Alarming Overexploitation of the Caribbean Spiny Lobster Stock in Martinique: Ecological Point of View and Recommendations

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ABSTRACT

The Caribbean spiny lobster (*Panulirus argus*) is the most valuable marine species along the entire intertropical area of the western Atlantic. *Panulirus argus* represents 54 % of the world catch of Palinuridae, about 39,700 tons. From 1996 to 1998, I managed an ecological monitoring program and conducted grow-out experiments on spiny lobsters in Martinique, to evaluate the state of the stock and the potential enhancement in the West French Indies. Postlarval supply, as measured on surface collectors, is moderate and continuous throughout the year, and throughout the shallow water habitats. However, juveniles are rare in the wild and can not be concentrated or protected by artificial habitats. Three non-exclusive marine reserves exist in Guadeloupe, but there are none in Martinique, nor is there any biological monitoring of neritic populations, or of shallow water nurseries. In fact, the decline of *P. argus* stock seems to be inexorable. In absence of any enforcement of fishery regulations (established since 1970), the artisanal fishery is largely unregulated and now impacts juveniles as much as adult spiny lobsters. All significant local markets are provided by imports of live (St-Vincent, Grenadines) and frozen (Cuba) *P. argus*. Given the dire status of the wild population near Martinique, the potential for future juvenile culture is theoretically good but still limited by the availability of an adequate and inexpensive lobster food. There is much that can be accomplished in further applied research studies, but I strongly recommend that local elected representatives work for respect of pragmatic regulations and the education of younger generations on the environmental problems facing Martinique and Guadeloupe.

KEY WORDS: Spiny lobster, fishery, Martinique

INTRODUCTION

Although their valuable spiny lobster resources are already overfished, necessity of a strong fishery management plan is still under-estimated in the French overseas departments and territories (DOM-TOM). The main reef areas concerned are Martinique and Guadeloupe in the Caribbean, Reunion in the

Indian Ocean, New Caledonia and French Polynesia in the Pacific (the exclusive economical area of the latter is as large as Europe). Thousands of tons of the European (*Palinurus elephas*) and Mauritanian (*Palunirus mauritanicus*) spiny lobsters were annually caught at the beginning of the century, before the forseeable collapse of those stocks (Ceccaldi and Latrouite 1994). Similarly, the current situation in the French West Indies is alarming. The increase of interest for *Panulirus argus* led to a dramatic situation described here for Martinique. Although Guadeloupe benefits from a larger reef area and a lower human population, it is subject to similar ecological, social and economical influences (Le Bail 1994).

SPINY LOBSTER FISHERY

Locally called *langouste royale*, *Panulirus. argus* is now considered a luxury product that brings $ 35 - 40 per kilogram at dockside. However, it was previously neglected in the French West Indies and until the 1950s was considered a harmful beast that interfered with fishes. As a sub-product of that fishing, spiny lobsters were thrown back or crushed to bait wire fish traps. Morice (1958) reported that *P. argus* was omnipresent and abundant, even in the shallowest seagrass meadows. Fishers caught them by hand, sometimes using fires to attract them closer to beaches (Morice 1958). Interest for fishes decreased soon in favor of spiny lobster. As *P. argus* mainly lives in shallow water habitats (i.e. accessible for both professional and recreational fishers), fishing with snare, harpoon or octopus (*chatrou*) were common, until those devices became inefficient.

Indeed, most fishers, because of a lack of law enforcement, do not follow local regulations. Juvenile and adult spiny lobsters populations are now reduced all around the island. Fishers gradually work further and further from the Atlantic coast, where the continental plate extends 15 km from shore. On the west coast of Martinique, where the continental shelf is very narrow, wire fish traps are now set at depths of 100-150 m but are inefficient. Our SCUBA dives to 70 meters confirmed that only a few *P. argus* are found in such deep habitats. However, along with the lack of controls of catches and fishing devices, there is no long-term monitoring of catches. Gobert (1990) stated that lobster size structure reversed since Clairouin's study (1980): in 1988, 60% of the sampling *P. argus* population was represented by animals under 22 cm carapace length (legal harvesting size).

As we regularly worked with fishers, we noted that many of them neglect regulations, yet all of them deplore the decrease in abundance of adult *P. argus*. Mesh dimension of wire fish traps is not respected, use of night lights and SCUBA diving are common, and animals under legal size and egg-berring females are commonly caught and sold on the beach or on the sidewalk. In fact,

there are no organized markets. Places and times of marketing are numerous and variable.

ECOLOGICAL APPROACH

Although some benthic processes have been described for spiny lobsters (Booth and Phillips 1994, Herrnkind et al. 1994), the local conditions (Durand 1996, Lazure et al. 1996) and the lack of any previous biological monitoring (Coton and Nijean 1987, Gobert 1994) in Martinique justified our ecological investigations. The studies we managed in Martinique from 1996 to 1998 showed that ecological processes are not favorable to an improvement of *P. argus* stock situation. After trying several methods for postlarval collection (static plankton nets equipped with a thermal or electric engine for water pumping, algal and/or cryptic artificial habitats on horizontal and vertical "networks") (Riclet 1998), we deployed surface collectors derived from Hunt's (Phillips and Booth 1994). Although one thousand postlarvae were collected, postlarval supply – which occurs during new moon nights (Acosta and Butler 1999) – was moderate. Collection was continuous throughout the year, occuring throughout the shallow water habitats, and presumably originates from upstream populations (Riclet 1998, Riclet submitted).

Although Farrugio (1976) noticed juvenile spiny lobsters were sometimes abundant in mangroves of Martinique, detection of any *P. argus* is now rare. Thus, we managed a visual census on five stations around Martinique: only two juveniles were detected on the south-eastern station. Then we set benthic artificial habitats on the same stations to determine their influence on juvenile *P. argus* survival. However, those habitats which proved efficient in the Florida Keys (Herrnkind et al. 1997, Butler and Herrnkind 1997), did not collect or concentrate juvenile *P. argus* during 14 months deployed in Martinique waters (Riclet submitted).

Other factors have to be considered. First, the development of the favorite settlement habitat of *P. argus* (Marx and Herrnkind 1986) - *Laurencia* sp. (Rhodophycae) – is negligible in Martinique. Thus, in spite of their potential suitability as nursery grounds, mangrove and seagrass beds (*Thalassia testudinum* and *Syringodium filiforme*) represent alternative nurseries for *P.argus* in the French West Indies (Acosta and Butler 1997). Their extent is limited around Martinique and will be estimated with the use of remote sensing data (IFREMER unpublish. data). Moreover, many neritic habitats are submitted to increasing pollution, due to both industrial and urban activities (Bouchon and Laborel 1986, Pommepuy et al. 1996, Riclet 1998).

RECOMMENDATIONS

The gravity of the ecological status of *P. argus* in Martinique suggests new management considerations. In spite of its artisanal character, local fishing practices are lethal for the exploitable stock by inexorably reducing its reproductive potential.

All significant markets are provided by importation of frozen (Cuba) or live spiny lobsters (Grenadines, St-Vincent), but regulations are not respected in those islands either. The official import (130 tons) is certainly underestimated because official controls are imprecise, and "ghost" imports using fishing boats are commonplace. So, which Caribbean countries will be able to provide live *P. argus* in the future? Even if Martinique and Guadeloupe's spiny lobster stocks are replenished by a postlarval supply originating from upstream populations (probably Grenadines, St-Vincent and Venezuela), such dependence is increased by natural variations of recruitment, alteration of settlement habitats, and recruitment overfishing. Ironically, the French West Indies, after having heavily exploited their own stocks, seem to contribute in upstream islands to the reduction of the larval production, from whom they are dependant. Although 23 % of the *P. argus* catches come from Brazil - about 9,300 tons per year (FAO 1998) – the recent distinction of a Brazilian subspecies from the Caribbean one – respectively called *P. argus westonii* and *P. argus argus* by Sarver et al. (1998) - destabilizes the hypothesis of the main participation of Brazilian native lobsters to the larval flux, which go from the Lesser Antilles to the Greater Antilles and the Gulf of Mexico (Ingle et al. 1963, Menzies 1981, Lyons 1981). In comparison with other cases (Australia, New Zealand, Japan), the fishery for *P. argus* concerns many small countries. However, the ecological connectivity of that system is obvious (Lessios et al. 1984, Cubit Roberts 1997), even between distant areas like the Lesser Antilles and the Florida Keys (Silberman et al. 1994, Shulman and Bermingham 1995).

Therefore, a long-term investment should be locally initiated to avoid a drastic increase of biological resources exploitation and the degradation of neritic environments. As the ecological monitoring of some main populations allows efficient management (Cuba, Florida Keys, Mexico) (Phillips et al. 1994), a pragmatic ecological survey and a minimal management, controlled by law enforcement, should be the first step for a potential replenishment of the overfished populations of *P. argus* in Martinique. Considering our dependence to upstream production of larvae and the natural variations of postlarval supply due to oceanographic processes, surviving recruits have to be protected. After an estimation of the ecological impact, only a fraction of those recruits should be collected for aquaculture projects. Such a regulation recently begun in New Zealand, where the government now allows the collection of 40,000 postlarvae for each ton of adult spiny lobsters fished (Booth et al. 1999). Without

pragmatic management of the spiny lobster population and its environment, scientists and investors have also considered juvenile culture (Ryther et al. 1988, Phillips 1988, Phillips and Evans 1997). But such applied projects remain dependent on a suitable food for grow-out (Riclet 1998).

While there are three non-exclusive marine reserves in Guadeloupe, there are none in Martinique. The potential efficiency of such reserves for spiny lobster populations dynamics has already been described (Acosta 1999, Childress 1997, Roberts and Polunin 1991). Marine reserves are not specific and would benefit all exploited species in Martinique: spiny lobsters, fishes, molluscs, sea urchins. If the potential effect of a reserve on the postlarval supply for *P. argus* by local recruitment is not clear, it might still benefit downstream stocks (Lipcius et al. 1997). Creation of exclusive reserves in Martinique could benefit to Guadeloupe's population, for example.

While sublegal size animals have to be protected, most recent studies showed that the proportion of bigger animals has a strong influence on potential recruitment (McDiarmid and Butler 1999). In fact, fecundity sharply increases with age and would justify a maximal size limit in the next few years. Such information should be disseminated now to permit a gradual change in fishing behavior.

Fishing with beach seines should be prohibited because it is an inefficient practice and destroys shallow settlement habitats, essential for *P. argus* and other benthic populations. Mesh size for wire fish traps should be respected, while their effective use should be improved. In fact, many of them are not regularly inspected and are lost. Made with iron wire, those fishing devices remain lethal for several months for spiny lobsters and fishes because no wooden escape boards are used.

Panulirus argus are also impacted by another practice: the neglect of traditional neritic fishing resources for the exploitation of oceanic populations. As in French Polynesia, the difficulty in managing stocks and in protecting them from pollution led to the promotion and development of "open sea" fishing. But one forgets that change of localization necessitates improved fishing equipment and only represents an alternative to nearshore ecosystem depletion, not a solution. The productivity of the vulnerable productive nurseries and coastal fishing grounds justifies their protection. Complementing ecological studies, information and education of the youngest human generations would be beneficial for the future exploitation of marine resources in the French overseas departments and territories.

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