SPILLOVER EFFECTS OF A MARINE PROTECTED AREA ON A EXPLOITED LOBSTER *PALINURUS ELEPHAS* RESOURCE

Maria cristina Follesa [1]*, Danila Cuccu [1] and Angelo Cau [1]
[1] Department of Animal Biology and Ecology, University of Cagliari, Italy - follesac@unica.it

Abstract
We investigated the effects of the Su Pallosu marine protected area (Central western Mediterranean) on the adjacent *Palinurus elephas* (Fabricius, 1787) fishery. After 11 years of no-take protection, a gradient of the lobster biomass (Catch Per Unit Effort) from the interior of the reserve up to a distance of about 20 km from its centre was found. CPUE showed non linear decline with distance from the centre of the reserve.
Keywords: Decapoda, Marine Parks, Western Mediterranean

Introduction
Fishing restrictions in a marine protected area (MPA) can promote an increase in biomass of species leading to a spillover to surrounding commercial areas and enhancing local fisheries [1,2,3]. After 11 years of absence of fishing activity, we investigate spillover from Su Pallosu MPA (CW Mediterranean) to commercial fishing zones based on the effects on artisanal local fisheries of lobster.

Materials and methods
The study was carried out in the Su Pallosu marine protected area of the central-western Sardinia (central-western Mediterranean) and its surrounding commercial zones. The area (4 km^2 area), identified in 1997, was closed to the fishing since 1998 (Regional Law No. 776 of 6-5-1998). Catch data were collected in 2008 during the annual lobster fishing season (May-September) onboard of artisanal commercial boats equipped with trammel net. Specifically, commercial data of 4 different local boats (Seleca, Monè, Marlin and Queen of sea) selected on the base of the main distance of their operative fishing zone from the centre of the protected area, were registered. Experimental fishing surveys inside the area by the same commercial boats were also performed. The geographic positions of the start and end of each fishing set were recorded. CPUE was calculated by the weight (kg) of lobsters caught per meter of trammel net per boats.

Results
The experimental main CPUE inside the reserve was 10.72±7.27 kg/boat/meter net. An evident progressive declining gradient of commercial CPUE values increasing the distance from the centre of the protected area was observed (Fig. 1). Commercial fishing data in fact show the existence of a negative lobster abundance up to 5 km away the protected area. Over 10 km from the centre of the MPA the commercial CPUE values settled to about 0,2 kg/boat/meter net (Fig.1).

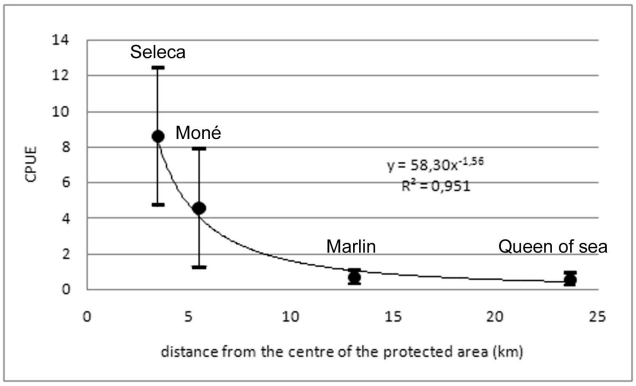

Fig. 1. Commercial mean CPUE (kg of lobster caught per boat per meter net) ± sd versus the main distance of each boat's operative fishing zone from the centre of the protected area

Conclusions
Net emigration of animal across reserve boundaries should create a gradient of density as results of the movement behavior and catchability and exploitations rate of the species in the adjacent fishery (Russ et al. 2003). In our study the limited mobility of *Palinurus elephas* (60.4% of lobsters moved less than 2 km from the centre of the area, [4]) jointed to the reduced dimension of the protected area (4 km^2) and the high fishing pressure across the boundary seem to be the main factors that should have conducted to gradually reduce to the availability of lobsters as distance increased.

References
1 - Sanchez-Lisazo JL., Goni R., Renones O ., Garcia Charton JA., Galzin R., Bayle J., Sanchez-Jerez P., Perez Ruzafa A. and Ramos AA., 2000. Density dependence in marine protected populations : A review. *Environ. Conserv*. 27 :144-158.
2 - Russ GR., 2002. Yet another review of marine reserves as reef fishery management tools. *In*: Sale P. (ed) Coral reef fishes. Accademic Press, San Diego, CA, p.421-443.
3 - Russ GR., Alcalà AC and Maypa AP., 2003. Spillover from marine reserves: the case of Naso vlamingii at Apo Island, central Philippines. *Mar. Ecol. Prog*. 132: 1-9.
4 - Follesa M.C., Cuccu D., Cannas R., Sabatini A., Deiana A.M. and Cau A., 2009. Movement patterns of the spiny lobster *Palinurus elephas* (Fabricius, 1787) from a central western Mediterranean protected area. *Scientia marina* 73 (3): 499-506.