

SOUTH PACIFIC COMMISSION

Twenty-second Regional Technical Meeting on Fisheries
(Noumea, New Caledonia, 6-10 August 1990)

**ENHANCEMENT OF PACIFIC ISLAND INVERTEBRATE FISHERIES
BY RESTOCKING**

(Paper presented jointly by the SPC Secretariat and the
FAO South Pacific Aquaculture Development Project)

Background

1 The concept of enhancing natural populations of exploited marine animals through the use of aquaculture is gaining currency in the region. Hatcheries have been established for giant clams and trochus specifically to produce animals - either adults or juveniles - for release into wild populations. Attempts are under way to develop similar facilities for other species, such as beche-de-mer. Interest in this type of ranching or restocking is being fuelled by increasing levels of commercial exploitation of vulnerable inshore species. However, restocking may also be considered as a means of mitigating environmental degradation, or simply of improving the productivity of natural populations, especially those that may be recruitment-limited.

2 In 1988, the SPC Inshore Fisheries Research Project (IFRP) and the FAO South Pacific Aquaculture Development Programme (SPADP) jointly presented a short working paper (WP9) to the 20th SPC Regional Technical Meeting on Fisheries (RTMF) that discussed issues relating to reef resource enhancement through aquaculture. The paper, and the ensuing discussion of the topic during the meeting, revealed that there was a high level of interest in the use of aquaculture techniques (and especially juvenile release programmes) as a means of enhancing stocks of depleted fishery resources. However, it was also agreed that the information available to evaluate the potential usefulness of restocking (with juveniles or adults) as an enhancement tool in any given fishery situation was inadequate. There was a general concern that most present efforts were focussed principally on the development of aquaculture technology, especially that for the production of juveniles, while the basic biological issues that control whether restocking of any given species might be successful were receiving less attention than they should. This led to two risks: one, that effort and funding would be expended on aquaculture activities that might not be rewarded by real enhancements to fishery stocks; and two, that fishery management practices or philosophies might be modified in the expectation that fishery restocking programmes would be successful before this had been demonstrated to be the case.

SPC/ SPADP collaboration

3 The meeting agreed on the need for improved information on the role that aquaculture might play in resource enhancement in the region, and recommended that the IFRP and SPADP collaborate in a two-phase project to elucidate some aspects of this debate.

4 Phase 1 of this collaborative activity was to involve the collection and dissemination of pertinent biological information on Pacific Island species for which restocking might be considered, and on reef ranching experiences elsewhere. This was to take place by:

consultation with specialists in the field;

a literature review;

preparation of a report of the initial study findings;

if appropriate, a more detailed technical workshop on reef resource enhancement issues.

5 Phase two of the project was to be planned in more detail following the findings of phase 1, but was anticipated that it would:

be field oriented;

be carried out in conjunction with in-country restocking experiments or activities;

include one or more studies or groups of experiments aimed particularly at evaluating the results of juvenile release trials.

Review of restocking activities

6 In response to this recommendation, both the IFRP and SPADP have directed as much effort as the burden of other duties has allowed into gathering relevant information on reef ranching and restocking. After correspondence with a range of specialists and identification of appropriate literature, a draft review of the topic has been prepared as planned and is presented as Information Paper 5 for the consideration of this meeting.

7 The paper is less comprehensive than originally envisaged because, it was discovered, literature on this topic is not abundant, and tends to be scattered, peripheral to the subject, and unfocussed. The topic of restocking and reseedling is not easily amenable to automated keyword-indexed searches through bibliographic databases. The review has thus, by necessity, been compiled mainly using sources already known to the authors or found through cross-referencing. The process of information-gathering is not yet complete and it is planned to expand the review further, especially by adding more details of restocking programmes carried out elsewhere, with the ultimate aim of circulating it more widely as a technical paper during the first half of 1991.

8 The paper principally considers the biological and other characteristics that will affect the potential for restocking of several key species groups that are presently subject to overexploitation in some parts of the region. These include giant clams, pearl oysters, trochus, green snail, spiny lobsters, mangrove crabs, coconut crabs and sea cucumbers. In particular, relevant knowledge of basic reproductive and larval biology is reviewed in each case in an attempt to understand whether restocking is likely to be effective.

9 Some information is also presented on restocking experiences outside the region, especially in Japan. This experience suggests very strongly that the benefits of restocking are not automatic, nor are they easy to actually quantify. Restocking on its own will not solve problems that have arisen because of a need for fishery management. Rather, restocking needs to be considered as one of a group of fishery management tools available for improving fishery yields.

10 The paper concludes that restocking has the potential to be of benefit to Pacific Island fisheries in certain circumstances, but that these circumstances need to be evaluated very carefully in the light of country-specific information, as well as knowledge of the biology of the species in question and the economic value of the fishery. Terms of evaluation will include the importance of recruitment as a limiting factor in population growth and the ratio of growth to mortality at different stages in the life history of the species in question. The benefits of restocking are by no means assured or automatic, and unless properly evaluated, restocking programmes can absorb a great deal of research and development effort (and funding) without delivering observable benefits.

Restocking issues

11 There are thus important questions that countries need to investigate before making commitments to restocking programmes. These are mainly related to the following issues:

- a) Restocking needs to be considered as part of an overall management approach and not as an alternative to management. Overseas experience all underlines the fact that simply releasing large numbers of juveniles into the fishery will not produce population increases unless the fishery is also subject to some form of management that allows the released juveniles to reproduce and thus make a contribution to population growth. Restocking should be viewed as one of a set of management tools, and not as an easy way out of management.

b) The reproductive and larval biology of the species will be major determinants of whether restocking is likely to have biologically significant results. Restocking is likely to be of most benefit to populations in which recruitment is a limiting factor. The limitation may arise because the population has been so reduced that reproductive success has been impaired (giant clams, pearl oysters, possibly trochus), or because specialised habitat requirements or larval life history characteristics impose a "filter" on the number of juveniles that are able to recruit to the adult fishery (tropical spiny lobster, possibly trochus).

c) Restocking is likely to be of greatest economic value in species that achieve large sizes (or high values) relatively quickly, and with low rates of mortality. Slow-growing species, those that have a high ratio of mortality to growth, or those that do not achieve a large size or high value, will be less viable candidates for restocking from an economic viewpoint. Most organisms show higher rates of both growth and mortality early in their lives, and these drop in different ways as the animals age. In most cases the economics of restocking will be determined by the cost of raising the animals to the point where the ratio of mortality to growth falls to an acceptable level.

d) The contribution of restocking programmes to wild populations can be extremely difficult to assess. This has been demonstrated in well-funded, high-technology juvenile release programmes in Japan, as well as in experiments with trochus carried out within the region. In many cases there has been no demonstrable effect on yields from wild fisheries despite releases being carried out over many years, and the expenditure of large amounts of research effort and funding.

Future activities

12 IFRP and SPADP staff believe that there is a need to generate a greater awareness of these issues among technical and managerial fishery staff involved in activities related to restocking. In order to achieve this, there is a need to look objectively at experience elsewhere (especially in Japan) and to examine more closely specific aspects of the biology and life histories of the key species involved to realistically understand the contribution that aquaculture might be able to make to resource enhancement. This topic area might be addressed by the convening of a specialised technical workshop as originally envisaged, or by some other means.

13 The conduct of one or more field studies on restocking activities was envisaged as part of phase 2 of the joint IFRP/ SPADP project. The attached review makes some initial comments on the levels of benefit that different resources might be expected to gain from restocking programmes, and the constraints that might be expected to apply in each case. We appear now to be approaching the point where specific studies could start to be defined in more concrete terms. This would require the identification of a small number of key species to be examined, and expressions of interest from countries that are planning restocking programmes and are prepared to collaborate in studies of this type.

14 There are areas of research in this field that could usefully be addressed by universities and other research bodies from both within and outside the region. The detailed investigations into aspects of reproductive and larval biology that will be necessary in the development of hatchery technology for key species are beyond the capacity of most national and regional fisheries agencies to address. However, these could possibly form the basis of university studies that met the requirements of academic research projects and at the same time contributing towards fisheries development goals in the region. There thus appears to be merit in encouraging and supporting research bodies interested in developing such research programmes.

Action required by this meeting

15 This meeting is invited to:

discuss the issues raised above and in Information Paper 5;

consider the means by which information on restocking should continue to be gathered and disseminated, and, specifically, on whether the organisation by the IFRP and SPADP of a technical workshop on this topic, as originally planned, is considered appropriate;

comment on the usefulness of the IFRP and SPADP jointly commencing field studies that aim to assess the real benefits of restocking for resource enhancement, and if appropriate make preliminary identifications of key areas for study;

discuss possible mechanisms by which universities and other research agencies from within and outside the region might be encouraged to undertake research projects that would support the development of restocking programmes in the region;

make recommendations on other specific future actions by the IFRP in this area.