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Some background notes on a successful fisheries management study at a remote Micronesian atoll

by Andrew Smith* and Paul Dalzell**

During April and May 1991, we conducted a series of fish stock depletion experiments on the back reefs of Woleai Atoll, Yap State, Federated States of Micronesia. The objectives of this study were to obtain contemporary information on catch rates by traditional community fishing methods, identify the principal target species in the catch and estimate the standing-stock biomass of the fishable stock. Two types of community fishing methods were employed in this study, leaf-sweep drive-in-net fishing (known locally as *roop*) and group spearfishing (known locally as *gapiungiupiung*). Both methods employ between 30 and 40 men working in a group to catch large volumes of shallow-water reef fishes.

Both types of fishing are common throughout Micronesia and the insular tropical Pacific but have not generally been studied in detail. Further, these co-ordinated types of fishing lend themselves to stock depletion experiments, where intensive fishing conducted over a short time period in a limited area should result in a noticeable decline in catch rate or catch per unit of effort (CPUE). The rate of decline in CPUE is proportional to the initial biomass, so a plot of CPUE on cumulative catch can be used to estimate the original population size in numbers and weight. If the area fished is known, the biomass can be expressed per unit of area (e.g. kg/ha or t/km^2). The total biomass on a reef can then be estimated from the product of the relative biomass density and the total habitat area.

This project was very successful and four stock depletion studies were conducted at Woleai Atoll. The results were later documented and published as Inshore Fisheries Research Project (IFRP) Technical Document No. 4 in 1993 (available from the South Pacific Commission, B.P. D5, 98848 Noumea Cedex, New Caledonia). Standing stocks of shallow-water reef fishes, mainly surgeonfish and parrot fish (Acanthuridae and Scaridae) ranged from 5

* South Pacific Regional Environment Programme (SPREP), P.O. Box 240, Apia, Western Samoa.
**South Pacific Commission, P.O. Box D5, 98848 Noumea Cedex, New Caledonia.

to 25 t / km^2, with a mean of 12 t / km^2. Differences in biomass density were possibly linked to the history of community fishing on the different reefs, with the lowest densities on those reefs fished most recently. Besides the stock depletion study, we also collected information on catch rates by other gears, simple biological observations on the fishes in the catch, and information on the numbers of fishing gears and vessels on Woleai.

The Woleai project was conceived as a result of a chance conversation between the two authors. One us (Smith) was explaining, with the assistance of some photographs, a traditional fishing method involving a leaf-sweep which was recorded during his study of traditional fishing methods in the outer islands of Yap State, Federated States of Micronesia. Dalzell suggested the possibility of using such a method for intensive (depletion) fishing experiments to gain an estimate of fish standing stocks. It took two years from this chance conversation until the project was successfully completed.

During the project's development Dalzell was a Fisheries Scientist with the South Pacific Commission. Smith had just completed two years in the outer islands of Yap State recording traditional fishing and management techniques, and had recently been employed as Adviser to the Yap State Government's Marine Resources Management Division.

After further correspondence to clarify our ideas, the next step involved securing approval in principle from the council of outer islands' chiefs, during one of their biannual meetings in Yap, to proceed with the project. No objections were raised at that meeting and so we continued with the project planning.

The next hurdle was to obtain funding for the project. Considerable effort went into explaining and justifying the project proposal to both the Yap State Legislature and the South Pacific Commission. After those two bodies approved funding for the project, official requests to the specific atolls were made through the council of chiefs. Although this is the official procedure, it had a number of inherent problems. Often, what is discussed with a chief or chiefs at the council meetings in Yap only gets back to the island in an incomplete form, if at all.

This can result in rumours which can have a lasting effect on the project. To overcome this, in addition to meeting with the chiefs and discussing the project with them, specially written explanations of the project's aims, needs and benefits were provided in the vernacular. Immediately after the council meeting, discussions were also held with outer island government officials, who, once they understood the purposes of the project, also advised those living out on the islands about it. One of the keys to the success of the project was explaining the aims, needs and benefits of the work to as many people as possible, for as long as possible, to ensure that they understood what it involved.

One of the hardest tasks was explaining to the chiefs, reef custodians and fishermen why we wanted to fish in the same place, with the same method, on successive days with the aim of catching less fish each day. The fishing methods we proposed to use are normally used in the same area only once or twice a year to get fish for a special occasion or for community use. To obtain permission to conduct this 'strange' style of fishing we had to satisfactorily explain:

1. How much area we would require;

2. Why we wanted to fish-out an area;

3. What benefits they would see from the project;

4. How much manpower we would require; and

5. If they would be paid.

Due to considerable logistical problems related to the remoteness of the Yap outer islands, our initial proposal to fish on two atolls, one that had been heavily fished and one that was rarely fished, we had to alter our plans and work only on one atoll, Woleai. Upon arrival at Woleai for the field work, a meeting was held with all the men on the main island and representatives of those from the other inhabited islands within the atoll. The whole project was explained step by step, and any questions answered and problems resolved.

The specific forms of the fishing methods we preferred were discussed and agreed on, and once the people fully understood our requirements, they determined how many men would be required and the most appropriate locations to conduct the fishing. After this meeting the project progressed without any problems. Without their complete understanding and co-operation, it would have been impossible to keep 40-plus men from five separate islands in the atoll working five days a week for four successive weeks.

A number of factors contributed to the success of the project, not the least of which was luck! We had four weeks of virtually ideal weather conditions.

Only once did we have some bad weather, and that fell on a weekend. Familiarity with the fishing methods, how they are usually conducted, and what minor alterations were needed to satisfy the scientific objectives was also essential to the project's success. This was achieved because of the familiarity with the island's culture and fishing methods acquired by Smith during the traditional fisheries project. The fact that Smith is married to a woman from Woleai probably also contributed to some degree to the co-operation we received.

Payment of the fishermen, hiring of the necessary boats, and provision of outboard motor fuel for the time spent fishing ensured the men's continued interest. Payments were made after the completion of work at each of the four fishing sites. Prior to the field work, considerable time and effort was put into ensuring that the fishermen would be paid in cash, rather than the usual government cheques which can take months to be issued.

After the project was competed and the report prepared, copies were sent back to the council of chiefs and to Woleai Atoll. On subsequent visits to the atoll Smith has continued to answer questions concerning fisheries management posed by the chiefs and fishermen.

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Traditional fishing on a Polynesian atoll

*by Michael D. Lieber**

Abstract

Field research on the organisation of traditional fishing activities on Kapingamarangi, a Polynesian atoll, shows that homeostasis in this marine ecosystem is an outcome of how the constraints on fishing activity are mutually ordered. Even a very simple technology that uses only local resources can generate hardware and techniques that are capable of wiping out whole species of fish. It is how fishing methods are sequenced that prevents potential devastation, and this depends on the human institutions that control the sequencing. These institutions are designed to cope with environmental conditions as they are perceived by the local human population. Change either the local perceptions or the local institutions, and the ordering of constraints on fishing activity change. This is what makes the difference between homeostasis and ecological (and social) chaos. The idea of sustainable technologies is useless if it includes only hardware. It must also include the organisation of deployment, the institutions that implement that organisation, and the cultural patterns of perception that shape the institutions.

An atoll is one of the most marginal human habitats on earth. Pacific atolls support only 50 to 100 plant varieties, and of these less than a dozen are edible. Coconut and pandanus trees are almost everywhere, and maybe also arrowroot and edible creeper. Breadfruit and taro grow only on those islets—strips of land perched on the lagoon side of the reef—wide enough to support a ground-water lens, since the only source of fresh water is rain. The only native mammal is the rat. From this skimpy resource base, people have to make their living.

When disaster—typhoons, red tides, droughts—strikes, there isn't much to fall back on unless there are other islands nearby that people can flee to for refuge. Most Pacific atolls are fortunate enough to have been parts of regional interdependent clusters from time immemorial. The Polynesians of Kapingamarangi Atoll in Micronesia weren't so lucky. This tiny atoll with less than half a square mile of land area was one of the most isolated islands in Oceania until colonial contact in 1877. Kapinga people were left alone to survive as they could for most of their 800-year history.

The land supported taro, breadfruit trees (for food, canoe hulls, cordage, and clothing), coconut trees (food, drink, baskets, thatch, and house posts), pandanus (food, thatch, mats, canoe sails), hibiscus (cordage, loin-cloths), a few varieties of hardwood for construction, and coconut shells for bowls, fuel and small fish hooks. The lagoon and deep sea

* University of Illinois at Chicago, Anthropology m/c 027, 1007 W. Harrison St., Chicago, IL 60607-7439, Fax: 312-413-3573; e-mail: U28550@uicvm.uic.edu.