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Artificial Shelters for Enhancement of Rock Lobster Fisheries

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The best marine species for export from Pacific Island villages have at least some of the following characteristics:

- Fetch a high price on the international market;
- Do not require laborious or expensive processing;
- Can be stored and transported live;
- Is not a key species for local subsistence consumption;
- The international market demand for it exceeds the supply and is expected to do so for the foreseeable future;
- Requires a minimum of capital investment in harvesting gear.

Rock lobsters possess all these characteristics. However, except for the fishery for *P. ornatus* along the southwest coast of Papua New Guinea, sustained commercial lobster fisheries in the SPC area are few and small. This appears to be because stocks in the region are generally small (Prescott, 1988). Since rock lobsters are otherwise very attractive as an export commodity, is it worth considering the possibility of enhancing some stocks in the region artificially?

The most promising Pacific Island marine resource enhancement strategies should possess the following characteristics:

- They are simple.
- They are inexpensive.
- The materials they require can be obtained locally.

Artificial shelters used to enhance rock lobster catches of artisanal fishermen in Cuba and Mexico fulfil all these requirements. Commonly called 'casitas' or 'pesqueros' these structures consist of little more than a flat surface 2 - 4 m² made of timber or ferrocement, and supported at between 20 and 40 cm above the surface in shallow habitat that is not exposed at low tide and contains comparatively little natural shelter. There are many variations on the basic plan but these need not concern us for the present. The important thing is that they are cheap and simple, they can be made from local materials and, most importantly, they work.

That is to say, they work for the Caribbean lobster, *Panulirus argus*. Very substantial increases in the catches of this species in both Cuba and Mexico have been correlated with the use of increasing numbers of these shelters. We do not as yet have any idea of whether they work for Pacific species, although they, like the Caribbean lobster need holes or crevices in which to shelter during their inactive periods.

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How do they work?

These shelters apparently provide a critical refuge from predators, yet allow optimum foraging in food-rich areas lacking sufficient natural shelter. The shelters may:

1. Reduce predation, thereby increasing the yield of lobsters;
2. Increase food accessibility by providing shelter in locations near food sources, leading to increased growth and survival;
3. Concentrate the lobsters, making them more vulnerable to capture;
4. Provide a combination of some or all of these functions.

Little research has been done to determine how the shelters work, but preliminary studies show that there is a relationship between the size of the shelter and the mortality of *Panulirus argus*. Optimal design, placement and spacing of the shelters have not been established.

How are they used?

The shelters are regularly checked by fishermen, working from small dinghies in Mexico and from larger boats in Cuba. A shelter is lifted by divers, usually after placing a net around it, and legal-sized animals are collected by gaff or from the nets. Up to 200 lobsters have been caught per shelter, which is more than any other Cuban or Mexican gear yields.

What are the yields?

Since the late 1960s the annual catch of the Cuban rock lobster fishery has increased 25 fold to 12,000 tonnes while the Mexican catch in Quinana Roo has increased 14 fold to 350 tonnes. These increases are apparently correlated with the use of artificial shelters although the connection has not been scientifically proven.

Potential for Artificial Rock Lobster Shelters in the SPC region.

The two most promising species in the region would appear to be *Panulirus ornatus* along the southwest coast of Papua New Guinea and *P. versicolor* throughout much of the rest of region. Both are found in shallow sheltered waters where artificial habitats can be placed.³ (*P. pencillatus* is common throughout the region but it shelters in very exposed outer reef slopes, a habitat unsuitable for casitas).

Clearly research is needed before any major investment of time or effort should be made on the introduction of artificial rock lobster shelters to the SPC region. If preliminary trials showed that rock lobsters are indeed attracted to these shelters in significant numbers, then attention should be given to choosing those places in the region with sufficient expanses of shallow protected locations that do not uncover at low tide to provide promising trial sites.

³It is perhaps noteworthy that the inhabitants of Murray Island in Torres Strait have for centuries made artificial shelters to aggregate *P. ornatus* on their reef flats by piling up clumps of table coral. The structures are known as *keiar meta*, literally "rock lobster houses" (Johannes and MacFarlane, in press).

Possible Drawbacks

We do not know the effect of artificial shelters on the stability and structure of bottom communities.

We do not know whether the shelters just concentrate existing stocks of rock lobsters and make them more vulnerable to fishing, or actually increase lobster production. There is a common belief among fishermen and some managers that the latter applies. But no research has been done to test this belief.

Finally, excessive numbers of shelters have been placed on Cuban fishing grounds leading to a dramatic drop in catch per unit effort and accompanying economic inefficiency.

Obviously then, if preliminary research indicated that the shelters proved sufficiently attractive to Pacific rock lobster species, additional research would be needed prior to introduction in order to determine:

1. How they enhance rock lobster yields;
2. Optimum density of shelter placement (which will probably vary with habitat), and
3. Effects of shelters on the stability and structure of seagrass communities.

Research on optimal shelter design and placement and optimal harvesting strategies would be among the subjects requiring subsequent investigation.

The relevance of customary marine tenure

In many regions of the world marine resource enhancement projects are made difficult or impractical because the open access status of coastal fisheries encourages poachers to help themselves to the product of any fixed improvement on the fishing grounds. But in the many Pacific islands where rights of customary marine tenure are still strongly observed, poaching can be greatly reduced.

Fishermen who are secure in their possession of the exclusive rights to a fishing ground can generally be depended upon to carry out surveillance and enforcement themselves if the contained resources are considered worth protecting. This takes a major burden off government fisheries officers and increases the likelihood that resource enhancement programs will succeed, provided they are begun with clear community consensus as to who has what rights with regard to the relevant resources.

Relevant Knowledge in the SPC Region

Two of the authors of this report, Phillips and Crossland, have visited the Caribbean region on several occasions in order to study several artificial shelter based rock lobster fisheries, to make a first assessment of the habitat/ecosystem of the fisheries and to establish collaborative research with local scientists. Phillips is continuing a collaborative research program on lobster recruitment in Mexico and Cuba.
