobs and income for local communities in the long term. Already well established in the US, native oyster restoration is gaining momentum in other parts of the world

due to the similarity in the problems experienced by many species of oyster.

The Solent Oyster Restoration Project—one of many restoration efforts that have sprung up across Europe—began in 2014 with the intention of restoring the European flat oyster (*Ostrea edulis*) populations in the area that separates the Isle of Wight from mainland England (see Fig. 1).

Once supporting the largest oyster fishery in Europe, the Solent's oyster population is currently in a very poor state. A chronic reduction in the population, followed by an acute decline in landings from 200 to 20 tonnes over a five-year period (2007-2012), led the Southern Inshore Fisheries and Conservation Authority (Southern IFCA) to close the fishery in 2013. The IFCA approached the Blue Marine Foundation (BLUE), a UK-based marine conservation charity, to help address the issues surrounding the collapsing fishery. BLUE conducted a feasibility study and developed a management plan,



Figure 1. Solent experiment locations for the pilot study (light blue) and expanded study (light blue + dark blue). © Luke Helmer.