

HO19 Managing the Caribbean lionfish invasion

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Two species of lionfish (*Pterois volitans* and *Pterois miles*) that are native to the Indo-Pacific have become invasive in the western Atlantic. Invasive lionfish were first recorded off the coast of Florida in the 1980s and are now found along the east coast of North America, in the Caribbean Sea and in the Gulf of Mexico. Lionfish invaded Honduras more recently, with the first individuals seen in 2009.

The hunting behaviour of lionfish, which involves flaring the pectoral fins, undulating the dorsal spines and occasionally blowing jets of water at prey, is unlike any other predator in the Caribbean. For this reason, native fish may not recognise lionfish as a predator, allowing lionfish to consume prey at much higher rates than native predators. This has led to declines in native fish abundance, richness and recruitment across the invaded range. Lionfish also negatively impact the feeding behaviour of herbivorous fish and may even have been the cause of a phase-shift from a coral-dominated to an algal-dominated reef in the Bahamas.

Lionfish occupy a range of habitats in the invaded range including coral reefs, seagrass, mangroves, estuaries and man-made structures. Lionfish are also found on deep reefs down to over 300 m and have been observed at a maximum depth of 250 m in Honduras. Lionfish are generally said to occupy structurally complex habitat, but the definition of complexity, and the scale at which it is measured, differs between studies. In the last two years Opwall has been researching lionfish habitat preference in more detail using recently developed 3D modelling methods. This year we will continue with the 3D modelling and may also be recording additional metrics of habitat complexity to gain a clearer picture of lionfish habitat preference.

In both their native and invaded range, lionfish are often found in pairs or small groups. Several papers have acknowledged this aggregating behaviour and mentioned the composition of these groups, but until Opwall started investigating it a few years ago there had been no papers dedicated to studying aggregation behaviour. We are now starting to understand why these groups might form but there is a lot of research still to be done.

Because of the negative effects that lionfish exert, and because they have no natural predators, they are currently managed by culling. Although complete eradication of lionfish in their invaded range is unlikely, studies have shown that local management efforts are effective at reducing lionfish density and allowing native species to recover. However, there are a few problems with current culling methods. Culling is mainly limited to shallow water (<30 m) due to the cost and training requirements of diving deeper. Culling may also lead to lionfish being less active and hiding deeper in the reef, making them more difficult to find. Lionfish traps are a possible alternative that will increase the depth limit of culling and reduce search times by divers, but these are only in the initial stages of development. By researching the ecology and behaviour of lionfish in Honduras, Opwall hopes to generate data that can be used to inform and improve lionfish management.

This project will be based in Tela, on the north coast of Honduras. Students will dive at Banco Capiro, an offshore reef system at depths of 10-20 m. Banco Capiro has unusually high hard coral cover

compared to other Caribbean reefs, including nearby reefs in Tela bay. Banco Capiro has very low culling pressure and diver presence, with culling restricted to the Opwall field season.

Students on this project will be involved in searching for lionfish on the reefs, recording data underwater and then dissecting the lionfish back at the lab. At the start of the field season we will assess lionfish abundance using belt transects. Once all the transects are complete we will go on lionfish hunting dives, allowing us to cover a much wider area of the reef and collect more lionfish. When a lionfish is spotted on the reef we record depth and number of lionfish in the aggregation, in addition to 3D modelling the reef and recording a range of behavioural and habitat variables. Once the lionfish have been speared we transport them back to the lab and dissect them the same day. We record a range of variables such as length, weight, sexual maturity and stomach contents.

Students will be involved in all aspects of data collection but are free to pick and choose which pieces of data are relevant to their project. Students on the lionfish behaviour project will be collecting some lionfish data from another reef system in Tela bay, so it may be possible to do a comparison between the two reef systems. Opwall has been collecting most of this data for the last four years, allowing students to assess changes over time where appropriate. Students can take this project in a variety of directions such as impacts of culling, lionfish habitat preference and the effects of lionfish on native prey populations.

Reading list

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