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Resource evaluation of current populations of two commercially harvested sea cucumber species (*Actinopyga mauritiana* and *Stichopus chloronotus*), and recommendations for management for Kosrae State, Federated States of Micronesia

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Background

The Kosrae state government, municipalities and individuals have expressed concerns over the past several years regarding the sustainability of commercial sea cucumber harvesting. The Development Review Commission and the State Marine Resources Division were therefore asked to undertake appropriate scientific studies to determine if the current commercial harvesting of sea cucumbers in Kosrae is sustainable and to recommend any activities that should be undertaken to allow this fishery to remain sustainable in the future.

In November 2000, these departments recommended that a moratorium be decreed on all commercial harvesting of sea cucumbers until such time that recommendations, based on scientific information, can be compiled and provide information on the sustainability of these operations. The government of Kosrae accepted and cancelled all permits, which effectively stopped legal commercial harvesting.

These agencies, through grant assistance money from Marine Resources Pacific Consortium (MAREPAC), contracted a marine biologist to provide baseline biological information. The consultant was hired to:

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- undertake a marine evaluation stock assessment of the current populations of commercially harvested sea cucumbers in Kosrae;
- provide information pertaining to these species' habitats and population locations on the reefs;
- undertake a training and information exchange programme for the government of Kosrae on all relevant marine evaluation techniques and potential management options;
- provide information and advice to assist the government of Kosrae in developing a sustainable management plan that can be maintained over an extended period of time, including a monitoring programme if required;
- generate any other biophysical data that are important to the formulation of a management plan; and
- provide a written report on all findings at the completion of the contract.

The target audience for this report is the Kosrae state government agencies, interested individuals and the general community.

Executive summary

Visual resource survey methods were used to evaluate current standing stock populations of two commercially harvested sea cucumbers, the surf redfish *Actinopyga mauritiana* and greenfish, *Stichopus chloronotus* in Kosrae, Federated States of Micronesia. Fifty-six tows, covering 10.1 ha were conducted during the evaluation. Fifty-two tows were made on the reef flats of Kosrae and four tows were made on the reef edge and slope. Data collected for each tow included: water depth, tow width, tow length, total number of sea cucumbers and percentage of coral cover.

Inclement weather conditions precluded the survey team from evaluating the reef crest and reef edge on the eastern side of the island, the preferred habitat of the surf redfish. Therefore, only limited data were collected for this species. Data collected were insufficient for scientifically estimating stock abundance of this species. An additional survey will be required to provide data on this species stock abundance. This information is a prerequisite for the development of a management plan to determine acceptable levels of commercial exploitation for this species.

Sixteen species (Table 1) of sea cucumbers were located during the evaluation, and data were recorded only on those species of potential commercial value.

Stock populations of all potential commercial sea cucumber species inhabiting the reef flats of Kosrae were low to very low, including the two harvested species.

A total of 571 individual greenfish, *Stichopus chloronotus*, were found in 11 transects (20 per cent of transects) that covered a combined reef flat area of 4026 m². All transects, but one (transect 52) (where greenfish was found), were located on the reef flats between the seaward side of the airport in Tafunsak to the western end of Walung. Transect 52 was located on the reef flat to the north of the island of Lelu.

The density per square metre of these individuals varied between site locations, however all sites recorded very low stock densities when compared to the previous study undertaken in 1997 (Edward 1997). The mean greenfish density per square metre for all sites, where this species was recorded, was 0.015 as compared with 1.21 in the 1997 survey (Edward 1997). These low numbers are a direct result of commercial harvesting. The current level of exploitation of this species is not sustainable and a management plan, based on scientific data, must be developed and implemented.

Recommendations

A total ban on the commercial exploitation of all species of marine sea cucumbers should be imposed in Kosrae until the recommendations listed below have been addressed. The commercial exploitation of sea cucumbers in Kosrae must be done on a sustainable basis. Data collected indicate large declines in stock populations of greenfish. This decline is directly attributed to commercial harvesting. Information on the surf redfish is incomplete due to unfavourable weather conditions preventing the col-

Table 1. List of commercially valuable sea cucumbers recorded during the investigation.

<i>Actinopyga mauritiana</i>
<i>A. echinites</i>
<i>A. miliaris</i>
<i>Bohadschia argus</i>
<i>B. marmorata</i>
<i>Euapta godeffroyi</i>
<i>Holothuria atra</i>
<i>H. coluber</i>
<i>H. difficilis</i>
<i>H. hilla</i>
<i>H. leucospilota</i>
<i>H. nobilis</i> (both colour varieties)
<i>H. scabra</i>
<i>Stichopus chloronotus</i>
<i>S. horrens</i>
<i>Synaptula recta</i>

lection of data. Stock population survey data are required for this species. The recommendations below will provide baseline scientific data to enable a sound environmental management plan to be developed and implemented for these sea cucumber species.

The recommendations presented below have wider implications for other marine species located in Kosrae and should be used in this context. This is not a definitive list and additional priority areas should be developed.

- Undertake a resource evaluation of the current stocks of surf redfish on the reef edge and reef crest on the eastern side of the island when weather conditions are more favourable. Line transects and timed swims should be used.
- Collect basic life history data on both species of commercially targeted sea cucumbers (the surf redfish and greenfish). These (biological and morphological) must be collected on a monthly basis over an annual period for each sea cucumber species. Information obtained on each individual species is imperative to the development of a suitable marine management plan. These must include date of sample, location of sample, sex, body length, wet and dry weight, reproductive condition, and gonad index.
- Undertake an intensive public awareness programme to provide information on sea cucum-

ber management and why it is required. This could include, but is not limited to, public media announcements, community-based workshops and relevant public discussions groups. This programme could be expanded to include additional reef species.

- Develop a marine resource management plan for the commercial harvesting of sea cucumbers for Kosrae state. This will need to be done once the scientific information has been gathered.
- Include within the management plan marine reserves, minimal harvest size limits and bans on collection during spawning seasons for both species of sea cucumber.
- Further develop appropriate government regulations to allow control, through permits of all commercial sea cucumber harvesting operations. This should include permit requirements that include basic data reporting duties. Fines should be incorporated with all violations.
- Conduct yearly marine resource stock surveys (as undertaken in this evaluation) to provide information on the population structure and abundance of sea cucumbers over time.

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Marine resource survey and assessment of Jaluit Atoll, Republic of the Marshall Islands

John Bungitak¹ and Stephen Lindsay²

Background

The Jaluit Atoll Marine Conservation Area (JAMCA) was established in 1999. JAMCA was developed by the combined efforts of the Jaluit Atoll Development Association, the Jaluit Atoll Local Government Council, the Jaluit Community, and the National Environment Protection Authority. Assistance has been received from the South Pacific Regional Environment Programme through their South Pacific Biodiversity Conservation Programme and a Conservation Area Supporting Officer has been recently appointed to manage and develop the programme.

The goals of JAMCA are to develop and implement:

- a sustainable marine resource management plan,
- a sustainable terrestrial management plan,
- community-based management structures,
- alternative income-generating activities,
- public awareness, training and education programmes, and

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