

# Is the *Carcinus maenas* population endangered due to competition with the invasive crabs, *Hemigrapsus* spp.?

Gothland Moâna<sup>1</sup>, Nicolas Spilmont<sup>1, 2</sup>, Lionel Denis<sup>1</sup>, Tarik Meziane<sup>3</sup> and Jean-Claude Dauvin<sup>4</sup>

<sup>1</sup> Laboratoire d'Océanologie et de Géoscience – LOG UMR CNRS 8187  
Université Lille Nord de France – Lille1, F-62930 Wimereux, France  
E-mail: [moana.gothland@univ-lille1.fr](mailto:moana.gothland@univ-lille1.fr)

<sup>2</sup> Environmental Futures Centre, Griffith University, Gold Coast QLD 4222, Australia

<sup>3</sup> Biologie des organismes Marins et Ecosystèmes, Département Milieux et Peuplements Aquatiques  
– BOREA UMR CNRS 5178, Musée National d'Histoire Naturelles, Université Pierre et Marie Curie,  
F-75231 Paris, France

<sup>4</sup> Université Caen Basse-Normandie, Laboratoire Morphodynamique Continentale et Côtière – M2C  
UMR CNRS 6143, F-14000 Caen, France

Being the consequence of the rise of maritime trade, the introduction of invasive species is one of the most important human perturbations disrupting coastal ecosystems, together with fishing, pollution, destruction of habitats and climate change (Jackson *et al.*, 2001). Invasive species can change the structure and the functioning of marine ecosystems (Grosholz, 2002) at all biological levels (genome, individual, population, species, communities and ecosystem) via predation, parasitism, pathogenic transfers, physical and chemical modifications of habitats (Beisel and Lévêque, 2010). Among the alien species identified in France, *Hemigrapsus takanoi* (Asakura and Watanabe, 2005) and *Hemigrapsus sanguineus* (De Haan, 1835), native from the north-western Pacific, have been reported on the intertidal zone of the French coast. Nowadays, they are observed from Mount-Saint-Michel Bay to the Belgium border (Dauvin and Dufossé, 2011; Gothland *et al.*, in revision). Locally, the endemic species *Carcinus maenas*, seems to regress in favour to *Hemigrapsus* species (e.g. Opal coast) but this is not a generality and the success of invasion does not appear uniform along the coast (e.g. *C. maenas* remains largely dominant in south of Boulogne-sur-Mer, to the Normandy and along the western coast of Cotentin). In this context, several reasons for this heterogeneity of the success of the invasion were identified by (i) studying the dynamics and biological traits of each species but also (ii) evaluating their food preferences. Thus, crab populations from five study sites were surveyed during 13 months. Thus, the densities, the ecological characteristics of their habitat (sediment nature), the breeding season and the period of recruitment, the sexual maturity and the longevity were evaluated. The fatty acids (FA) and stable carbon and nitrogen isotopic ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ) compositions of crabs and of several sources (11 including algae, gastropods, bivalves and polychaetes) were seasonally investigated to evaluate the food preferences of *C. maenas* and *Hemigrapsus*. We showed that *H. sanguineus* and *H. takanoi*, through their demographic behaviours corresponded to population with a “r-selected strategy” either more competitive for the conquest of the space than population with a “k-selected strategy” as *C. maenas*. We also underlined the presence of an interspecific competition for resource and the importance of the combination of density-dependent cannibalism and space competition in the nursery area of *C. maenas*, which contribute to the success of the *Hemigrapsus*.

## References

Asakura A., Watanabe S. 2005. *Hemigrapsus takanoi*, new species, a sibling species of the common Japanese intertidal crab *H. penicillatus* (Decapoda: Brachyura: Grapsoidea). *Journal of Crustacean Biology* 25 (2), 279–292.

Beisel J.N., Lévêque, C. 2010. Introductions d'espèces dans les milieux aquatiques. Faut-il avoir peur des invasions biologiques? Editions Quae, éditions Cemagref, Cirad, Ifremer, Inra, Versailles, France, Collection synthèses, 232p.

Dauvin J.C., Dufossé F. 2011. *Hemigrapsus sanguineus* (De Haan, 1837) (Crustacea: Brachyura: Grapsoidea) a new species in European waters: the case of the French English Channel coast (2008–2010). *Aquatic Invasions* 6 (3), 329–338.

Gothland M., Dauvin J.C., Denis L., Dufossé F., Jobert S., Ovaert J., Pezy J.P., Tous Rius A., Spilmont N., in revision. Habitat preference and population characteristics explain the distribution and colonisation ability of the invasive shore crabs *Hemigrapsus takanoi*. *Estuarine, Coastal and Shelf Science*.

Grosholz E. 2002. Ecological and evolutionary consequences of coastal invasions. *Trends in Ecology and Evolution* 17: 22–27.

Jackson J.B.C., Kirby M.X., Berger W.H., Bjorndal K.A., Botsford L.W., Bourque B.J., Bradbury R.H., Cooke R., Erlandson J., et al. 2001. Historical Overfishing and the Recent Collapse of Coastal Ecosystems. *Science* 293: 629–638.