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Short communication

The introduction of the Japanese Carpet Shell in coastal lagoon systems of the Algarve (south Portugal): a food safety concern

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Unofficial estimates indicate that 8.000-10.000 people can be directly involved in the commercial production of bivalve molluscs in the Algarve (South of Portugal). The most produced species is the Grooved Carpet Shell *Ruditapes decussatus* (Linnaeus, 1758). In favorable years, production of this clam can reach 7.000 tons (R. Cachola, personal communication). Most of the production is exported to western European countries, especially Spain. Small quantities are sold in local markets and consumed by resident population and tourists in restaurants and seafood festivals. The Algarve tourism industry is now emphasizing gastronomic tourism as an important complement for the sustainability of the activity (WTTC 2003). Clams are cultured in licensed bottom culture beds called "viveiros", located in the intertidal of the coastal lagoon systems "Ria Formosa" and "Ria de Alvor". Bottom culture beds are maintained by families or single people, a small number organized in associations/cooperatives, which exploit natural clam stocks or sow juvenile clams called seeds previously collected on natural banks and transfer them into the beds. When grown, clams are harvested by each owner. Contrarily to the situation in other European countries, where most of the seeds are produced in hatcheries, the bivalve industry in the Algarve is largely dependant from the natural supply of clams used as seed. In an attempt to maintain competitiveness on the open market with other national and international bivalve production regions, large quantities of seeds and adults of the Japanese Carpet Shell *Ruditapes philippinarum* (Adams & Reeve, 1850) have been imported by producers, at least since the later 1980's. More recently, 235 tons in 2002–2003 and 400 tons in 2003–2004 were imported from Tunisia through Spain.

Many ecological impacts from introductions of nonindigenous species into coastal environments have been described. Once well-established and widespread, introduced species are difficult to eradicate (Wasson et al. 2001). The most significant are the rapid and extensive geographical spread of introduced species (Galil 2000), the impacts on multiple species and ecosystems (Wasson et al. 2001), the rapid and extensive hybridization between introduced and native species (Ó Foighil et al. 1998), and transport of pathogens and disease (Leite et al. 2004). Regarding pathogens and diseases' transport, there is now evidence that *Perkinsus* spp. is being transported to the "Ría de Arousa" (northwest Spain) via the imported seeds of *R. philippinarum* (Leite et al. 2004). In the Algarve, the protistan parasite *Perkinsus atlanticus* Azevedo, 1989 is known to be the main cause for the recurrent mass mortalities of *R. decussatus* in culture beds over the last 20 years (Ruano 2001). Azevedo (1990) also detected virus-like particles in *P. atlanticus*, but virus pathogenicity and their relationships with clam mortalities remain unknown. Nowadays, producers claim that clam landings are nearly one-eighth of those in 1980. Viable oocysts of *Cryptosporidium* spp., the cause of zoonotic diarrheic illness in animals, were recently found in samples of bivalves, namely *R. philippinarum*, cultured in Galicia (northwest Spain) and in samples imported from Italy and United Kingdom (Gómez-Couso et al. 2003). From a food safety perspective, the magnitude of this problem is quite relevant.

In Portugal, INIAP/IPIMAR is the authority responsible for the sanitary controls of bivalves for human consumption, as well as for technical and scientific advice regarding installation of new bottom culture beds. In order to improve the reporting requirements for clam imports and to implement management practices and outreach strategies specific to this transfer mechanism, a number of preventive measures will be proposed to the Portuguese authorities in order to limit negative impacts arising from the introduction of *R. philippinarum*, namely: (a) in the scope of the microbiological monitoring programme of bivalve mollusc harvesting areas, new sampling points will be defined in the natural banks of *R. decussatus*; (b) the species *R. philippinarum* will be proposed

to be included in the list of nonindigenous species of the national legislation; (c) cooperative work will be developed regarding the adjustment of legal regulatory procedures in the process for authorizing new production beds, and thus guaranteeing that each new bed produces only one bivalve species; (d) the process of product certification for *R. decussatus* from the Algarve will be assisted, guaranteeing its quality and nutritional value; and (e) the environmental awareness of producers and consumers, focusing on the negative impacts from introductions of nonindigenous species, will be promoted.

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