

# Three Crabs, and a Gozo Connection

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## Mediterranean Shore Crabs

The three crabs in question are the three species of shore crab belonging to the genus *Pachygrapsus* that occur in the Mediterranean. Shore crabs are marine crustaceans that are adapted to live on the shore, which is the interface between the terrestrial and the marine environments. Shores are very difficult environments to live in for marine animals because not only is the shore periodically exposed to the atmosphere, but wave action batters the shore and anything that lives there. Key problems that shore animals have to face are the tendency to dry up (desiccate) when they are exposed to the air, the high temperatures especially in summer, the increased salinity as the water around them evaporates, the difficulty in obtaining oxygen using gills that need water to function, and the constant danger from terrestrial predators which forage for food on the shore, in addition to marine predators when submerged. On top of this, the shore is a very dynamic environment, especially in winter, when waves pummel shore dwelling creatures almost constantly. During rough seas, any creature living on

an exposed shore can expect to be impacted by tens of litres of water every few minutes and considering that just one litre of water weighs one kilogramme, there is a very real danger of mechanical damage or of being swept away by the waves.

*Pachygrapsus* crabs live on rocky shores and are amphibious, being equally at home under the water and walking on land in that zone of the shore only wetted by sea spray. They are superbly adapted for this mode of life. In calm weather, these crabs forage for food along the waterline, both below and above it, and in rock pools. The crabs are omnivorous and browse on algae and any other vegetable matter and will feed on any small animal that they are able to catch; they will also take larger prey, if this prey is moribund. Additionally they feed on detritus (finely divided organic material) and scavenge on bulk organic matter, including the leftovers of shore users. The claws at the tips of their walking legs are strong and enable the crabs to gain a good hold on the rock even during moderately rough seas, however, when the sea gets really rough and there is danger of detachment, the crabs seek refuge



The Marbled Shore Crab *Pachygrapsus marmoratus* – a specimen from Ix-Xatt l-Aħmar, Gozo. [Photo by Stephen Mifsud © 2009].



*Pachygrapsus maurus* from Hondoq ir-Rummien, Gozo. The scale is in millimetres. [Photo by Ramon Grech © 2009].

under water in holes or crevices in which they jam their bodies tightly. Compared to other marine crabs that do not live on the shore, shore crabs are flatter and are very agile, being able to move at great speed in all directions. These are adaptations for beating a quick retreat at the least signs of danger, not just predators but also from a rapidly changing environment, and for fitting snugly in even very small crevices.

### Three Crabs

The commonest Mediterranean shore crab is the Marbled Shore Crab *Pachygrapsus marmoratus*. This crab is found throughout the Mediterranean wherever there are rocky shores and it is also found on the Atlantic shores of northwest Africa and on the European Atlantic coasts of Spain, Portugal and France as far as the entrance of the English Channel, as well as the Macaronesian islands<sup>1</sup>. The second commonest species, which has no common name,

is known as *Pachygrapsus maurus*. This species is found in the Macaronesian region and in the western Mediterranean where it occurs here and there along the Spanish coast, the Balearic Islands, France and the Tyrrhenian shores of Italy. It also occurs in the eastern Mediterranean but here it is much rarer and very patchily distributed in a few localities only that include the Ionian coast of Sicily, Greece close to the Strait of Otranto, Crete, and the southern coast of Turkey. It is not known at all from the Adriatic and the entire southern and eastern shores of the Mediterranean from western Algeria to the Turkish-Syrian border.

The third species is the Mottled Shore Crab *Pachygrapsus transversus* which is mostly a species of the tropical and subtropical Atlantic where it has a wide distribution on both east and west coasts. It occurs also in the Mediterranean where it has an odd distribution being found in Spain, in the central Mediterranean (Tunisia and Sicily) where

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<sup>1</sup> The Macaronesian islands are the Azores, Madeira and the Canary islands.



The Mottled Shore Crab *Pachygrapsus transversus* from Ix-Xatt l-Aħmar, Gozo. [Photo by Stephen Mifsud © 2007].

it is a rare species, and then more abundantly in the easternmost part of the east basin (Egypt, Israel, Lebanon, Syria, Cyprus, and a few spots in southern Turkey and the Aegean Sea). It has been suggested that the Mediterranean populations of *Pachygrapsus transversus* owe their origin to entry of this species from the east Atlantic either naturally through range expansion via the Strait of Gibraltar, or through human transport, at least initially; the latter hypothesis seems more likely given the very disjunct distribution and the lack of records from along the North African Mediterranean coasts.

### Shore Crabs of the Maltese Islands

Until very recently, it was thought that only the Marbled Shore Crab *Pachygrapsus marmoratus* occurred in the Maltese Islands. All previous works on Maltese crabs or on marine life only ever recorded this species, while in an extensive survey of local crabs that my colleague Edwin Lanfranco and I made in 1984, during which we examined many tens of shore crabs, we only found this

species. All shore crabs that I have seen since were also all *Pachygrapsus marmoratus*. All this changed three years ago when the Italian marine biologist Fabio Crocetta spotted a photograph of a crab posted on an educational internet website by another colleague, Stephen Mifsud, which was clearly not the Marbled Shore Crab but *Pachygrapsus transversus*, and he alerted us to the fact. Checking his records, Stephen Mifsud found that he had photographed the animal at Ix-Xatt l-Aħmar in Gozo in the summer of 2007. An expedition to Gozo was hastily organized in February of 2009 to look for this completely unexpected crab. We did not find any *Pachygrapsus transversus* on that first expedition, but we did find something even more unexpected – amongst the many individuals of the Marbled Shore Crab we examined, there were two from Hondoq ir-Rummien which appeared different. Close study of these specimens revealed them to belong to the third Mediterranean species of shore crab, *Pachygrapsus maurus*. A little after we made this discovery, Stephen Mifsud searched thoroughly the Xatt l-Aħmar site where he had photographed

*Pachygrapsus transversus* and managed to find two individuals of this species as well as a specimen of *Pachygrapsus maurus*. A little later still, one of my research students, Joseph Piscopo, who was studying the behaviour of the Marbled Shore Crab, brought me specimens of a crab he found that had a different colour pattern from that of the species he was studying, and these too turned out to be *Pachygrapsus maurus*. It seemed that all three Mediterranean species of shore crab were living on Maltese shores.

Given that shore crabs are very familiar and visible animals and that large numbers of naturalists and students have looked closely at the animals of local rocky shores, it seems unlikely that the two newly discovered species had been there all the time but nobody noticed them. To check on this my colleagues and I searched through as many old collections of specimens of shore crabs and photographs of crabs taken in the Maltese Islands as we could find. Although we examined a large number of crabs going back to the 1980s, they were all the common *Pachygrapsus marmoratus*, except

for a single individual of *Pachygrapsus maurus* collected in 1990 from Xghajra by one of my then research students, Adrian Mallia, during his studies of Maltese rocky shore life. In the meantime, Joseph Piscopo embarked on a survey of the rocky shores of all three main islands of the Maltese archipelago with the aim of mapping the distribution of the three shore crabs. After months of painstaking work he had a clear picture of the distribution of these animals.

As we expected, *Pachygrapsus marmoratus* was invariably present on all the rocky shores surveyed and was usually abundant, except on a few very exposed shores, where only a few individuals were encountered. *Pachygrapsus maurus* was much rarer and was found on eight of the 15 Gozitan shores surveyed, on a single shore on Comino, and on seven of 15 shores surveyed on Malta. Overall, this species was present at low to very low abundances on most shores except for two shores on Gozo and one on Malta which are very exposed to wave action. Of the three, the Mottled Shore Crab *Pachygrapsus transversus* was the rarest, being



The shore at Ix-Xatt l-Ahmar, Gozo, which is one of only two shores known to date where the three different species of *Pachygrapsus* co-occur in the Maltese Islands. [Photo by P.J. Schembri © 2009].

found on just three (two shores on Gozo and one on Comino) of the 33 shores investigated during this survey; moreover, on these shores, only one or two individuals were found. While too few individuals of *Pachygrapsus transversus* were found to draw any conclusions about their distribution, it is quite clear that *Pachygrapsus maurus* occurs in the largest abundances on those very exposed shores where the common species, *Pachygrapsus marmoratus*, finds it difficult to live.

### The Gozo Connection

Gozo features prominently in this account. Not only were *Pachygrapsus transversus* and *Pachygrapsus maurus* both first discovered on Gozo, but following the survey made by Joseph Piscopo, it resulted that the former only occurs on Gozo and Comino as far as we know at present. The western coast of Gozo is the most exposed in the whole of the Maltese Islands since it is subject to the full force of the prevailing north-westerly wind ('Majjistral' in Maltese) without any close by land to shelter it. Therefore, it is not surprising that of all the places where it occurs, *Pachygrapsus maurus*, which is apparently adapted to live on exposed shores, attains its highest populations on the sloping shores of the Dwejra area (the shores at Il-Port and Il-Qasir). The shores at Ix-Xatt l-Aħmar and at Il-Port have an additional significance. These are the only shores in the whole of the Maltese Islands where all three species of shore crab were found living together along the same stretch of shore. This gives rise to a very biologically interesting situation because where closely related species that exploit the same resources co-occur, there are usually some biological mechanisms operating to reduce competition between the different species. Investigating this phenomenon was one aspect of the research undertaken by Joseph Piscopo. He discovered that where *Pachygrapsus maurus* and *Pachygrapsus marmoratus* co-occurred, they occupied slightly different habitats; the former species stayed in pits mainly in the upper reaches of the shore in that part wetted by breaking waves, while *Pachygrapsus marmoratus* was found closer to the sea at or just below sea level.

There is one additional Gozo connection – Joseph Piscopo is Gozitan.

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