OBSERVATIONS ON THE ALIEN CRAB *PERCNON GIBBESI* (DECAPODA, BRACHYURA, GRAPSIDAE) FROM THE MALTESE ISLANDS

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Abstract
A preliminary account on habitat preferences, bathymetric distribution, population density, and aspects of the reproductive biology of the alien grapsid *Percnon gibbesi* in the Maltese Islands is given. This alien was first recorded from Malta in 2001 and has since established breeding populations in suitable habitats throughout the Maltese islands where of its preferred habitat types, upper infralittoral boulder fields or rock faces with a sparse algal cover, are available. The crab breeds in summer and recruits in winter. Female crabs may produce up to 30,000 eggs per spawning. Interactions with the native grapsid *Pachygrapsus marmoratus* were observed.
Keywords : Decapoda, Reproduction, Behaviour, Rocky Shores, Species Introduction.

Introduction
The subtropical crab, *Percnon gibbesi*, was first recorded in the Mediterranean Sea in 1999 contemporaneously from Linosa Island (Straits of Sicily) [1], Capo Passero (southern Sicily) [2] and Ibiza [3]. Records of its occurrence to date are from the western and central Mediterranean [4,5,6]. It was recorded from the Maltese Islands in 2001 [7]. We made observations on the habitat preferences, bathymetric distribution, population density, and egg production of this species in the Maltese Islands in order to assess if there were any differences in the biology of this species in Malta relative to other Mediterranean sites.

Method
Habitat preferences and bathymetric distribution were assessed by carrying out surveys at 23 sites around the Maltese Islands where preliminary observations indicated the crabs to occur. At 20 of the investigated sites, the population density in the preferred habitat was determined by counting the number of crabs in replicate $1m^2$ virtual quadrats. To estimate reproductive output, egg-masses from 30 ovigerous females were weighed and the number of eggs in triplicate sub-samples from each egg-mass was counted.

Results and discussion
All individuals of *P. gibbesi* encountered were wholly submerged and occurred between depths of 0.05m and 4m. The preferred habitats were similar to those reported from elsewhere in the Mediterranean [4,5,6], and consisted of submerged boulders covered by a thin microalgal felt, encrusting algae or algal turf, or rock ledges, crevices and vertical rock walls sparsely covered by macroalgae. Population density ranged between 1.6 $\pm$ 0.5 s.d. and 11.9 $\pm$ 7.1 s.d. crabs m^{-2} (Fig. 1) and was significantly higher (Kruskal-Wallis p <0.001, Dunn's pairwise test p <0.05) at Marsascala, Dahlet Qorrot and Hondoq ir-Rummien, where extensive areas of boulder habitat occurred at depths less than 4m that were not interrupted by unsuitable habitats such as homogeneous rocky or sandy bottoms or seagrass patches as in the other sites.

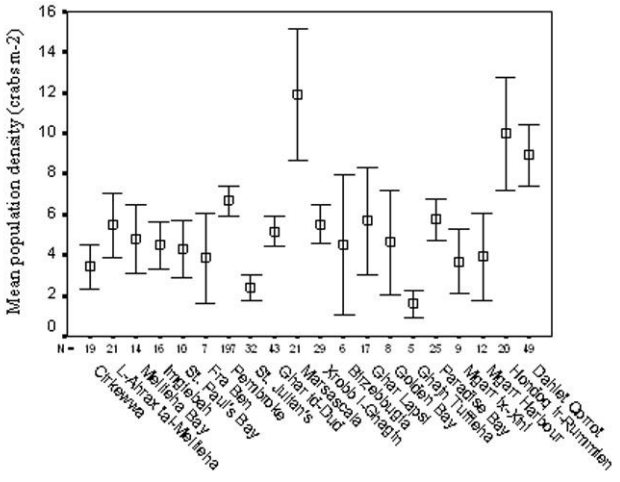

Fig. 1. Mean abundance (error bars represent the 95% confidence intervals) of *P. gibbesi* at 20 sites in Malta and Gozo.

Diurnal changes in abundance were investigated at Pembroke, where a two-fold increase between morning (counts made before 13.30h) and late afternoon (counts made after 16.00h) abundances (5.2 $\pm$ 3.4 crabs m^{-2} and 10.1 $\pm$ 5.7 crabs m^{-2}, respectively; Mann-Whitney U-test; p<0.05) was recorded hence supporting observations from Pantelleria [4] and Isola delle Femmine [5] that *P. gibbesi* becomes most active towards dusk.

We recorded berried females from June until the end of September, and juvenile crabs (carapace length $\leq$ 15mm) from October until March, suggesting that *P. gibbesi* breeds during the summer months and recruitment takes place throughout the winter. Egg brood size ranged between 254 (the total number of eggs in the smallest egg mass) and 32 040 $\pm$ 281 eggs and was found to be positively correlated with carapace length (r = 0.677, p <0.001, df = 27). High fecundity and the relatively long breeding season are factors that may have facilitated the rapid and successful spread of this alien species in the Mediterranean.

Contrary to reports by some authors [4,6], *P. gibbesi* was observed to coexist with the grapsid *Pachygrapsus marmoratus* and the xanthid *Eriphia verrucosa*, which are the two native species that occur in the same habitats. Again contrary to reports, *P. gibbesi* was observed to occasionally interact with *P. marmoratus* when the two approached to within c. 15cm. These observations suggest that in the Maltese Islands the alien species is a potential competitor for resources, mainly space, with the native syntopic grapsid. Studies are clearly necessary to assess and quantify the impacts of the alien on the Mediterranean marine systems where it has become established, including the risk of competitive exclusion of native species with similar patterns of resource utilization.

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