Virgin biomass, fishing potential and valorisation of *Plesionika edwardsii* (Crustacea: Decapoda: Caridea: Pandalidae) in the Cape Verde Islands - Preliminary results

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These studies are part of the PROACTIVA 1-2 (2009-2012) and MARPROF-CV projects (2010-2013), in the framework of the Canary Islands Government and UE PCT MAC 2007-2013 programmes respectively. Research has mainly focused on the stock assessment of the striped soldier shrimp, *Plesionika edwardsii* (Brandt, 1851), because it has shown moderate to high levels of fishing yield and abundances compatible with the development of a new sustainable fishery in the Cape Verde Islands (González & Tariche, eds., 2009). Several actions have been done in order to implement an ecosystem approach. Other aims have prosecuted to contribute to the professional training through technology transfer actions, and to promote and disseminate new fish products through public presentations and valorisation gastronomic events reinforced with an informative exhibition.

Cruises took place onboard the R/V "Profesor Ignacio Lozano". Of the four cruises scheduled, three 15-day cruises have been conducted to date: Camarão-0 (around São Vicente and Santa Luzia islands, April 2010) within the PROACTIVA 1 project, Camarão-1 (Santiago island, November 2011) and Camarão-2 (Boa Vista island, Mars 2012) within the MARPROF-CV project. A standardized fishing gear was used, so-called multiple semifloating shrimp traps (MSFST), each fishing line with 40-65 traps operating around 2.4 m above the seafloor (González *et al*. 1992). The most abundant, coastal pelagic fish in the Cape Verde waters, the so-called "cavala preta" *Decapterus macarellus* (Cuvier, 1833) (Carangidae), was used as unique bait of the traps.

An echo-sounding bathymetric survey was done followed by a prospection around the mentioned islands, and finally a depletion model approach was applied. Temperature and salinity profiles have been obtained by the use of CTD during fishing operations and these data were further related with the relative abundance indices of the target species.

Initial biomass was estimated from depletion experiments at different target species' abundance stations by applying the Leslie & Davis (1939) method, adapted and modified by Ricker (1975). Density by area was calculated assuming two different areas of attraction of the fishing gear. Each trap was attached to the main bottom line every 15 m (González *et al*. 1992), and the maximum attraction of this bait was established to be 100 or 150 m, according to the experience gained from the local fishery for lobsters. 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 between 90 and 220 m. Total biomasses (Bt) were calculated from areas (km^2) and mean minimum/maximum densities (kg/km^2).

Maximum sustainable yield (MSY) was estimated from Bt using the Beddington and Cooke (1983) model by entering natural mortality (0.6), growth rate (0.53 $year^{-1}$) and recruitment age (1.32 year) parameters for the target species published for the Canary Islands (Santana *et al*. 1997, Quiles, 2005). These parameters estimate an exploitation rate (β) of 0.262. Based on a quarterly work strategy, the life cycle of this target species in the Cape Verdes is being studied in order to check the stock estimations.

The MSY estimated to date were 30.5 tons/year for the stock of São Vicente, Santa Luzia, Ilheus and São Nicolau islands, 10 tons/year for the stock of Santiago island, and 139 tons/year for the stock of Boa Vista and Maio islands. In a near future, the stock of the Sal island will be equally assessed, meanwhile the small stocks of Santo Antão, Fogo and Brava islands will be estimated by interpolation. More than 200 tons per year is expected to be the total MSY for the striped soldier shrimp around the islands of the Cape Verde archipelago, occupying a total area of more than 1,900 km^2 of new fishing grounds at between 90 and 220 m of depth.

In comparison with the metallic bottom traps, which are traditional and intensively used in the Canary Islands, the innovative fishing gear MSFST seems to be more selective for pandalid shrimps, minimizing the gear impact on the seafloor as well as the by-catch by reducing the discards.

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 from very close (few nautical miles in Santiago to far away (10-12 miles in Boa Vista) to the coastline. Additionally, all specimens caught have been identified, counted and weighted at species level, ecological studies, vertical distribution and basic biological parameters of several by-catch species involved in the future fishery are being studied.

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In parallel, according to the communication plan scheduled (González & Tariche, eds., 2009), local biologists, technologists, technicians and fishermen have been trained in the fishing operations onboard both the research vessel and the local fishing boat "Sinagoga", in the biological sampling at laboratory, and by means a theoretical and practical course for hand-making traps and the whole fishing gear for 30 people. After every campaign, main results were presented and discussed with the local stakeholders, followed by a culinary laboratory and a gastronomic tasting based on target and by-catch species, which were also valorised with nutritional biochemical analyses. All these actions were reinforced with an informative exhibition composed of four panels of large format and several explanation posters and displays (roll-ups), as well as by means radio and TV interviews.

When biological and assessment studies were 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 Capeverdean fishery should be carried out by several 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 industrial 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 the Cape Verde regulatory bodies and all the stakeholders involved learn the lessons this teaches us about this resource management?

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