

Estimating the biomass and fishing potential of the deep-water shrimp *Plesionika edwardsii* (Crustacea: Decapoda: Pandalidae) around the Macaronesian archipelagos

J.A. González^a, J. Delgado^b, E. Isidro^c, J.I. Santana^a, A.R. Góis^b, M.R. Pinho^c, S. Jiménez^d, A.M. García-Mederos^a, M. Arrasate-López^a, O. Ayza^a, V.M. Tuset^a & MARPROF Consortium^{abc}

^a Grupo de Biología Pesquera, Instituto Canario de Ciencias Marinas, A.C. 56, Telde, 35200 Las Palmas, Spain (solea@iccm.rcanaria.es).

^b Direcção de Serviços de Investigação das Pescas, Funchal, Portugal.

^c Departamento de Oceanografia e Pescas, Universidade dos Açores, Horta, Portugal.

^d Grupo de Biología Pesquera, Instituto Español de Oceanografía, Santa Cruz de Tenerife, Spain.

After understanding the distribution of the Pandalidae species in the Macaronesian region and determining the maximum abundance of *Plesionika edwardsii* at depths between 200 and 350/400 m, several research cruises were performed under the PESCPROF (2003-2008) and MARPROF (2009-2012) projects. Research has mainly focused on *P. edwardsii* because it has shown moderate levels of fishing yield and abundances compatible with the development of a new fishery in the region. Cruises took place around the Canaries, Madeira and the Azores archipelagos onboard the R/Vs “Prof. Ignacio Lozano”, “Arquipélago” and several fishing vessels. A standardized fishing gear was used, so-called multiple semifloating shrimp traps (MSFST), each fishing line with 50-100 traps operating around 2.4 m above the seafloor. An echo-sounding bathymetric survey was done followed by a prospection around the islands, and finally a depletion model approach was applied. Initial biomass was estimated from depletion experiments at different target species’ abundance stations applying the Leslie & Davis (1939) method. Density by area was calculated assuming two different areas of attraction of the fishing gear. Each fishing operation was classified according to its yield (CPUE in g/trap/night). The potential fishing planar area was estimated between the isobathymetric lines of 200 and 350/400 m. Sector and total biomasses (Bt) were calculated from areas (km²) and mean min/max densities (kg/km²). Maximum sustainable yield (MSY) was estimated from Bt by using the Beddington and Cooke (1983) model with regional parameters of natural mortality, growth rate, and recruitment age.

The MSY estimated was 2.6 to 5.3 t/year for Faial Island, Azores, 10.4 to 20.7 t/year for the Madeira archipelago (Porto Santo, Desertas and Selvagens not yet included), and 79 to 145 t/year for the Canaries. In comparison with the traditional metallic bottom traps, the innovative fishing gear MSFST is highly selective for pandalid shrimps, minimizing the gear impact on the seafloor as well as the by-catch.

Depletion methods are based on the assumption of a closed system. The straightforward decline of CPUEs obtained during the depletion experiments seems to confirm that *P. edwardsii* is a low mobility species, making this assumption valid at least during short-time periods. Because of the bathymetry profile of these islands, the depth range is very close to the coast line. Once biological and assessment studies are concluded, the management options using the best methods and data available should be analyzed, especially prior to fishing activity. Fishing effort should be controlled on the basis of quotas, number of fishing vessels and a precautionary approach in order to ensure that catching is commensurate with sustainable levels of exploitation. The MSY estimates suggest that this new Macaronesian fishery should be carried out by few specialized medium-sized fishing vessels, fitting well with the current artisanal fleets of the Macaronesian small-scale fisheries.

During the last decades a combination of shrimp trawling and trapping activity has threatened over-exploitation in the Mediterranean fisheries targeting on *P. edwardsii*. Currently the shrimp collapse has conducted to the decline of these fisheries. Can Macaronesian regulatory bodies and all stakeholders involved learn the lessons this teaches us about the resource management?