SPC/Inshore Fish. Mgmt./BP 17
1 June 1995

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

JOINT FFA/SPC WORKSHOP ON THE MANAGEMENT OF SOUTH PACIFIC INSHORE FISHERIES
(Noumea, New Caledonia, 26 June - 7 July 1995)

SEDENTARY RESOURCE MANAGEMENT IN ONNA VILLAGE, OKINAWA, JAPAN

by

S. Kakuma & Y. Higa
Okinawa Fisheries Research Laboratory
Itoman, Okinawa
Japan

Sedentary Resource Management in Onna Village, Okinawa

by
Shin-ichiro Kakuma
Okinawa Fisheries Research Laboratory,
Itoman. Okinawa. Japan

and

Yoshimi Higa
Onna Fisheries Cooperative Association.
Onna. Okinawa. Japan

I. Fisheries in Onna Village

Onna village is located on the west coast of Okinawa island. in southern Japan. The village has a 16km coastline and a population of 9000 (Okinawa Island in southern Japan has a population of 1.2 million). The number of fishermen is approximately 100 (compared to 5000 in Okinawa). The main fisheries are 'Mozuku' (seaweed *Cladosiphon okamaranus*) aquaculture and small scale coastal fisheries including shellfish fisheries. Recently annual fisheries production in Onna village. including aquaculture is around US$ 2.5 million. approximately 1 % of the total fisheries production in Okinawa (US$ 300 million).

II. Fisheries Management Regime

The fundamental management regime for fisheries is almost the same throughout Japan. Common fisheries rights allow the Fisheries Cooperative (FC) the exclusive rights to collect benthic organisms such as seaweed. Although the fisheries laws allow fishermen exclusive rights to benthic stocks, non-fishermen in the community in Okinawa also have traditional free access to such stocks.

Each prefecture has its own regulation. For example the Okinawa Prefectural Fisheries Regulation (OPFR) imposes size limits and closed seasons. Poaching still occurs although the regulation is in place. It is difficult to say whether the OPFR has been successfully implemented.

A self-imposed control system was initiated by fishermen in Onna village which is the main topic of this paper. A self-imposed system has different characteristics from fisheries rights or prefectural regulations and has recently received considerable attention because or their success in mainland Japan. Successful management stemming from initiatives imposed by local fishermen has been classified as "Community Based Coastal Fishery Management" (CBM).

III. Why Self-imposed Management is Needed?

The near shore sedentary stocks were harvested for many years before Okinawa reverted to Japan in 1972. Since then, because of economic development and the rise of fish prices, fishing

pressure on local stocks has increased. The use of SCUBA has also contributed to a further reduction in stocks. Reduced stocks call for higher fish prices, which increase fishing pressure and lead to further stock reductions. When a particular stock becomes too small to sustain its fishery. fishermen often change their target species. Consequently. in the mid-1980s. the near shore stocks became seriously threatened in Onna village and the fishermen realized that they needed some strategy to mitigate the problem.

IV. **Planning of "Onna Fisheries Promotion Project"**

The national government assisted the Onna FC to form a fisheries promotion project. The project consisted of five-year overall plans, the main impetus was to increase fishermen's income by managing near-shore stocks properly.

Fisheries extension officers were dispatched to the Onna FC to guide the fishermen in preparation of the project plan. However. the ideas of management plans were not forced by the national or prefectural government but discussed under initiatives proposed by the fishermen. The extension officers provided scientific information. such as biological data or target species. or expected effects of restrictions.

V. **How Restrictions were Set**

As a rule, a restriction for each species was decided by fishermen's common consent. This is the primary character of CBM. CBM has some disadvantages because it is sometimes ineffective for highly migrating species and it has no legal support. However there are several advantages: it's flexibility allows it to be applied to a variety of conditions and its compliance with fishermen secures its enforcement, although it cannot set restrictions that violate the prefectural regulation.

Restriction proposals for each target species were made by the staff or Onna FC and representatives of major fisheries groups by type of fishing gears used. Then, opinions on the proposals were gathered at meetings held for each small community and major fisheries groups. After arranging these plans and opinions, the plans were amended and presented again to the fishermen to get compliance.

VI. Contents of the Restrictions

The restrictions for each species are shown in Table 1. There are many interesting opinions concerning biological and economical factors of the species which are outlined as follows:

(1) Trochus

Stock management of trochus cannot be discussed without discussing the prefectural sea-farming or farming fishery projects. In Japan. the sea-farming generally means stock enhancement by releasing hatchery-produced juveniles. Re-stocking of hatchery -produced trochus juveniles are being usually undertaken on shallow reefs where predators are few. The low survival rate at the early stage after reseeding is the biggest hurdle to overcome Therefore, research on selection of suitable re-stocking locations and development of use of concrete blocks protecting juveniles after re-stocking are now underway. The blocks are constructed with an

installation of internal protection devices to prevent predation. Trochus seeds are usually kept in the blocks until they grow 3cm in base diameter.

To secure the necessary brood stock for seed production, a reserve was set up at a coral channel to keep the brood stock. The brood stock was returned to the reserve with tags after spawning was induced in the hatchery. The locations re-stocked with juveniles were also classified as reserves. The OPFR prohibited capture of trochus smaller than 6 cm in base diameter. However, the size was too small. both biologically and commercially as the smaller trochus has less mar~et value. Therefore. the size limit was increased to 8 cm in Onna village.

(2) Giant clams
Giant clam stock management especially *Tridacna crocea,* is also closely related to the prefectural sea-farming projects. Re-stocking of hatchery-produced giant clam seeds is mostly undertaken with air-powered drills and protective net pieces. This operation is laborious but high survival rates are expected. Onna village fishermen started this reseeding programme in 1989. The reseeded areas were kept as reserves. Opening of the reserve is decided in accordance with the reseeding year and growth of the clams generally four years after reseeding. An area where many giant clams used inhabited was set aside as a reserve for reserving the spawning broodstock.

OPFR applied an 8cm size limit and a closed season from June to August which is main spawning season. Giant clam fishery is operated in shallow lagoons bv mostly elderly fishermen. The use of SCUBA was prohibited to prevent the depletion of stocks.

(3) Turban shell *(Turbo argyrostoma)*
A large area in the reef lagoon was considered a good nursery around for many shellfish species including the turban shell. Since this place is totally exposed during low spring tides many local people practice reef gleaning at the time. Therefore, the area was setup as a reserve to prohibit the gleanings.

The size limit of 3cm at shell mouth specified by OPFR was adopted for the local regulation. A catch quota was allocated at 40 kg per head per day. This quota. of course was set for the purpose of stock management but also aimed to adjust market prices as the price of turban shell declined because of large landings in summer. When deciding the quota. the minimum income for a fisherman was taken into account. (There are many success cases or CBM mainly focussed on marketing issues in mainland Japan.)

(4) Strawberry conch *(Strombus luhuanus)*
This shellfish gathers in shallow places for breeding in winter. The use of SCUBA was considered a threat to the stock. A period from December to March should be declared a closed season to improve stock recruitment. In this case, however, fishermen cannot catch this mollusc efficiently. Therefore, the near shore area was divided into four blocks and rotated on a yearly basis, whereby one zone was set aside as a reserve from December to March for securing reproduction.

(5) Sea-urchin *(Tripneustes gratilla)*
Since gonad is the product for food, the sea-urchin's management is complicated. In the initial plan, its fishing was closed from October to April, when the gonad is undeveloped. However, there were claims that in certain areas where seaweeds grew (i.e. sea-urchin food) there was gonad development in winter. So the area was excluded and relocation of young sea-urchins to this area was also undertaken.

The size limit of 7 cm diameter was set for securing sufficient spawning. There are two ways for marketing sea-urchin gonad: firstly, fishermen catch sea-urchin and process them by themselves: secondly. fishermen sell the sea-urchin in a net (called "Tabu") to the processors.

The second method is unsuitable for management purposes because more sea-urchin are likely to be caught as there is no need to spend time for processing them. Since many processors live in Onna village. banning the sale to processors was impossible. Therefore. a quota was set at 60kg per head per day.

(6) Damselfish *(Chromis* spp)
Some damselfish species were fished intensively in their spawning season because of good gonad taste just before spawning. As a result, the stocks almost collapsed. Fisheries for these species were completely banned. A limited season, low economic return. and low stocks made il easy for the fishermen to accept a total ban on these fishes.

(7) Spiny lobster in Okinawa. *Panulirus longipes. P. penicillatus. P. ornatus. P. versicolor,* and *P. homarus* are fished, ;md the first two are important in terms of their stock sizes, although the period from April to June was set is a closed season in OPFR, there was strong evidence that lobsters carrying eggs in July, so the closed season was extended to July in Onna village. The OPFR imposed a size limit of 18 cm in body length. Slipper lobsters (Scyllaridae) are excluded in OPFR though they are important in the market. So Onna FC prohibited the harvesting of gravid ones and those smaller than 500g.

The above restrictions seem very rigid considering they were proposed by the fishermen themselves. This was possible because the majority of the fishermen's income was from seaweed culture or agriculture in some cases and the dependence on sedentary stocks was not so great. They were also accustomed in operating and managing own aquaculture practices. There were many, mostly young fishermen who were really concerned about the depletion of the stocks and future prospects of fisheries in the region. All of them worked favourably to build the management plans.

In formulating management plans, restrictions should work in unison with life cycles of aquatic organisms, and they should be simple and easy enough to be observed by the fishing community. The extension officers should have a basic knowledge of biology and experience in economics and socio-cultural aspects.

Can resource management be initiated without undertaking extensive biological research, and without any fisheries statistics? It seems rather difficult in South Pacific countries and Okinawa to undertake intensive research. However, fishermen know a lot about the behaviour and ecology

of their target species in the sea. Compiling this knowledge. along with minimum scientific advice, might help initiate the management of the stocks. Since self-imposed restrictions are flexible, they can be changed if they do not work well. In Onna FC. fishermen amended the restrictions three times since 1986 when the first management plan was formed.

VII. Enforcement

The first step towards the enforcement of the management plan was the distribution of copies of the plan to all members of the FC, and posters describing management plans with photos of the target species were put up in many places. Except for vicious poaching cases. enforcement was done by fishermen themselves. It may look ineffective. but it seems as if many enforcement officers are at sea all the time. With certain conditions it may be more effective and apparently less costly than enforcement by the government.

There were no restriction penalties but illegal landings were not handled in the market. However, violation of the rules was considered serious by peer fishermen. These methods are effective especially in small fishing communities.

VIII. Effect of the Restrictions

(1) Trochus
Recent catches of trochus in the region are small. Although the local stock has somehow recovered. the world trochus price has fallen (in Japan. US$10/kg in 1991, but only US$3/kg in 1995), therefore fishermen are not keen to catch trochus at the moment.

In the reserve for broodstock, the density for trochus has increased. A survey in 1991 revealed that the stock size was estimated at 10,000 shells (30 tons) and the density was three times higher than that found in other good habitats. Also, the size of shells tend to be larger than in other habitats. Stock in the reserve may provide recruits to adjacent reefs as their planktonic larval stage is short. This is one of the advantages of the restocking programmes. One thing that should not be overlooked regarding the secondary effects of re-stocking is "educational awareness". There are many cases where fishermen started stock management with re-stocking programmes. By observing tagged trochus, fishermen realized that its growth rates were fast and understood its life cycle. Thus this prevented the increase of overfishing. They also appealed their property rights for re-stocked trochus. The number of re-stocked trochus in the region is shown in Table 2. The survival rates are now under investigation. Good results from the protection blocks might be expected.

(2) Giant clams
The restrictions have been observed and their management has been successful so far The number of reseeded giant clams is shown in Table 2. Reseeding after 1989 was considered successful, and harvesting started. The survival rate four years after reseeding was, on average estimated at around 50%. Table 3 shows an increasing tendency of giant clam catch. and catch from the protected area has increased. In 1993 harvesting from protected areas was not permitted because of a marketing reason.

The restrictions were amended in 1991. That included the size limit of 15cm for T *rnaxima;* a catch limit of 50 shells per head per day; only giant clams with shells could be sold for a marketing reason. It was also decided that fishermen who harvested clams from protected areas had to pay 10% of the catch, and all giant clam fishermen had to attend the reseeding and research work. The opening of the reserves were decided according to the results of the research and market price.

(3) Turban shell
The restrictions were generally abided by, but the effect of the reserve was doubtful. so it was abolished. The quota system has been maintained. Annual catch has fluctuated

(4) Strawberry conch
The effect of the restricted block harvesting system was doubtful and harvesting by non-fisherman continued, so it was abolished. The quota system has been maintained. The annual catch increased recently, although it can not be attributed to the effect of management.

(5) Sea-urchin
Recruitment and distribution of wild seaweed have differed greatly from year to year. Consequently, the enforcement of protected areas was difficult, so some of the restrictions were abolished. The management of the sea-urchin stock has left decisions entirely to the group of sea-urchin fishermen, whose relocation plans are revised yearly. Sea-urchin were relocated from areas where recruitment was large enough, but wild seaweed was poor, to areas where the conditions were better. The quota system has been maintained.

(6) Damselfish
The restrictions had been kept and the stock recovered in a relatively short period (5 years). The fisheries have resumed paying strict attention to overfishing.

(7 Spiny lobster
The restrictions have been kept, however, the annual catch has remained low.

IX Extending Effect and Future Plans

The successful CBM in Onna village has attracted attention in other parts of Okinawa and a general movement toward CBM has started. In Onna village, the management systems should be kept or extended and should be introduced to other regions in Okinawa. At the same time, an effective resource management regime is needed not only for sedentary species but also for the bottom fish and squid species outside the reef.

Okinawa is lagging behind mainland Japan in terms of the development of CBM. The reasons are as follows: the species are different from those found in the mainland and research has not been carried out on many species. Historically, access systems to fishery resources and the idea of property rights to the resources were different. On the other hand, the species are the same in Okinawa and the South Pacific. So the case of CBM in Okinawa might be useful in the South Pacific as well. In some cases large-scale facilities subsidized bv governments are to be utilized for sea-farming programmes. It seems difficult to introduce such facilities in the Pacific islands,

but they are not essential to forward to CBM. Likewise, the case study of resource management in the South Pacific is useful for Okinawa. Exchange of information and researchers would be beneficial for the mutual development for the coastal fisheries resource management.

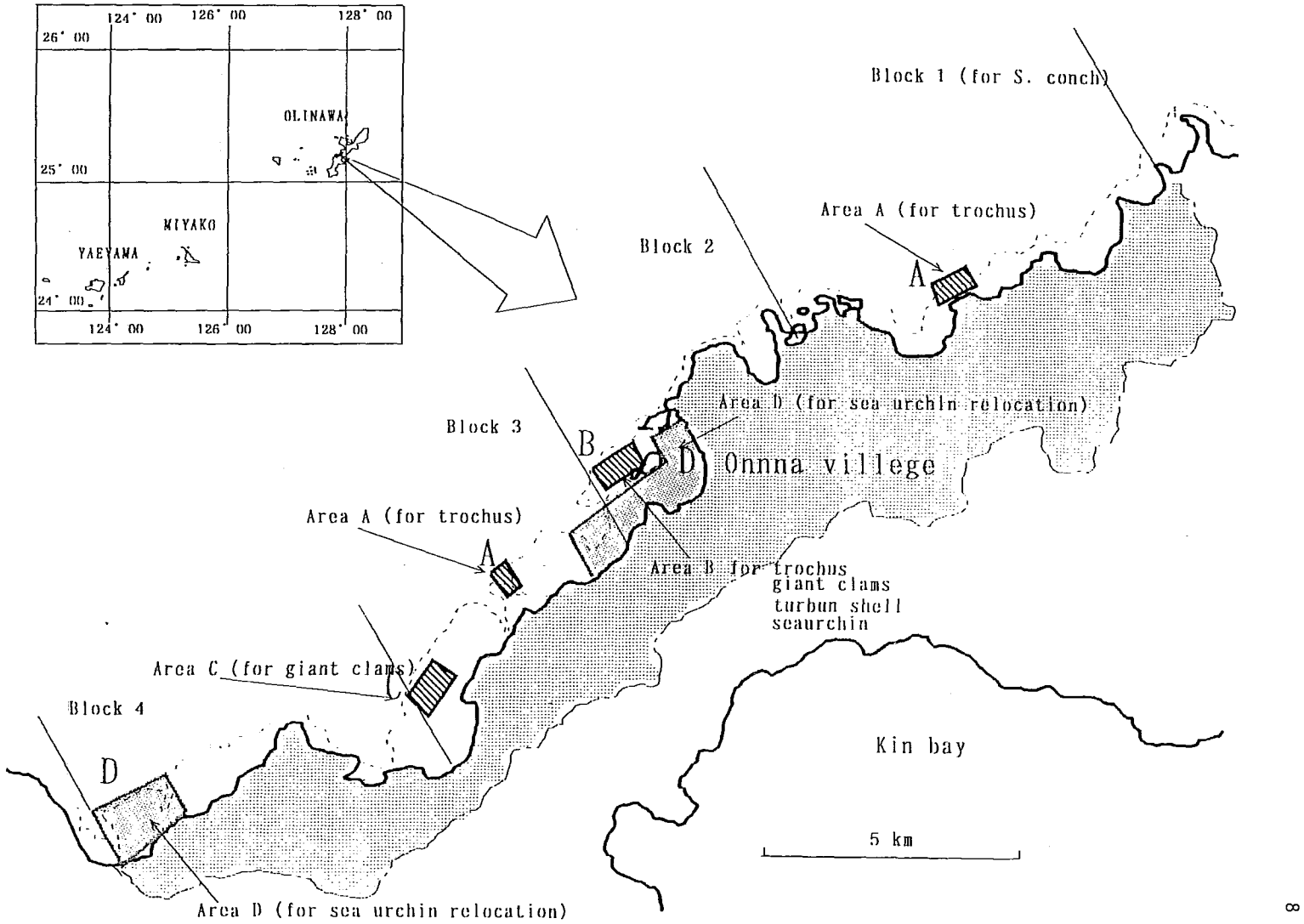

124° 00
126° 00
128° 00
26° 00
25° 00
24° 00
OLINAWA
MIYAKO
YAEYAMA
Block 1 (for S. conch)
Block 2
Area A (for trochus)
A
Area D (for sea urchin relocation)
Block 3
B
D
Onnna villege
Area A (for trochus)
A
Area B for trochus
giant clams
turbun shell
seaurchin
Area C (for giant clams)
Block 4
D
Kin bay
5 km
Area D (for sea urchin relocation)

Table 1 Community based fisheries management in Onna villege

Prohibited to catch

	TROCHUS	*T. crocea*	TURBAN SHELL	SEAURCHIN	LOBSTER
AREA	Area-A,B	Area-B,C	Area-B	Area-B	
PERIOD		P JUN-AUG		OCT-APR	P APR-JUN APR-JUL
SIZE	P Under 6cm Under 8cm	P Under 8cm	P Under 3cm	Under 7cm	P Under18cm
GEAR		SCUBA			
QUOTA			40kg a day	60kg a day	
OTHERS	Tugged				Gravid

P : Prefectural Regulation (OPFR)

Table 2 The number of reseeded trochus and giant clams

Year	Trochus		Giant clams	
		T. crocea	*T. squamosa*	*T. maxima*
1987		3,000		
1988	9,953	10,340		
1989	84,000	20,200		5,000
1990	84,500	35,200	40,000	
1991	100,000	56,510	53,000	
1992	50,000	60,600		
1993	80,500	49,000		
1994		16,000	42,000	
sum	408,953	250,850	135,000	5,000

Table 3 The catch of shellfish in Onna villege

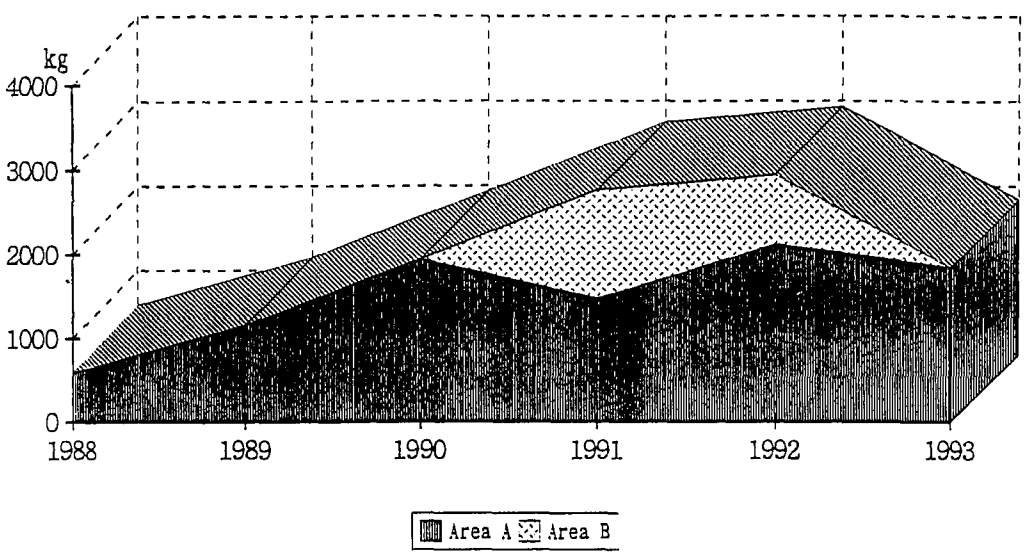
(t)

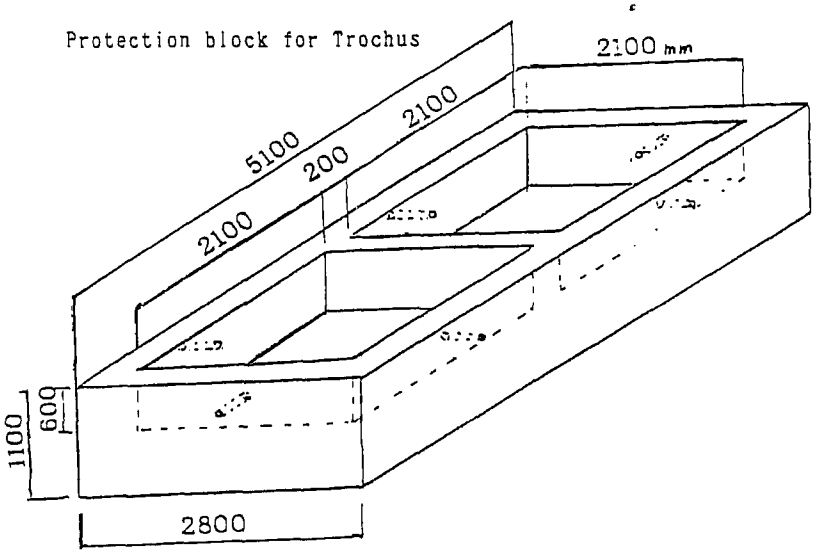
Year	Giant clams		Trochus	Turban shell	S. conch
	Area A	Area B			
1988	595		2,044	4,002	551
1989	1,163		2,024	1,484	469
1990	1,951		3,829	4,005	1,305
1991	1,481	1,278	2,187	2,576	1,125
1992	2,120	820	1,237	2,368	7,580
1993	1,845		2,196	2,471	3,589

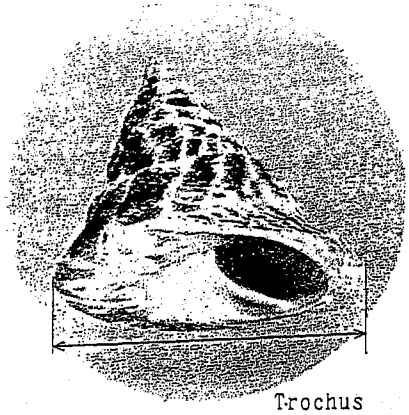
Area A: Normal area

Area B: Reserves

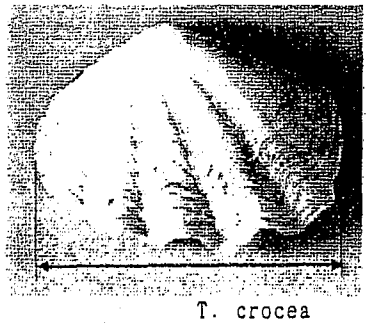
The catch of giant clams



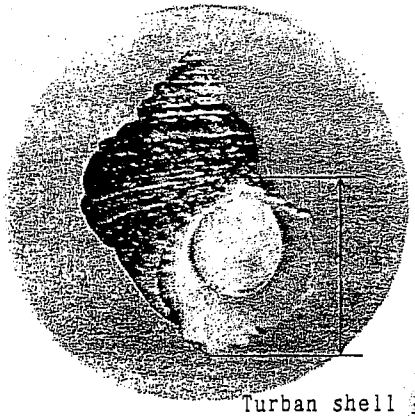




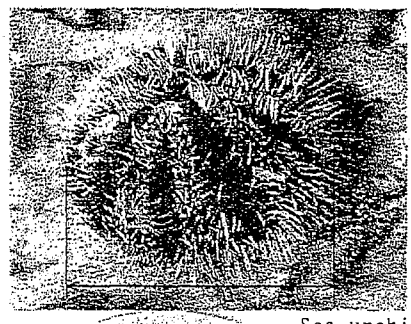
Trochus



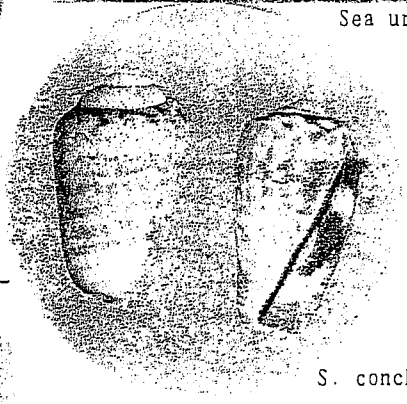
T. crocea



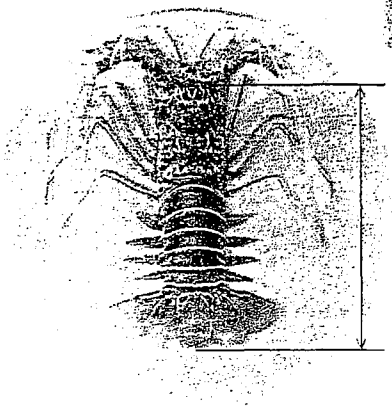
Turban shell



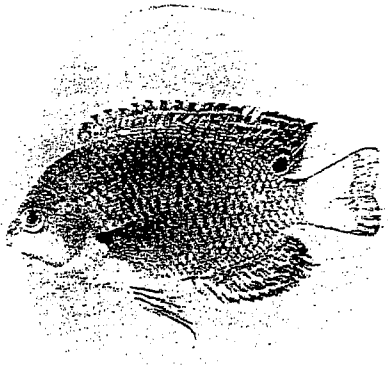
Sea urchin



S. conch



Spiny lobster



Damselfish