Scientists investigate the uncontrolled expansion of invasive blue crabs in the Mediterranean

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The American blue crab (Callinectes sapidus) is an invasive voracious alien species, with no known predators and with high reproductive and survival rates, which has now spread throughout the Mediterranean. Since it appeared in the Ebro Delta in 2012, this crab native to the

American Atlantic has expanded via sea, rivers and wetlands all over the region of Valencia.

University of Alicante Marine Research Centre (CIMAR) scientist Carmen Barberá reports on a collaboration between the scientific community and management bodies to define control measures; however, blue crab expansion is faster than research activity and the efforts made by scientific bodies. This crab has potential high fertility and survival rates, which could also be the reason why it has been established in this area successfully.

Commercial fishing is one of the most affected sectors, as the crab accidentally destroys the nets when they are caught. The study was carried out as a result of a request made by the Guardamar Fishermen's Association. Members fish king prawns and cuttlefish with gill nets in the area of Guardamar and Santa Pola during the summer. According to the researcher, one of the measures to control its expansion could be to issue permits to fish with more specific fishing baskets, as happens in the American Atlantic, where the crab originates. The researchers are working with fishermen to try out different types of fishing baskets.

The problem is similar in other geographical areas. In La Albufera in Valencia and in Mar Menor, the problem is even worse all year round because fisherman also work in winter.

Follow-up

The University of Alicante-Santa Pola Town Council Marine Research Centre (CIMAR) is actively collaborating in the follow-up of the distribution of this invasive species in the Santa Pola Salt Lake Nature Reserve, where they were caught for the first time in 2014.

At the moment, the study is focused on determining the migrations made

by the crab from the sea to fresh water and vice versa for reproduction purposes. Its behavioural pattern is known in the natural distribution area in coastal and estuarine areas—females move to the sea to lay their eggs during the summer. Eggs require some salinity for the larvae to hatch. In the early Autumn, females migrate with juveniles to freshwater streams. Barberá points out that one of the objectives is to define very well where they are at all times.

In this regard, the CIMAR works with the Guardamar Fishermen Association, whose traditional fleet accidentally catches crabs at the Segura River mouth, a fishing ground for king prawns with gill nets. This crustacean is thought to be one of the crab's favourite prey when they migrate to the sea.

The researcher states that it is difficult to determine how this species has expanded from the Ebro Delta toward the south, as water currents do not go that way. Human factors are likely responsible, such as the ballast water of ships. In terms of ecological impact, the crabs can live higher in wetlands and salt lakes, as they are more closed ecosystems where any change has more intense effects. However, the socioeconomic problem is greater in the sea since it affects fishermen by destroying nets and making them waste days of work.

Aim of study

The aim of the study is to get to know this species' ecology in these new geographical areas and environments that they occupy as an alien species. This is dangerous because the areas may not have limiting factors to the growth of crab populations, such as competitors, predators, temperature, etc. To this end, a simultaneous sampling plan has been designed in different connected ecosystems, such as the fresh waters of El Hondo in Elche, wetland, the brackish and hyper-salinated water channels of Salt Lake Nature Reserve and the estuarine-marine waters of

the Segura River mouth in Guardamar. The results of the study will be published very soon, while researchers continue to work on it. Isabel Esteso, currently working on her master's final project on the blue crab, is one of the researchers involved. In her study, among others, she collects data such as water temperature where the crabs are found, as well as oxygen, salinity and pH levels.

Researchers know exactly where the crab communities are located as they have been sampling from the Segura River mouth (in Guardamar) to El Hondo in Elche and it has shown up everywhere, according to the CIMAR scientist.

In order to answer questions such as what they eat, what eats them, what the growth limits of their populations are, when and how they are captured most efficiently, how profitable their commercialisation is, and whether this would serve as a control measure, CIMAR has requested a national project—Ecology and Impact of the Atlantic Blue Crab in the Spanish Mediterranean Coastal Lagoons and Adjacent Waters (ECESIS). Polytechnic University of Valencia and the Spanish Oceanographic Institute (Murcia Oceanographic Centre) are also contributing, and it will be coordinated by researcher Silvia Falco Giaccaglia, from the Polytechnic University of Valencia.

There are many factors to consider. According to records in CIESM Atlas of Exotic Species in the Mediterranean, the blue crab is an invasive species already established in the Mediterranean, and any wrong action could further its expansion.

The blue crab was first detected in the province of Alicante, both in Guardamar and Santa Pola, in 2014. Two years earlier, in 2012, it was seen in the Ebro Delta of the Eastern Mediterranean. It has been known in the area of Tunisia, in Turkey, since the 1940s. However, this crab is originally from American North Atlantic. In the U.S., it is just another

fishing species, although there, fishermen use special fishing gear, as explained by Carmen Barberá. How the species came to the Mediterranean is still unknown. Researchers think that the most likely theory is that they arrived in the ballast waters of ships. However, it is also known that companies experimented with blue crab farming in Turkey. The fact is that right now, it has spread all over the Mediterranean and Strait of Gibraltar.

The blue crab is known for being extremely aggressive, with hard short claws and strong jaws. Researchers have analyzed the content in their stomachs, and know that these crabs sometimes eat each other. On the other hand, due to their accelerated metabolism, involving rapid digestion, the analysis of the content is difficult. According to researchers Carmen and Isabel, everything they have digested prior to the bait is difficult to detect in their stomachs. The scientists also said that they still do not know whether they are feeding in freshwater or in the sea; it seems that they feed mainly on king prawns.

Some of these crabs can be more than 20 centimetres in length, from end to end of their legs, and adults can weigh more than 450 grams. They are hidden in daylight and fish at night. Scientists have not noticed interaction with other target species, but this cannot be analysed easily as fishermen avoid areas where more crabs are found.

They have been found in the sea during the summer and then they migrate toward fresh water in gullies, rivers, the salt lake reserves from Santa Pola to El Hondo in Elche.

They winter in the brackish water of the Albufera, and they move to the marine area during the summer. In Murcia, the crabs are in the Mar Menor, which is hypersaline. In this area, the fishermen are also having a lot of problems, as they fish for king prawns and the nets are very fine. The crabs are located at the river mouth and the nets break if they get

caught. In the North Atlantic, it is known that blue crabs have predators, but it is not known if they are hunted in the Mediterranean.

More information: P. K. KARACHLE et al. New Mediterranean Biodiversity Records (March 2016), *Mediterranean Marine Science* (2016). DOI: 10.12681/mms.1684