# PRELIMINARY SUMMARY OF THE MANAGEMENT AND DEVELOPMENT OF HARVESTING SEA URCHINS ON GUAM

GUAM MARINE FISHERIES
ADVISORY COUNCIL

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A. Identification and Biological Assessment

There are many species of sea urchins recorded in the Western Pacific Region; however, only seven species have been identified on Guam as having commercial value. Various ethnic groups in Micronesia, Southeast Asia and Japan consume sea urchins, usually as a delicacy or supplement to their regular protein intake. Japan is the only known country in the Western Pacific Region that engages in a commercial sea urchin fishery. In most other countries, as on Guam, harvesting is done only on the subsistence level. Edible species of sea urchins of potential commercial value found in Guam waters are listed below:

*Diadema savignyi*
*Echinothrix diadema*
*Echinometra mathaei*
*Toxopneustis pileolus*
*Tripneustes gratilla*
*Diadema setosum*
*Echinothrix calamaris*

Sea urchins inhabit the shallow reef flats extending out to the reef margin generally on the leeward side of the island. Both *Diadema* and *Echinothrix* spp. are characterized by a round black test covered with long (100-400 mm) black, brittle spines. *Diadema* is differentiated by longer and narrower spines; a bright blue irridescent ring on the test; and a tendency to aggregate on relatively open substrates. *Echinothrix diadema*, in contrast, bears a more stout appearance with shorter (150-200 mm) thick spines, lacking the blue ring and a tendency to seek shelter under coral heads and rubble.

*Echinometra mathaei* has thick short spines (100-200 mm) and generally seeks shelter in reef crevices and under coral heads. *Toxopneustes pileolus* is characterized by a large test (200-250 mm) and a flowery arrangement of short, white delicate spines. This species generally inhabits the inner reef margin and is found half buried in the sandy substrate. *Tripneustes gratilla* is the most sought after species, characterized by a large test (200-250 mm) and short

spines (25-50 mm). This species is generally found on the inner side of the reef margin among coral heads, rubble, seagrass beds and sargassum.

Diadema setosum and Echinothrix calamaris are also of commercial value but are comparitively rare on Guam (Stojkovitch and Smith, 1978), and thus will not be dealt with other than their being mentioned here.

The only known reef fish to actually prey on sea urchins for food are the trigger fish (Balistidae). However, other fish will feed on sea urchin gonads once the urchin's calcarious shell is broken to expose its contents.

Information on recruitment, longevity and fertility are lacking. Past efforts have attempted to correlate sea urchin reproductive cycles within such parameters as temperature, tide, lunar cycles and latitudes.

In Palau, Saipan and other islands in Micronesia, the gonads are known to be ripe around the period of April through May.

Sea urchins, though considered sedentary, can move considerable distances at night. However, the fact that they are mostly confined to the leeward side of the island indicates their mobility is probably limited by unfavorable environmental conditions. They are not found in close proximity to brackish waters, such as near river estuaries.

B. Statistical Monitoring and Fishing Catch Efforts

While sea urchin gonads are harvested as a delicacy by many Japanese, Southeast Asians and Micronesians on Guam, the actual extent of the harvesting of this resource for home consumption is not known. Like other fishing efforts for home consumption purposes no attempt has been made to compile data on catch efforts. The only descriptions of the fishery stock to date are gained from personal interviews with local residents. The experience of one local fisherman has shown that in the early part of 1960 through 1970 one fisherman could fill

a 50 lb. rice sack with urchins (Tripneustes) within a 1½ to 2 hour period in areas such as Alutom Island in Agat Bay and from the west side of Agana Boat Basin to Asan Point. Today, one would be fortunate to harvest one-fourth that amount in the same time span. Therefore, a rough estimate shows that the resourc population in these areas has declined 75% in the last decade. Given the limited population for subsistence gathering, it is unlikely that sufficient stocks exists to support much of a commercial effort.

It is noted that local Micronesian residents who consume sea urchins generally prefer Tripneustes gratilla over other species. Occasionally, they will also gather Echinothrix sp.. Perhaps the reasons for not harvesting other species are their lesser palatability and difficulty in handling the animal due to its relatively toxic spines.

C. Identification and Evaluation of Techniques and Facilities for Harvesting, Handling and Processing

There is no sophisticated method of harvesting sea urchins. Because sea urchins thrive in shallow reef flats and lagoons at a depth ranging from less than 1 meter to 5 meters, harvesting is usually done by either wading out to gather them with a gloved hand or by diving from a small boat. Equipment cons basically of mask and snorkel, fins, gloves and rice sack or similar containers. Harvesting of Echinothrix, Echinometra, and Diadema spp. requires the use of tong in order to avoid direct contact with the toxic spines. Once the animal is dead the spines are rendered harmless.

Sea urchin gonads are retrieved by merely cracking the shell open and scooping the gonads out from the shell. While island residents consume the gonads fresh, they can be pickled and refrigerated. Japanese are known to can sea urchin gonads. Processed sea urchin can be purchased from local Japanese food markets for $2.75 for a 100g (net weight) jar.

No adverse environmental affects are expected from harvesting sea urchins due to the fact that the animals are harvested manually. The real concern is directed toward the depletion of stocks resulting from overharvesting or the destruction of suitable habitats by pollutants, dredging, filling or blasting.

G. Socio-Cultural Concerns

Micronesian, Japanese and Southeast Asians regard sea urchins as a delicacy. An already partial depletion of one species of sea urchin (Tripneustes) on Guam has undoubtedly adversely affected some of the island residents' preferred dietary choice. Further depletion could possibly result in loss of recreational enjoyment associated with traditional subsistence gathering of this resource.

H. Legal Issues

No statutory authority exists to specifically control the harvesting of sea urchins on Guam. Only Guam Water Quality Standards and permit requirements for dredging, filling or blasting affect the sea urchin fishery in their overall approach to resource management.

I. Federal Funding

Efforts should be made to identify a funding source to finance biological assessment with regards reproduction, recruitment, longevity and mortality.

J. Conclusion

The limited sustainable yield of this fishery does not allow for the development of even a small-scale commercial industry. Even though there appears to be an abundance of Diadema savignyi, Echinothrix diadema and Echinometra mathaei, their range and distribution is limited such that any commercial efforts could rapidly deplete the resource. Furthermore, their reproductive stage when gonads are ripe for harvest occurs during a short period. Thus, any commercial fishery effort would only be active during these few months and dormant for the rest of the year.

D. Assessment of Costs of Production

The cost of subsistence level harvesting of sea urchins from the reef and lagoon is minimal, consisting of purchasing mask, snorkel and fins. A boat is not even necessary, in most cases, since the lagoons and reef flat in which sea urchins are found are readily accessable by wading or swimming.

Basic equipment investment cost is roughly about $50.00 for mask and snorkel, fins and miscellaneous items such as sacks, tongs and hand gloves. Cost information regarding processing, such as canning, is lacking at the present stage of the development of this fishery and would hardly be feasible in relation to the local demand and limited stocks.

E. Marketability and Value of Resource

Marketability of fresh sea urchins is mostly limited to a small number of Japanese residents and tourists and Micronesians. Unit cost for fresh sea urchins is not available partly due to the fact that almost all sea urchins that are harvested are comsumed by the subsistence fisherman and his family. However, it was noted earlier that canned Japanese sea urchin cost $2.75 per 100g. The cost of processing and handling sea urchins would be high due to the prevailing wage on Guam and the limited fishery stock discourages the sea urchin fishery from becoming a viable industry on the island, at least in the foreseable future. The emphasis in management of this fishery should be on maintenance of sustainable yields for subsistence level efforts and conservation purposes.

F. Environmental Concerns

Sea urchins, while considered sedentary animals, move along the lagoon substrate and reef flat interacting with other organisms utilizing nutrients and recycling byproducts within the ecosystem. Sea urchins play a role in the food web as food for other fish. Dead sea urchin shells contribute to the build-up of the reef system and in formation of lagoonal rubble and sediments.

K. Recommended Policies for Sea Urchins

1. Conduct more basic stock assessment research of reproductive cycles, habitat, population and other behavioral or biological characteristics, or environmental parameters which would assist in better formulating a management strategy for the sea urchin fishery.
2. Discourage development of a commercial sea urchin fishery; however, do not regulate subsistence taking unless further stock assessment indicates otherwise.
3. Support designation of a marine sanctuary which includes a representative population of the edible species of sea urchins, as a component of the protected ecosystem within the sanctuary.

L. Bibliography

Survey of Edible Marine Shellfish and Sea Urchins on the Reefs of Guam. Jeanine O. Stojkovitch and Barry D. Smith, Dag. DAWR for BP, CZM, Sept. 1978.