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THE SOUTH PACIFIC ISLANDS FISHERIES NEWSLETTER

No. 5 Noumea, New Caledonia May 1972

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Issued by the South Pacific Islands Fisheries Development Agency, a United Nations Development Programme (Special Fund) project, with the Food and Agriculture Organization of the United Nations as Executing Agency and the South Pacific Commission Co-operating Agency on behalf of the participating governments.

(296/72)

EDITORIAL

This South Pacific Islands Fisheries Development Agency's Newsletter is No. 5; it therefore opens the second year of publication.

This issue follows closely on the preceding Newsletters 3 and 4 covering the end of 1971 (issued after long delays due to practical difficulties) which gave some indication of the Fisheries Agency's policy following recommendations by the Second Meeting of the Consultative Committee and decisions taken at FAO Headquarters in Rome, and gave details of research activities and fisheries developments in the tropical Pacific.

In this issue, which covers early 1972, it is proposed to give more detailed information on the various current projects. It is tempting to say "Happy New Year", although we are already in May!

Actually this is not intended as a joke as life, especially in an Agency such as ours, is a perpetual fresh start. To do, undo, do again is always to do something. Thus from meetings to committees, and then to sub-committees, one meets again to vote motions and start fresh enquiries. During that time the earth revolves, the seasons change, the tides rise and fall regularly and navigation continues in coastal waters or on the high seas depending on the weather - but the projects make no progress! Thus some sort of history is written, reflecting a chronology of events which has no bearing on facts. Thus a chronicle could be compiled which would list exchanges of correspondence and cables, calm or agitated meetings, visits and missions which were either well prepared or hastily improvised, which have marked the life of our Fisheries Agency in the last few months. With minor variations this occurs in almost all agencies.

But we prefer to concentrate on more solid facts. While some people go to great lengths to amuse the gallery, more or less successfully, others, in the background, who are more modest, work quietly but resolutely, with eagerness, passion and courage to achieve something which may be of value to the islands' communities.

During a visit to Fiji in March and the New Hebrides in April, the Project Manager had the pleasure of again finding himself in the halthy, frank, cordial environment of those who strive, at sea or inshore, often in difficult conditions. Despite many last minute difficulties due to outside interference, the current work in Palau and in St Vincent Bay, New Caledonia, has taken such an impetus that nothing, and no one, can now stop it.

Few are the territories which have not informed the Agency of some activities undertaken during recent months and we are aware that eagerness and enthusiasm are now beginning to bear fruit in the Gilbert and Ellice, in the Cook Islands and the Solomons, as also in French Polynesia, the Trust Territory and in Papua/New Guinea.

The solidarity of men of action is being stimulated throughout the islands groups. One of the main lessons to be drawn from living in the South Seas is that, more than anywhere else, a man on his own is doomed. It is therefore a very encouraging omen to note the rapid increase in exchanges of information, views, advice and services. We feel that one of the vital roles of the Fisheries Agency, and of its Project Manager, is the subtle and fundamental one of acting as a driving and snowballing link to overcome distances, language barriers, and mutual errors.

We feel therefore that we have made a fairly satisfactory start. Of course the Fisheries Agency still does not have a Co-Manager since no Fisheries Officer has been appointed to the South Pacific Commission. Much remains to be done before the project will have available the counterpart facilities promised when the Plan of Operation was signed. More support and a better understanding on the part of some organizations is desirable.

But in spite of all these worries, delays, and obstacles, the green light for action has been given and this is all-important.

The South Pacific Commission's Planning Committee was impressed by this, and expressed its support for the Fisheries Agency's work, for the present and the future, in a resolution which will be quoted elsewhere.

The United Nations Development Programme has undertaken a first review by arranging a mission - a consultant who visited the Agency's headquarters and several territories during May.

Lastly, progress and the first results will be reviewed at the Third Meeting of the Fisheries Agency's Consultative Committee which will open in Noumea on Monday 7th August and continue, with the South Pacific Commission Technical Fisheries Meeting, until Saturday 12th August.

All beings, all organizations, go through growing troubles from which they emerge either revitalized or exhausted. Apparently, in the life of publications of all kinds, the second year is a turning point and one of destiny. With your support of this Newsletter and your collaboration we hope, dear readers, that 1972 will see a regular periodic issue. It is our wish that this modest bulletin should not only be the Fisheries Agency's spokesman but also a link of solidarity for all those who strive for better knowledge and development of tropical and equatorial Pacific resources. We hope it may be of some value.

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Extract from the report of the
SOUTH PACIFIC COMMISSION PLANNING COMMITTEE
(held in Noumea, New Caledonia, 10-14 April 1972)

III. Consideration of the Three-Year Work Programme

C: Agriculture, Livestock and Fisheries

Items 519, 692, 693, 698/699 - Fisheries

43. In view of the importance of SPIFDA to the development of fisheries in the region, the Planning Committee appointed a sub-committee to examine the future of SPIFDA and to make recommendations. The following recommendations made by the sub-committee were accepted by the Planning Committee to be submitted to the Twelfth South Pacific Conference and Thirty-fifth Session of the South Pacific Commission:

(1) Existing SPIFDA projects should be continued at the present planned level, based on recommendations of the Second Consultative Committee 1971.

(2) New or expanded projects should be discussed as part of a joint UNDP/SPC review of SPIFDA in 1972; this review should include a strong development economics component to ensure that regional and territorial needs are appropriately ranked.

(3) SPC should make planning provision for cash contribution to SPIFDA (or a successor agency) as follows:

1973*	1974	1975
A$ 15,000	A$ 20,000	A$ 25,000

for three reasons:

(i) to ensure the counterpart provision is provided;
(ii) to ensure continuance of SPIFDA for the life of the present Plan of Operation, and beyond if necessary;
(iii) to enable SPC representatives to make provisional commitments up to this level, if required, during the forthcoming review of SPIFDA's future.

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* to ensure the settlement of accounts between the Agency and SPC.

(4) For the same reasons, SPC should make planning provision to continue the Fisheries Officer post 1973-75, and consider re-establishment of further posts after the future of SPIFDA has been decided.

44. The following items were accorded Priority I status:

Item 519	- Fisheries Officer	1973-75
Item 692	- SPC counter-contribution to UNDP(SF) for SPIFDA at the levels recommended at paragraph 43 (3) of the Report	1973-75
Item 693	- Technical meetings on Fisheries	1974
Items 698/699	- Regional Symposia	1975

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THE ST VINCENT BAY MARINE CULTURE EXPERIMENTAL STATION

NEW CALEDONIA

Why St Vincent Bay ?

St Vincent Bay lies north-west of Noumea on the West coast of New Caledonia. It is a geographical complex covering an area some 80 km by 20 km which includes all natural environments found in tropical Pacific islands.

The continental coastline area is bordered by large mangrove marshes; comparatively abundant fresh water from the Tontouta, Ouenghi and Ouamenie rivers flows into the lagoon through vast deltas. The shoreline is therefore made up of mangroves and deep channels between rocky heads and outcrops which form a hard substratum sandwiched between soft substrata. The lagoon is divided into two distinct parts by a string of islands. Between the islands and the continental shore the lagoon has a typical subaerial erosion morphology with large coralless expanses of mud and sandy-mud silt. In this inner lagoon grow extensive grassy areas harbouring large numbers of green turtles (Chelonia mydas) and Dugong or sea-cows. The latter live in herds several dozens strong and are now closely protected. Large populations of crustaceans (crabs, penaeidae prawns, stomatopoda, etc.) also live on the muddy and sandy-mud bed of the inner lagoon.

Coral life in the inner lagoon is poor and limited to a few isolated structures. By contrast, the outer lagoon is typically oceanic and coralline. The islands are bordered by fringing reefs, and the lagoon is boundered on the ocean side by a great outer barrier indented by deep passes (passes of Uitoë, St Vincent and Isié) through which there is an active interchange of lagoon waters causing strong currents throughout the bay.

Thus, for applied research work on the development of marine resources, St Vincent Bay offers all the environments to be found in the tropical Pacific. Because of this exceptional combination it was chosen in 1960 for systematic biological and ecological research work for the Paris National Museum of Natural History under the "Mission Singer Polignac" research programme. A vast amount of fundamental research data was collected by some twenty geologists, geographers, botanists and marine biologists who worked in the area several months, and even in some cases several years, betweeh 1960 and 1965. This work which is now being published is a very valuable reference source for all marine farming and development work.

On the strength of the suitability of the natural conditions alone this site should have been selected for marine culture development projects. But in addition it affords vital logistic facilities whithout which no large scale valid project can be considered in the South Pacific islands where many a good project which should otherwise have been successful failed because of distances, communications and transport difficulties. For no large scale applied research or demonstration programme can be undertaken unless the flow of supplies is reliable and maintenance and repair facilities for the equipment are available. Since planning and executive staff are expected to work non-stop, sometimes night and day, a minimum of comfort, of laboratory and of accommodation facilities are necessary. There must also be facilities to take delivery of, and transport quickly, live consignments from abroad for breeding and rearing.

With an international airport close by (30 minutes or so), a fast major highway which puts Noumea at less than one hour by road, St Vincent Bay is exceptionally well situated. For example, live consignments cam be transported from the Baie de St Vincent Station to laboratories and experimental farms in Honolulu in approximately 10 hours, to Tahiti in 8 hours, to the Sydney area in 4 to 5 hours (approximately 8 hours for Port Stephens), and to the Auckland area in 5 to 6 hours. Thus a relay circuit can be set up with the major experimental research stations throughout the Pacific. This factor will prove vital when it comes to farming out breeding, post-larval and acclimatized stock to centres located in other territories which will thus benefit from the work done in St Vincent Bay.

Spirit of the project

When planning the "Baie de St Vincent" project, fundamental research and projects which would require complicated and difficult techniques, and which should only be carried out by highly specialized laboratories, have been deliberately excluded. This however does not imply that there will be no research or that a day-to-day pragmatic approach will be preferred to strict scientific requirements. But, initially, the project will concentrate on achieving positive results in the rapid growth of high density reared stocks.

In the reefs, lagoons and mangroves, good natural breeding stock is usually available, in sufficient quantity, to provide an abundance of larval and early juvenile stock. In many areas oyster spat, larval and post-larval crustaceans and fish fry are readily available. Contrary to general belief tropical Pacific reef lagoons and mangroves do not suffer from an undue depletion of breeding stock or the lack of early juveniles. It is later, during growth, that disastrous mortalities occur and wipe out much of the resources which would otherwise be available for human consumption.

What is required, therefore, is to protect oyster spat, prawn post-larvae and fish fry from predator attacks so they can have a rapid and undisturbed growth in the best hydrological environment and in adequate food conditions.

Thus the St Vincent Bay Station will concentrate first and foremost on developing the best techniques for capturing and rearing youngs, and on producing optimal growth conditions for the juvenile by achieving a biophysical and biochemical balance of the water masses and by providing supplementary food. A study will be made of the behaviour of various species groups according to densities and to their association with other groups, to ascertain whether integrated cycles of several simultaneous rearings can be achieved.

Only later, and at a more sophisticated stage, can controlled production and mass rearing or larvae be developed with a view to creating wholly integrated and controlled farms, from reproduction stock to marketable produce.

Thus it should be possible soon, within two years at most, to develop practical techniques intended for professional fish farmers who could come to the centre for training and then be able to start family farms or co-operative groups of their own. The centre would then be responsible for the overall supervision of farm establishment and for providing assistance to farmers in the form of advice on food, water change techniques and the use of methods best suited to local conditions. Only when this stage has been reached will it be possible to expand laboratory activities to the selection of breeding stock and the controlled production of rearing stock (oyster and other molluscs spat, prawn post-larvae, fish fry).

Research will also be conducted in the near future on the possibility of introducing foreign fast growing species, by importing rearing stock, either from natural beds or from artificial reproduction centres.

1972-1973 Work Programme

Having regard to the considerations mentioned above the following Work Programme has been prepared:

1. Mollusc Culture

1.1 Oysters

1.1.1 Native species: mangrove oysters (Crassostrea echinata) and rock oysters (Crassostrea glomerata);
spat collection and study of growth in various environments.

1.1.2 Imported species: Japanese oysters (Crassostrea gigas), Australian oysters (Crassostrea commercialis), Philippines oysters (Crassostrea iradalei);
importation of natural and artificial spat;
study of growth in controlled tanks.

1.2 Mussels

Transplantation trials of Manila Bay green mussel spat (Mytilus smaragdinus) and of New Zealand green mussels (Perna canaliculus);
study of growth in controlled tanks and study of possible reproduction with imported stock.

2. Prawn Culture

2.1 High density rearing trials with natural and artificial feed for penaeidae and metapenaeidae species producing post-larvae in St Vincent Bay.

Acclimatization trials of Artemia salina in the Ouenghi salt marshes and the abandoned Uitoë salterns.

3. Fish Culture

Collection of 20.000 young mullets of several species in the river mouths and the inner lagoon, and stocking in rearing tanks for growth control, with study of the effects of water renewals and natural and artificial fertilizers.

For all species, production trials of juveniles (spat, fry and post-larvae).

Facilities

1. Finance

The Terriroty of New Caledonia has allocated the Baie de St Vincent Experimental Centre 10.9 M francs CFP (approximately $US 115,000) for the calendar year 1st January to 31st December 1972. These funds are intended for setting up the Centre infrastructure and for local operating costs. The Fisheries Agency will provide a marine culture expert for a maximum period of 12 months.

2. Technical aspects

The working installations consist of a 13,000 m^2 pond with a 20,000 m^3 capacity. This pond is boundered in the north and the south by

two hills, in the east by a dyke-road and in the west by a compact earth, 120 m long, barrage whose crest is at the + 2 m tide-mark*. The foot of the barrage is at the tide-mark* 0.30 m in relation to mean sea-level; the depth will be 2 m at the outlet.

The overflow is evacuated through three outlet pipes under the dyke-road into a salt swamp at the tide-mark* + 0.95 m with possible further development over several hectares. The water for filling or changing the pond water is supplied by a centrifugal motor pump which raises thewater 4 metres and discharges it by gravity via a 75 m long concrete pipe with a diameter of 0.5 m. The specified output is 750 m^3/h and on average pumping will be possible 6 hours per day. The pumped water is discharged into pounds (claires) covering an area of 100 m^2 intended for controlled culture and observation of oysters and mussels. The water then overflows from these "claires" into the main farming pond. If required the pond can be emptied and filled again in 48 hours.

The pond is emptied by gravity and the water level is controlled by a concrete sluice built inside the pond and to be right of the medium part of the dyke. A 30 m^3 fish pond upstream collects the animals and facilitates their capture.

When the plant becomes operational, power will be provided by two 25 kw generators which will also supply the food crushing plant, the laboratory and accommodation premises. The temporary installations consist of a 36 m^2 laboratory space and 96 m^2 for accommodation built to stand winds up to 200 km/h (the roof is a reinforced concrete slab).

All premises and plant are designed to allow for further extension.

3. Planning and development

The plans were prepared in close collaboration between the Fisheries Agency and the Department of Fisheries of New Caledonia (Service de la marine marchande et des pêches maritimes). The territory of New Caledonia has called in a consultant for seven months, M. Raoul Dérijard, who arrived in Noumea on 26 February 1972, to carry out the first phase of the Fisheries Agency's project. Mr Dérijard, who is 35, is a pupil of Professor Pérès, Director of the Marine Biology Laboratory at Endoume (Marseilles). He is a marine biologist who specialises in oceanography and tropical ecology; for seven years (1962-68) he was in charge of the marine biology laboratory at Tuléar (Madagascar). For two years (1969 and 1970) he managed the Ivory Coast Marine Rearing Company at Abidjan (Ivory Coast). In 1971, he supervised the activities of the Morbihan agricultural

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* The tide-marks are expressed in relation to mean sea-level which, for Noumea harbour, is itself 0.96 m of datum.

farm in Brittany, at Quiberon, and he organized a marine farming research and development programme for the "Compagnie Générale Transatlantique" (controlled production of oyster spat, eel rearing, prawn rearing).

Dr Dérijard who has a doctorate in oceanography (July 1963) teaches at Montpellier University (scientific and technical) as Senior Lecturer (Maître Assistant) in the Department of marine hydrobiology. His published scientific works concern Indian Ocean crustaceans.

The design and blueprints were finalized by Professor Doumenge and Dr Dérijard in March and the works schedule was passed to Mr F. Raulet, architect and Mr Stephanopoli, engineer for implementation.

In the initial stages of study and work the Fisheries Agency will have available the services of an FAO expert biologist, Mr R.H. Baird, at present on an appointment in British Honduras, who should arrive in Noumea early in June. Mr Baird is an expert in oyster and mussel farming. Before joining FAO, he worked for the Conway Laboratory, in Wales, in Great Britain. After assisting in initial work the Baie de St Vincent Centre Mr Baird is to study the possibilities of extending the trials to Fiji if the environmental factors seem suitable and if local assistance is available.

4. Initial survey of natural stocks

Samples of the prawn fauna have been collected at regular intervals in various appropriate places around the Centre area. An initial survey carried out by M. Alain Michel of CNEXO (National Oceanography Experimental Centre) of samples collected up to the end of January 1972 has produced three species of penaeidae:

- Penaeus monodon (Giant tiger prawn)
- Penaeus merguiensis (Banana prawn)
- Penaeus semisulcatus (Green tiger prawn)

as well as two species of Metapenaeus which it has not yet been possible to identify with related Australian and New Guinean species and which may perhaps be new species.

A systematic study of the effects of tides and the moon on the behaviour of natural stocks is being conducted.

Techniques and gear for mass catching of post-larvae juveniles are being experimented. Deep water fishing with a view to making a preliminary survey of natural stocks will be undertaken during May or June.

5. Progress of the works at the site

The civil engineering works began on 10th April and the main dyke, the dyke-road and the concrete fish trap (moine pêcherie) were completed on 3rd May. These works required moving by transport and packing more than 2000 m^3 of spoil earth and filling material. Work was started on the water piping system early in May and the pumping plant, ordered from Australia, will be installed in May. The experimental pond will be flooded in June and at the same time work will begin on the laboratory-accommodation block. The preparatory work necessary before farming can begin is in hand: ploughing of the pond bed, spreading of chemical fertilizers before flooding, building of the shellfish pounds (claires) for oysters and mussels, making of floating crates for fish and crustacean rearing stock.

The supply of oyster farming equipment, and of products intended for special operations (Rotenone, Furamace, fish genital extracts) and for auxiliary rearings (Artemia salina roes) is already in place.

The funds used to achieve this, which are provided by New Caledonia, are approximately as follows:

3 million francs CFP (approx. US $ 32,250) for civil engineering, building of the fisheries' dykes, piping and claires;

1 million francs CFP (approx. US $ 10,750) for the pumping plant and installation;

2 million francs CFP (approx. US $ 21,500) for the laboratory-accommodation block;

1 million francs CFP (approx. US $ 10,750) for equipment, transportation and general expenses.

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THE MARINE CULTURE EXPERIMENTAL STATION

KOROR, PALAU, TRUST TERRITORY

Why Koror, in the Palau islands?

The establishment of a marine culture demonstration centre at Koror, in the Palau islands, is due neither to chance nor to political choice. The decision to set up a centre for the experimentation and farming of marine culture techniques adapted to the equatorial Pacific islands was dictated by a combination of exceptionnally favourable factors.

Firstly, part of the Palau islands consists of a karstic reef limestone structure, overun by sea, with vast natural basins surrounded by steep rocky walls. These basins can easily be controlled since hydrological exchanges take place through narrow channels linking the basins which become gradually larger.

Such an assortment of conditions is very seldom found in the Pacific islands as it requires a combination, successively of a raised compact reef limestone mass, then erosion with heavy sub-aerial dissolution after the uplift and, lastly, a subsequent overrunning by sea, due either to the raising of the oceanic level or to subsidence of the insular mass. These characteristics are found partially near Palau in Yap island, also in some islands of the Lau group in Fiji and in the north of Tonga island group, but all these areas are too remote and not well enough known for consideration to be given at present to the setting up of an applied research centre.

The Japanese who administered the island under a League of Nations mandate from 1920 to 1944, were well aware of the exceptional potential of the Palau islands. A very good marine biology laboratory was started in 1935 and for 10 years (1935-1944) a large team of Japanese scientists (altogether 30 people) compiled observations on the Palau islands lagoons and reefs which brought out their exceptional wealth and their considerable natural potential for fishing and marine farming. Pre-war work (1938-1941) and a large number of scientific publications in Japanese and in English represent most valuable reference data for the present development projects.

After the end of hostilities the American administration, under the terms of the United Nations Trusteeship, confirmed the suitability of Palau as the best site for a new start in the development of marine resources by setting up, on the island, the central laboratory and the headquarters of the Marine Resources Division of the Territory.

This Division, under the intelligent and energetic drive of Peter Wilson, assisted by a team of young American biologists and also by competent and devoted Micronesian assistants, has been working continuously to develop the local potential.

In the field of pelagic fishing, a skipjack (Katsuwonus pelanis) freezing plant has been successfully set up by the Van Camp Company. By contrast, almost everything remains to be done with regard to development of lagoon resources as a marine farming venture requires a rather protracted action and a great deal of outside assistance.

Yet, logistically, Palau is in quite a good position, with a good airport for air communications with Guam, though the supply of equipment and repair services is still often uncertain. The interest shown by the Universities of Hawaii, California and Japan in marine biology studies in Palau is an additional insurance of essentiel assistance and support since more than anywhere else it is impossible to "go it alone" in the Pacific islands.

Spirit of the Project

The final choice for locating the marine culture demonstration centre at Palau was made at the second meeting of the Fisheries Agency Consultative Committee which was held in Noumea from 18th to 22nd October 1971. Previously, all the Fisheries Agency's consultants who had studied Micronesia had stressed the value of setting up a centre in the Palau islands (reports by Mr John Glude, Professor F. Doumenge and Professor Villaluz in particular). As early as November 1971, steps were taken to determine the problems involved and to find quick and practical solutions for launching the project.

After a study visit to Japan at the end of October 1971, Mr John Glude, Fisheries Agency consultant, visited the Palau islands for three weeks to enlarge upon his previous survey. He was joined on the 15th of November by Professor F. Doumenge, SPIFDA Project Manager. During one week, from 15th to 22nd November, a working group including Mr Peter Wilson, Director of the Trust Territory Marine Resources Department, Dr James McVey, Marine Biologist at that Department, Mr John Glude and Professor François Doumenge, worked out the contents of the project in detail in order to submit to UNDP and FAO a precise work programme plan and budget and so as to be in a position to seek all possible outside assistance.

The Palau demonstration centre is designed not only as an applied research institution which will maintain close contacts with the laboratories and experts specializing in this field (in particular in Japan, the Philippines and the United States), but also to offer

facilities for the training of staff and skilled labour with a view to passing on, in island village communities, the techniques developed most likely to yield appreciable additional resources for the islands' economics.

As a first step, a dozen trainees from Palau islands will be selected and trained. Later, depending on results and lessons learnt from this experiment, trainees will be recruited from other Trust Territory islands and from other islands who will be sent, with scholarships, by the territories participating in the Fisheries Agency projects.

The promotion of education and training of actual marine farmers amongst the islanders is uppermost in the project which thus meets perfectly the recommendations of the Consultative Committee and the provisions of the SPIFDA Plan of Operation.

1972-1973 Work Programme

The remarkable potential which exists around Koror and throughout the Palau islands has led to the preparation of an ambitious programme so as not to neglect the development of some sectors:

1. Molluscs

1.1 Oysters

1.1.1 Native oysters

In the Palau islands, there are fairly large natural stocks of oysters Crassostrea glometara and Crassostrea echinata. The time of spatfall will have to be ascertained as well as the most suitable collectors and equipment for this culture.

A selection of the most suitable species for the market will be carried out having regard to the rate of growth and the flavour of the flesh.

1.1.2 Foreign oysters

Study the behaviour of a small batch of Crassostrea gigas from a Californian artificial spat production center.

1.2 Pearl oysters

Collect and study the development of Pinctada sp. and Pteria sp. from the lagoon.

Evaluate the possibilities of using reared shellfish either for sale as curios for tourists or for pearl production.

1.3 Giant clam shellfish

Ascertain the rate of growth of the three species of Tridacnes and Hipopus, T. gigas, T. squamos, H. hipopus; ascertain their reproduction cycle and the feasibility of obtaining and rearing larvae in controlled tanks.

2. Crustaceans

2.1 Sea prawns

Survey of the natural lagoon prawn stock, concentrating in particular on penaeidae.

2.2 Fresh water prawns

Survey of the natural stock of Macrobrachium lar; introduction of Macrobrachium rosenbergi in taro fields, compare behaviour of the two Macrobrachium species in flooded fields.

3. Turtles

Continue rearing trials of young turtles; study growth rate and mortality.

4. Fish

4.1 Rabbit fish (Sigamus lineatus and Sigamus fuscescens)

Ascertain the reproduction cycle;
rear fry from natural layings and ascertain growth rate up to a marketable size;
experiment with natural or artificial feed formulae with a view to increasing growth rate.

4.2 Milkfish (Chanos chanos)

Introduce juveniles from the Philippines for experimental rearing.

Facilities

1. Participating bodies

The rapid development of the demonstration centre has been made possible by the combination of assistance and support from various international and national bodies and aid-granting institutions.

1.1 Trust Territory Marine Resources Division

It has made available to the project its administrative infrastructure, its laboratory, its equipment, and transport and workshop facilities. A full time marine biologist of the Division has been appointed to conduct the project. He is Mr James McVey, 29 yrs, B.Sc. (1965), University of Miami, M.S. (1967), University of Hawaii, Ph.D. Marine biology (1970), University of Hawaii, who has worked on oysters and crustaceans in Florida (1963-1965), who later became particularly interested in problems regarding the succession of organisms on new substrata - fouling and artificial reefs - in Hawaii (Lockheed Aircraft Company fouling project 1965-1967), Pokai Bay artificial reef 1967-1970).

James McVey who has also a great deal of experience in research cruises in the Pacific joined the Marine Resources Division, Palau laboratory, in 1970.

In addition, secretariat, interpretation and public works staff, paid by the Marine Resources Division, is available part time or full time for the project development.

1.2 The South Pacific Islands' Fisheries Development Agency (FAO/UNDP)

It has contributed, to the project, consultants services and a small contribution of equipment (1 stereomicroscope and documentation data). For 1972-1973, SPIFDA will bear the cost of 12 months of oyster farming expert and 6 months of fish farming expert. The oyster farming expert has just been selected; he is Mr Clyde Sayce, 51 yrs, marine biologist, Willapa Bay laboratory, Washington State, U.S.A. Mr Sayce has more than twenty years experience in practical and commercial oyster farming on the United States Pacific coast. He has visited Japan on a great many occasions to inspect the quality of the spat imported each year from January to March from the Sendai area (Miyagi province).

Mr Sayce specializes in forecasts of density and timing of oyster spatfalls on the Washington State coast line and has furthermore contributed in the development of new farming techniques. He is due to start work in Koror at the beginning of May 1972 and will remain there until the end of April 1973.

In addition to providing an oyster farming expert for 12 months and a fish farming expert for 6 months, the Fisheries Agency will provide the services of its Project Manager who will stay in Koror about 3 weeks in 1972.

1.3 National Oceanic and Atmospheric Administration, U.S. Department of Commerce

1.3.1 Office of Sea Grant

The "Sea Grant" has granted $US 7,500 to the project, from 1st March to 1st July 1972, to cover the expenses of 10 Micronesian trainees and initial capital expenditure. A request for $US 70,000 covering a two-year period (July 1972 to June 1974) has been submitted to continue and expand the project.

1.3.2 National Marine Fisheries Service, Seattle Branch

With Mr John Glude, it provides technical and administrative assistance in the selection and purchase of equipment in the United States and deals with relations with the suppliers.

1.3.3 National Marine Fisheries Service, Honolulu Branch

This Service has accepted to deal as central delivery point for the project equipment and to facilitate its shipment in particular on the research vessel CROMWELL which undertakes periodical cruises in Micronesia.

1.4 Palau Community Action Agency

It has set aside an amount of $US 51,666 for Palau oyster market research ($ 17,666) and as a contribution to training activities at the center ($ 24,000) and extension work at the village level ($ 10,000). An additional contribution will be forthcoming during the future stages of the project.

1.5 Peace Corps

The Peace Corps has undertaken to provide technical staff and biology assistants to assist experts provided by the FAO and undertake the training of local staff who, later on, would take over the administration and implementation of the project.

1.6 Support already given or being negociated

Many bodies have shown their interest and willingness to participate in the activities of the Palau marine culture demonstration centre. These are in particular:

- The Foundation for the peoples of the South Pacific
- East-West Center, Honolulu
- The University of Hawaii (Marine Biology Section)
- Guam University (Marine Biology Section).

2. Location

The demonstration centre's initial work will take place in the southern part of Palau islands in three major areas:

Koror area
Peleliu
Ngatpang Bay.

2.1 Koror area

The operational base for the laboratories and the land operations is located in Koror harbour. The experimentation and demonstration center is close to the port (approximately 6 km) and it can be reached easily by boat in about thirty minutes.

The site selected consists of a series of 3 karstic basins of successively larger size, linked by very narrow channels but having an excellent tidal interchange of water. The inner basin is the smallest (diameter approximately 100 meters), it has a sandy bed and seaweed patches; it is almost entirely closed at low tide by a rocky shelf and could easily be developed into a turtle or fish pond.

The middle basin, much larger (diameter approximately 200 meters), has two lateral channels on either side of a small island which acts as a stopper. It has been selected for the land base as there is an intermediate platform overlooking a good rock oyster deposit. The topography is suitable for fish ponds and shellfish farming fixed installations.

The outer basin which, with its secondary ramifications is more than 500 m in diameter, constituting a water reservoir of some twenty hectares, is an ideal place for collecting spat and for suspended culture trials. This basin runs into a secondary bay which itself opens out on to the large channel to Koror harbour.

Thus, the demonstration centre has available a site which is easy to develop without excessive cost and suitable for all kinds of experiments with molluscs, fish and turtles.

2.2 Peleliu island

At the south-east end of Palau islands, the slightly raised reef limestone structure of Peleliu affords a nice 4 to 5 hectares pond, which the inhabitants of the neighbouring village already use as a natural reserve of fish, which enter it as fry and grow to adult size. But the inlet and the renewal of the water in this natural fish pond leave much to be desired. Pipes placed under a road constructed during the last war by the American Army only allow a limited supply from the mangrove channels which fill up at high tide. By simply cleaning up the edges of the pond and improving water circulation, it will be suitable for controlled fish farming experimentation.

2.3 Ngatpang Bay

The bay is a large indentation in the south-west coast of the central island (Babelthuap); it is undoubtedly a most suitable site for fattening experiments near and in the mangrove channels which cover a large coastal area. Control of the water is out of the question, but there are vast areas with suitable depths for suspended culture.

3. Initial work

In the basins located near Koror, observations and trials have been carried out throughout 1971. A first batch of collectors on raft was installed in January and in May there were good fixations on the collectors and young oysters growing rapidly.

These installations sunk in July; other rafts and floats were installed in August, and there were other good fixations by November.

Various types of collectors have been tried (trochus shells, giant clams, cement slabs, old tyre pieces). On the ropes and intervals between collectors there were fixations of Pteria which showed an extraordinary growth (shells more than 15 cm long weighing more than 150 g,

including flesh, on collectors under water less than six months). It is undoubtedly one of the highest growth rates reported for bivalve molluscs.

As a gesture to emphasize its will to see the activities of the centre started as soon as possible, the Marine Resources Division built in November 1971, and installed during December, a light pre-fabricated wooden bungalow for use as accommodation for workers in the field. Since then a fresh-water tank has been installed (3,000 gallons) and a generator is also being installed.

Materials suitable for the construction of rafts and of fixed installations for spat collection and oyster farming has been delivered by sea by the CROMWELL in March, as well as materials for floating boxes and fish ponds.

Furthermore, controlled hatching trials of good quality turtle eggs (Hawksbill turtle, Eretmochelis imbricata) have been started again and new juvenile rearing experiment carried out in 1972 for comparison with the early data collected in 1971. Results obtained and comments thereon by James McVey appear elsewhere in this issue.

* * *

PROGRESS OF THE MARINE TURTLE PROJECT

The study of problems related to the protection of marine turtle species endangered by human exploitation in the tropical Pacific concerns all the territories within the scope of the Fisheries Agency.

In 1971 two consultants, Professors Hirth, of Arizona University, and Hendrickson, of Utah University, visited most of the area covered by the Fisheries Agency. Their reports are now available: Professor Hirth's was circulated in October 1971, and Professor Hendrickson's has just reached us. Territorial Administrations now have documentation they can use to undertake limited but effective action.

From a number of recent developments it is plain that the project is being pursued vigorously. Firstly, to the documentation already available has been added a first class document, with the publication in February and the distribution in March, of the synopsis of biological data on green turtles (Chelonia mydas) published by FAO in Rome and written by Professor Hirth, the Agency's consultant.

In addition, through the co-ordinated action of the Agency's consultants, Hirth, Hendrickson and Glude, it was possible to meet rapidly an urgent demand for tagging equipment to continue current operations and undertake new activities. Tagging equipment was ordered specially in the United States and forwarded at the end of April to Western Samoa, the Trust Territory of the Pacific Islands and French Polynesia.

In the latter territory a special mass tagging operation was conducted in a very short time by the French Polynesian Department of Fisheries.

Following Fisheries Agency's consultants' recommendations, the Territorial Assembly of French Polynesia, on proposal of its Department of Fisheries, enacted, on 23rd December 1971, a new regulation on the capture and marketing of green turtles (Chelonia mydas), the text is attached.

In accordance with this regulation, about 200 green turtles found stocked - and intended for sale - in the Scilly atoll (at the extreme West of the Society island group), were confiscated by the administration at the beginning of March. On 16th March the Fisheries Agency in Noumea received a telegram from Tahiti, requesting urgently equipment and instructions for tagging green turtles before release into the sea. As a result of a rapid exchange of cables and correspondence between Noumea, Tahiti, Tucson (Arizona) and Salt Lake City (Utah),

88 tags and a pair of pliers were delivered 10 days later in Tahiti and transported urgently to Scilly where the Polynesian Fisheries Department tagged and released, on 31st March, 67 female adult turtles, measuring between 87 and 110 centimetres at the longest part of the shell.

The Fisheries Agency, the Polynesian Fisheries Department and the consultants, Professors Hirth and Hendrickson, because of their immediate co-ordination and close co-operation, were able to meet a new and unexpected situation which ended with a first mass release of tagged green turtles, in an area where, at present, we have no accurate data regarding movements and behaviour.

In addition studies on green and hawksbill turtle rearing are continuing in some territories and we are grateful to Mr James McVey, biologist of the Marine Resource Division in the Trust Territory for forwarding to us, for the information of our readers, the first results of his experiments on growth and feeding of young hawksbill turtles. We look forward to receiving similar notes on current experiments from territories.

Lastly, to show its interest in this project which covers all territories, the South Pacific Commission has decided, as counterpart, to participate in the purchase of equipment and to bear the cost of publication of the extension handbook on marine turtles in the Pacific.

* * *

Resolution No. 71-209 dated 23 December 1971 on the control of MARINE TURTLE (Chelonia mydas) FISHING IN THE TERRITORY OF FRENCH POLYNESIA

Article 1. All fishing of marine turtles (Chelonia mydas) whose carapace is under 65 cm in length is prohibited in the whole territory of French Polynesia.

Article 2. The capture, on land, of regulation size turtles is prohibited between 1 November and 31 January.

Article 3. The capture, at sea, of regulation size turtles is prohibited between 1 June and 31 January.

Article 4. Turtle concentration grounds are open to fishing according to a quota allotted to each zone and fixed by Council of Government decree on proposal of the head of the Fisheries Department.

Article 5. The holding of live turtles for more than 10 days is only permitted in a fish pond fitted with a sun shade. Live turtles may only be transported if shaded from the sun and provided they are not ill-treated in such a way as to cause unnecessary suffering.

Article 6. The gathering of mature turtle eggs on land is prohibited.

Article 7. Permits for the capture of turtles of all sizes and for harvesting of mature eggs may be granted for scientific research purposes by the head of the Fisheries Department.

Article 8. Slaughtering of turtles shall be carried out in good, sanitary conditions and especially away from flies, dust and any polluting or infectious matter.

Article 9. The sale of sea turtles is prohibited throughout French Polynesia.

Article 10. Anyone found to have collected mature eggs on land without permission and anyone who sells live whole turtles or turtle flesh shall be punished in accordance with the scale of sentences provided in Decree No.2792/AA dated 24 October 1968 under the fifth category of offence.

Anyone who fishes turtles of non regulation size during the open fishing season or female turtles, on land, which have not finished laying their eggs will be punished according to the scale of sentences provided in Decree No.2792/AA dated 24 October 1968 under the fourth category of offence.

Anyone who fishes turtles during the closed fishing season will be punished according to the scale of sentences provided by Decree No.2792/AA under the third category of offence.

Anyone who fails to comply with any other provision covered by this Resolution shall be punished according to the scale of sentences provided by Decree No.2792/AA dated 24 October 1968 under the second category of offence.

Article 11. This Resolution is adopted for implementation by all concerned.

* * *

Photo 22-25

GROWTH RATE AND FOOD CONVERSION IN YOUNG HAWKSBILL TURTLES (Eretmochelys imbricata)

James P. McVey, PhD.

The hawksbill turtle (Eretmochelys imbricata) is considered an endangered species by the United States Department of Interior and is placed on the list of protected species. However, there are still viable populations within the Trust Territory of the Pacific Islands and particularly within the Palau District. Increased predation from fishermen and the local practice of eating turtle eggs have led to a decline in hawksbill populations. The Marine Resources Division of the Trust Territory has, as a conservation measure, embarked on a programme to raise the turtles from the egg to a stage large enough to avoid most predation in nature. The growth rates and conversion ratio of food weight to turtle meat is also being explored to determine future possibilities of farming the hawksbill turtles. The following information was obtained from the first of a series of experiments on growth rate and food conversion in hawksbill turtles.

Hawksbill turtles were collected on their hatching day (3-2-71) from natural nests in the southern uplifted rocky reef limestone rock-island area of the Palau District. The turtles were measured and weighed to determine average weight (12.3 gms.) and carapace length (3.1 cm.) upon hatching. Approximately twenty turtles were placed in two twelve-foot diameter ferro-cement tanks supplied with running sea-water from an inert marine pump. The hatchlings were fed a mixed diet of tuna and bonito meat, sardines and benthic algae (Laurencia and Padina). Fish was the preferred diet; only traces of algae were consumed.

The turtles were divided into two groups as a means of checking the reliability of the experimental method. Monthly measurements of turtle weight and carapace length were made. During the period 6-30-71 to 8-22-71, when the turtles were approximately four to five and one-half months' old, the daily food ration per turtle was computed. This data was then compared to the average weight gain per turtle to estimate the food conversion ratio.

Figure I shows the weight gain and carapace length with time for ten randomly selected turtles. In six months the turtles grew from an initial average of 3.1 cm. to 14 cm. in carapace length, while their average weight went from 12.3 gms. to 361 gms. in the same period.

Table I shows the food conversion ratio for the two groups of turtles. For each group (Group A--19 turtles, Group B--20 turtles) the conversion ratio was very close to three indicating that it takes about three pounds of food for one pound weight gained.

Several difficulties were encountered while raising the turtles. Young hawksbills are more pugnacious than green turtles and frequently injure each other during their aggressive feeding. Once a sore develops it is picked at by others until the injured animal dies. Separation of injured animals until they were healed helped to reduce this mortality. Gentian violet was used as an antiseptic for the wounds and was applied by dipping the animals in a 1% solution. Noticeable improvement occurred after treatment, and several animals were returned to the group tank after two to three weeks.

Frequently, a salt-like formation would appear in the corners of the eyes of the hatchlings. This could be removed mechanically by using a toothpick wrapped in cotton to scrape the encrustation from the eye.

One of the most persistent problems was the growth of algae on the backs of the young turtles. This was overcome by brushing the back of each turtle at two-week intervals. Putting a roof over the tanks helped to reduce this problem by reducing the light intensity for photosynthesis.

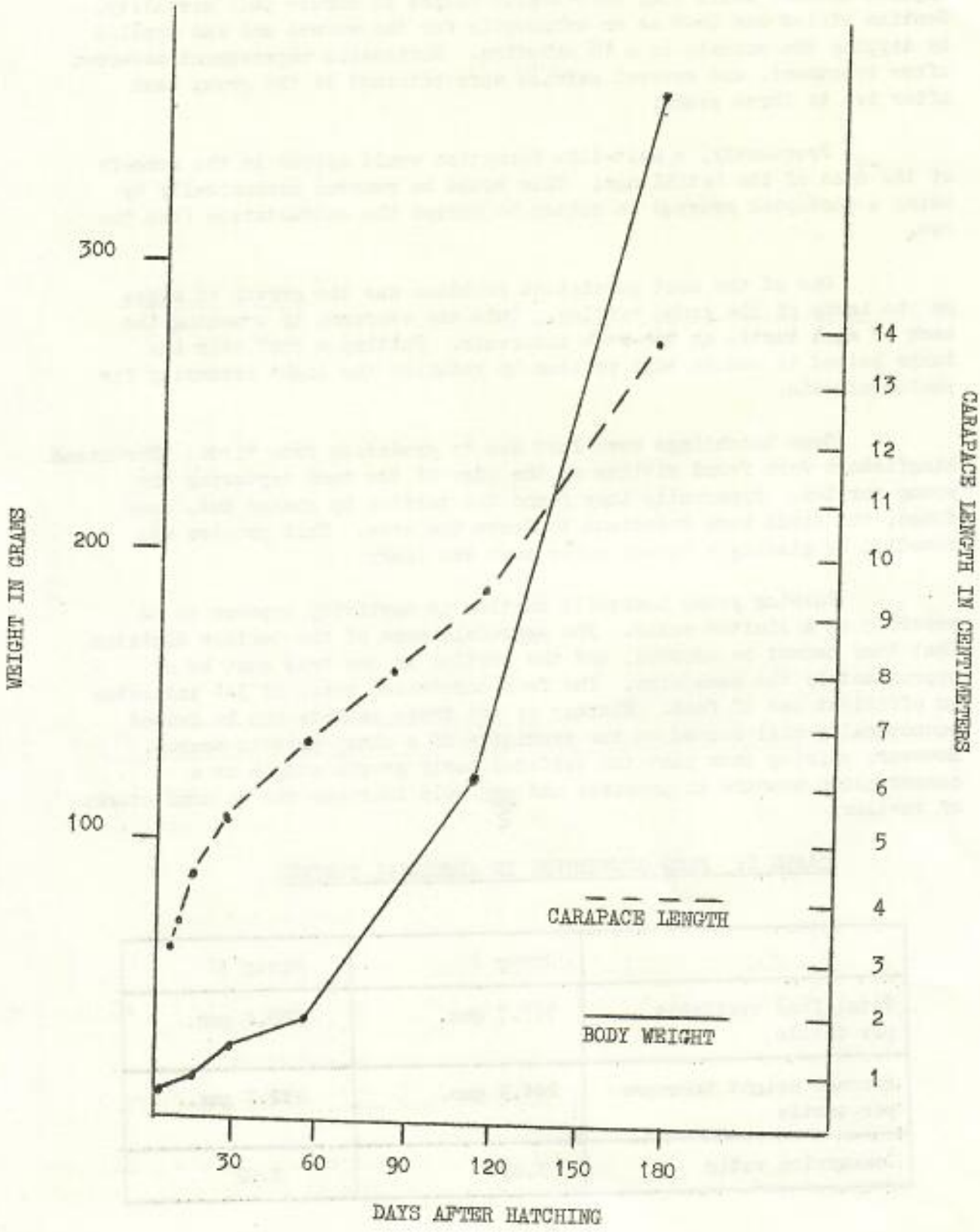
Some hatchlings were lost due to predation from birds. Herons and kingfishers were found sitting on the edge of the tank capturing the young turtles. Apparently they found the turtles by chance but, once found, the birds were reluctant to leave the area. This problem was remedied by placing a screen cover over the tanks.

Raising young hawksbill turtles in captivity appears to be possible on a limited scale. The aggressiveness of the turtles dictates that they cannot be crowded, and the turtles in one tank must be of approximately the same size. The food conversion ratio of 3:1 indicates an efficient use of food. Whether or not these animals can be raised economically will depend on the proximity of a cheap protein source. However, raising them past the critical early growth stages as a conservation measure is possible and may help increase the natural stocks of turtles.

TABLE I: FOOD CONVERSION IN HAWKSBILL TURTLES

	Group I	Group II
Total food available per turtle	747.7 gms.	680.4 gms.
Average weight increase per turtle	244.5 gms.	232.7 gms.
Conversion ratio	3.05	2.92

FIGURE I: TURTLE WEIGHT AND CARAPACE LENGTH INCREASE WITH TIME



PROGRESS OF BOAT BUILDING PROJECT

Mr John Fyson, FAO adviser on fishing boat development, is working hard in Suva to develop the SPIFDA boat building project as recommended by the second meeting of the Consultative Committee and approved by FAO, Rome. He sends us news of his work.

1. Progress

38 ft. ferro-cement boat for Western Samoa

After a visit to Western Samoa in November a revised layout and general arrangement drawing for this boat was prepared and approved by the Fisheries Officer. On the basis of this arrangement, construction and superstructure drawings were prepared giving woodwork and joinery details. Further detail sketches were also prepared for such items as windows, vents, mast, rigging, etc.

28 ft. plywood day boat for Western Samoa

Design and construction drawings were prepared and an equipment specificiation made out for this vessel which is being built in the boatyard of Millers Ltd., Suva. Drawings made as follows:

Profile and deck plan
Lines plan and offsets
Construction profile and plan
Construction sections
Trolling boom fittings

Regular visits were made to the yard to check on progress of the construction.

The boat was launched on 20 April and a trial run was made on 22 April giving average speed of 12.40 knots at 2,200 rpm and 10.69 knots at 2,000 rpm. Due to delay in shipping a further trial run was made giving an average speed of 11.25 knots at 2,100 rpm with three people aboard, and 9.7 knots with bait tanks full and three people aboard.

The boat was sent by cargo deck transport to Apia on 29 April.

27 ft. fisheries patrol boats for Fiji

An arrangement drawing was prepared for two versions (long and short range) of a 27 ft. fisheries patrol vessel. This drawing was requested by the Fisheries Division of the Fiji Government.

17 ft. 6 in. flat bottomed wooden boat for the inshore fishermen of Fiji.

Two drawings based on an FAO design were made showing construction details of this boat to enable a costing to be made for local construction.

35 ft. ferro-cement fishing boat for Fiji

A general arrangement, lines plan and offsets and a construction profile and plan were prepared for a 35 ft. general-purpose fishing boat to be used in the unit fishery project schemes. Based on an FAO hull, this new arrangement is to provide a boat suitable for the carrying of small dories, multiple trolling and hand and deep reel line fishing.

A brief specification giving details of the construction method has also been prepared. This boat may also prove to be of interest in Tonga and drawings are to be sent to the Government of Tonga for inspection and comment.

Building bays for the construction of ferro-cement fishing boats

Sketches and material lists have been prepared for the erection of two covered building bays for the construction of future 35 ft. ferro-cement boats at the Fisheries Division compound, Lami.

Third 30 ft. ferro-cement boat

Advice and supervision of the covering of the hull with mesh, plastering and curing were given during the construction of this boat to date.

Report on the unit fisheries project in Fiji

Assistance was given in the writing of sections on boat building, proposals for vessels and operating costs.

Other vessels for Fiji

Preliminary investigations have been made into the preparation of a design for a suitable fish-carrying vessel of 40 to 45 ft. to be built in ferro-cement. Basic dimensions and carrying capacity have been proposed and further work on this design will be carried out within the coming months.

Outline sketches have been requested for the construction of a 25 ft. inboard powered open fishing boat for the inshore fishermen of Fiji. This boat will be used for gill netting and long lining in inshore protected waters.

Ferro-cement and concrete rafts for mollusc culture

Investigations into methods of construction and a provisional costing have been made. An outline sketch of a raft has been prepared and costings of pontoon sections and beams requested in order to prepare a more detailed cost estimate.

35 ft. semi-displacement day fishing boat

Following requests at the second meeting of the Consultative Committee preliminary lines plan and arrangement are in preparation; work will continue on this project.

2. Programme of work

During the coming months the following work is proposed:

Complete drawings, work programme material, lists and building instructions for the 35 ft. wooden day boat requested by the Samoan representatives at the second meeting of the Consultative Committee.

Continue to provide supervision of ferro-cement fishing boat under construction for Fiji. Advise on construction of building bays, loft lines and supervise construction of first 35 ft. ferro-cement fishing boat as soon as loan approval is obtained.

Advise Fiji Government on 40-45 ft. ferro-cement carrier boat to be built for the transport of fish in the unit fishery schemes.

Provide drawings for a 25 ft. wooden inboard engined open fishing boat for the inshore fishermen of Fiji.

Provide detail drawing of bait tank and well construction and drainage for 75 ft. fisheries research vessel to be built by Marine Department shipyard, Fiji.

Supervise construction of ferro-cement raft for mollusc culture ordered by Fiji Government at a cost of approximately Fiji $ 1,700 (US $ 2,098).
The raft structure is to be 20 ft. long and 40 ft. wide with two transversal floating pontoons 20 ft. x 5 ft. x 4 ft. made of pre-cast units and three longitudinal prestressed concrete beams supporting a wooden frame. This type of raft for mollusc culture was suggested by Professor F. Doumenge, Project Manager, SPIFDA, after a visit to the experimental mussel farm in Marlborough Sound, Blenheim (New Zealand) last February.

* * *

30 TRAINING COURSE ON FRESH-WATER GIANT PRAWN CULTURE
EAST-WEST FOOD INSTITUTE, HAWAII

15 June to 15 October 1972

River basin developments have frequently resulted in the demise of economically significant prawn and shrimp fisheries in deltaic regions below such developments. On the other hand, reservoirs created as a result of river basin development provide excellent opportunities, if properly managed, for prawn and shrimp production on a scale impossible to achieve in undeveloped rivers. Recently developed techniques in breeding prawns in captivity now makes it possible to develop the potential of newly-created reservoirs through deliberately planned prawn and shrimp farming. Developing the capacity to utilise new and existing water resources through the application of this new breeding technology would serve to reduce the anticipated "protein gap", provide employment for several thousands of people and launch a lucrative export industry based on a highly elastic world demand, providing valuable foreign exchange.

The Food Institute have planned this four-month programme, which will be held in Hawaii with an anticipated twelve participants from seven countries, in the belief that the training will provide a basis for joint study of the skills and understandings needed in the application of new technology to specific new projects growing out of the Mekong River basin development as well as to current fisheries projects in areas of southeast Asia and the South Pacific.

Programme objectives and resources

The broad overall objective of this programme is to develop skills and understandings requisite to planning and implementation of culture of giant prawn, Macrobrachium rosenbergii. Emphasis will be given to the practical aspects of developing and operating a hatchery and to the operation of ponds for rearing marketable sized prawns. Related skills in identification, feeding, disease and water quality will be included; progress in fin fish culture will be observed and studied and general fisheries production and management in relation to the total food system discussed.

The resources of the Hawaii Fish and Game Division, the Hawaii Institute of Marine Biology, the Oceanic Institute and Fish Farms of Hawaii Inc. are being combined to provide a broad base of learning experience.

Programme calendar (dates tentative)

June 15-23 Arrival, orientation, programme arrangements. Participants should be prepared to give brief reviews of fishery operations in their country.

June 26 - Aug. 8	45-days of practical experience. Each participant will rear and care for a tank of larval prawns, also gaining experience in transporting juveniles, in operating rearing ponds and rearing prawns to commercial size.
Aug. 9 - Aug.17	Work study at Fish Farms of Hawaii Inc. at Kihei,Maui.
Aug. 18	Study evaluation.
Aug. 21 - Sept.29	Focus on variety of topics as: selection of hatchery and pond sites; design, construction, operation and maintenance of rearing ponds; identification of decopod crustaceans; diseases; natural and artificial feeds; water quality; marketing; reproductive physiology, larval rearing and larval feeding of fin fish.
Oct. 2 - Oct. 5	Tentative planning of home programmes using skills and processes learned.

Arrangements

Participants must have a B.Sc. degree or equivalent, preferably with fisheries or zoological bias. Knowledge of English essential. Previous aquaculture experience preferable, not necessarily with prawn fisheries. It is highly desirable that participants already, or on completion of training, be directly responsible for relevant work in their respective countries.

Participants will be housed in a residence hall located on the campus of the East-West Center. Instruction will take place at four different sites and transport will be arranged.

Asian and Pacific Island participants will receive US $210 per month for meals and incidental expenses (effective June 15); housing will be provided. All books and other materials required will be paid by the East-West Center. Participants will be covered by health and accident insurance. While travel to and from Hawaii will be arranged and paid for by the participant's nominating agency, the East-West Center will provide funds for local transportation associated with the programme.

* * *

LOSS OF JANSS FOUNDATION RESEARCH VESSEL "SEARCHER"

Professor A.L. Tester, of Hawaii University, has in recent months been planning a marine research programme to be undertaken in 1973 and 1974 in conjunction with the Janss Foundation of America who had acquired and fitted out an 88 ft. vessel to promote scientific research in the Pacific. Professor Tester visited many territories and sought discussions with many organizations - including the University of the South Pacific in Suva, ORSTOM and SPIFDA in Noumea and the University of Guam - and also with scientists attending the International Symposium on Oceanography held in Wellington in February.

Many proposals were submitted relative to basic studies of reef and lagoon, mangrove and pelagic and benthic fauna on deep sea structures (guyot and submerged volcanoes).

We have recently received the news that a disaster has overtaken the "Searcher", which caught fire, burned and sank off Costa Rica on 2 May 1972, while returning from a cruise to the Galapagos Islands. This is a great blow to the hoped-for opportunity of major marine research in the area and it is not known whether the Janss Foundation will procure and outfit another vessel.

* * *

OBITUARY

Alan Banner

26-year old Alan Banner was a young, enthusiastic graduate marine biologist devoting his energy to the field of applied marine research. On 17 April 1972, while swimming to an offshore island in Western Samoa for a project dealing with turtle management, he was attacked and killed instantly by a six-metre shark, probably a tiger shark.

As a Peace Corps volunteer, Alan Banner spent two years in Fiji before joining the Western Samoan Fisheries Service in January 1971; he had chosen marine ressource development in the South Pacific as his life career as he wanted to help the island people. He was planning to return home to Hawaii in less than a month.

Alan's good nature, helpfulness and decisive personality were highly valued by all those who came into contact with him in the course of his work. His loss will be acutely felt for in Fiji, as in Samoa, one came to rely on his help in any new ventures aimed at exploration and conservation of marine resources.

Through the medium of this Newsletter we would like to express on behalf of all those associated with SPIFDA our sincere condolances to Alan Banner's family and, more particularly, to his father, Professor A.H. Banner of the University of Hawaii who, for many years, through his research on ichtyosarcotoxism, has been joining his effort to those who work for the increased well-being of the indigenous plpulations of the Pacific islands.

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SPC-NMFS/Turtles/WP.4
25 October 1979

ORIGINAL : FRENCH

SOUTH PACIFIC COMMISSION

JOINT SPC-NMFS WORKSHOP ON MARINE TURTLES
IN THE TROPICAL PACIFIC ISLANDS
(Noumea, New Caledonia, 11 - 14 December 1979)

TAGGING AND REARING OF THE GREEN TURTLE CHELONIA MYDAS CONDUCTED IN FRENCH POLYNESIA BY THE DEPARTMENT OF FISHERIES

SUMMARY

The following is a preliminary report based on the observations made on Chelonia mydas in 1972, 1973, and 1979 by officers from the Department of Fisheries of French Polynesia. Most tagging was done on adult females on the atoll of Scilly. Rearing trials were run, and observation of eggs and hatchlings brought to light some of the difficulties associated with aquaculture of this species.

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25 October 1979

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TAGGING AND REARING OF THE GREEN TURTLE CHELONIA MYDAS, CONDUCTED IN FRENCH POLYNESIA BY THE DEPARTMENT OF FISHERIES

INTRODUCTION

The Department of Fisheries' involvement with protection of the green turtle Chelonia mydas goes back to 1972. Tahitians, like all South Pacific islanders, are extremely fond of this meat from the sea.

The atoll of Scilly or Manuae, longitude 154° 40 W, latitude 16° 40 S (Fig. 1), is one of the favourite nesting areas in French Polynesia for the green turtle, which is why research, and protective operations, were first started on this island. Scilly was declared a "protected area" on 28 July 1971 and the one family living there was appointed to watch over it.

The scientific data recorded since 1972, when the turtle programme began, were unfortunately dispersed, and to reassemble them was a difficult task indeed; much information is therefore missing. A modest study was nevertheless undertaken and comparisons made with other areas in the world where Chelonia mydas is found.

A small-scale green turtle rearing trial was undertaken in Rangiroa. In the absence of marine phanerogamia the hatchlings were experimentally fed on fish scraps and, especially, on Tridacna (Clam) flesh. It very quickly became apparent however that once they had reached a certain size, the young turtles developed deficiency symptoms due to the lack of plant materials in their diet. Attempts to feed them with land plants or algae were unsuccessful. The turtles finally had to be released and the programme remained confined to natural protection measures. This type of protection has proved positive since one of the turtles released from the Rangiroa farm weighing about 6.7 kg was recaptured almost 3,500 miles from the place of release.

I. TAGGING

1) Scilly, privileged nesting area in French Polynesia

Commonly eaten and much likely by the local population, the green turtle is becoming scarcer in French Polynesia, as in the rest of the world. Intensive exploitation has decimated green turtle populations in the Mascarene Islands, the Seychelles, Aldabra,

Chagos and the Maldive Islands. One commercial fishery is still operating in the Saint Brandon group and supplies around 50 tonnes of turtle meat to Mauritius (Hugues 1972). In French Polynesia, green turtles used to be extremely abundant in the whole of the Tuamotu island group, but due to the presence of man nesting is now restricted to the uninhabited areas, in particular Scilly atoll which is a privileged nesting place in French Polynesia, as are Europa and Tromelin in the Indian Ocean. Tagging was mainly carried out from Scilly, situated on the westernmost boundary of French Polynesia, very difficult of access, and far from any sea route, which is no doubt why it is still regarded as safe for nesting by the green turtle.

2) Tagging operations

The turtles tagged by the Department of Fisheries were thus primarily females that had come to lay their eggs on the beach. After the eggs are laid, the nests are carefully guarded during the period of incubation which can be anywhere from 49 to 65 days long. When the baby turtles hatch, they work their way out of the sand and head for the sea. Some of the hatchlings chose the night to emerge totally from the nest; the officers doing turtle research in French Polynesia were surprised to see the instinct of self-preservation function from the time of hatching. Unfortunately a majority of the hatchlings fall prey, in the daytime, to the frigate bird (Fregata minor) and, at night, to the hermit crab (Coenobita sp.).

Considering that the estimated survival rate is less than 1%, collection of eggs for hatching and rearing of hatchlings in captivity for at least one year may constitute one of the best methods of protection.

There is a very well defined nesting season from September to December, but even in the off-season females regularly land on the beaches to lay their eggs. A major tagging effort was made during the peak season in 1972 (c.f. detailed results in Annex).

3) Methods

Most of the turtles observed were captured on Scilly by the family that lives there. In 1972, 364 females, and very recently 42 more, were observed and tagged. After the females have laid their eggs, which they usually do at night, they are turned over on to their backs and left till the morning, when another team takes their body measurements. Slide calipers and a compass are used for measuring (c.f. length/weight graph in Fig.2).

4) The green turtle Chelonia mydas in Scilly

Scilly has probably received more turtle visits than any other atoll in French Polynesia. People who used to live there say that not very long ago (20-30 years) it was not unusual to turn over 100 to 150 turtles in a single night. The population had dwindled considerably, as would seem to be borne out by the small size of the individuals now seen (the largest turtles were about 106 cm long, and a great majority

of females had carapace lengths ranging from 93 to 97 cm), as compared with those found at Aldabra where the majority of females have a carapace length between 100 and 110 cm (Frazier 1971).

Eggs are laid all the year round on the sandy beaches of the atoll, but the largest numbers of females are seen from October till the end of December. During this period, while most of the females are busy nesting, the males stay outside the atoll (c.f. map).

The initial purpose of the studies done at Scilly on Chelonia mydas was to define the sites with the largest number of nests and those where turtles most often landed. Very quickly investigations were focused on the southwesterly portion of the atoll, particularly the islets Motu Rahi, Motu Oia and Motu Honu.

Measurements taken on more than 90 young turtles on Scilly will permit very interesting comparisons to be made with other young turtles studied by the Department of Fisheries, in particular on Rangiroa (studies in progress). Observation of the feeding patterns of young turtles on Scilly will improve our knowledge of food conversion ratios.

In addition, nearly 70 adult females were caught and observed during night outings and their meristic characters determined. Preliminary results showed that the very large turtle specimens (200 kg and over) that were still seen a few years ago have become virtually extinct, since the largest on record weighed only 175 kilos. On the first few evenings of our visit we saw large numbers of females crawling along the beach to lay their eggs, but subsequently they became more suspicious, especially those that were in the lagoon. The presence of man appears to greatly influence the turtles' choice of a nesting beach, where alternative beaches are available. The females have to swim over the outer reefs for a long distance (200-300 metres) under conditions that are always extremely difficult on account of the breakers and the undertow. When they get to the beach, they reach a stage where the nesting instinct overcomes their fear and they start digging in spite of the light from the torches. They usually come up from the sea in a straight line, but occasionally a female will cover more than 100 metres in her search for a suitable nesting place. After measurements had been taken, all the turtles were tagged and released. Two recaptures were made of females that had come in to lay for a second time, 9 days after the first, on the very same beach, only a few dozen metres from their first nest.

During each nocturnal search for females, the tracks made the previous night were measured and recorded. They showed that the most frequently visited site was the east coast beach on the ocean side of the atoll, where up to 14 tracks a night were counted.

About 10 nests were found, 5 of which were examined to establish the relationship between size and number of eggs laid and body weight of the female.

From Motu Rahi to Motu Oia on the ocean side (over a distance of 3-3.5 km), the number of tracks counted on the beach did not significantly vary during our visit (8-13 tracks/night).

At Motu Honu, the sandy lagoon beach was much favoured at the beginning of our stay (8-10 tracks/night), but gradually fell into disuse (1-3 tracks/night) because of our too frequent visits there.

The size of the females has appreciably declined in the last 10 years, evidence that man's predatory action has been too strong.

Rate of growth appears to be quite as high as in Rangiroa turtles, since the mean weight of Scilly turtles was 150 grams at 8 months.

Because of its scientific usefulness, particularly as regards observation of Chelonia mydas, the atoll of Scilly was scheduled as a protected area on 28 July 1971.

II. REARING

1) Turtle rearing on Scilly

The family living on the atoll started a very small-scale rearing operation in floating cages. Each cage is 2 x 1.5 m. in size and attached to a post standing in 50 cm of water. Being made entirely of wood the cage floats, half of it immersed and the other half constantly exposed to sunlight.

The eggs collected are buried and, on hatching, the baby turtles are put into a cage and left without food of any kind for three days. Subsequently they are fed mainly on clam and fresh fish.

This rearing experiment, though very small, has nevertheless enabled hundreds of releases to be made, when, 9 to 12 months after hatching, the little turtles were strong enough to survive. However, since this trial, which is still continuing, was not conducted on a scientific basis, it has not yielded much information.

2) Rearing on Rangiroa

Rearing of Chelonia mydas was conducted by the Fisheries Department on scientific lines from 1971 to 1972.

It involved about 50 turtles and yielded data on food consumption, rate of growth in first year, and food conversion ratio.

Growth studies showed that over the first 12 months, consumption of food (mainly clam and fresh fish) increased rapidly and irregularly.

Table 1 - Average quantity of food absorbed by a turtle during the first 12 months of life

Month	Average daily quantity	Average monthly quantity
1	25 g/day	775 g/month
2	50 g	1,400 g
3	65 g	2,015 g
4	65 g	1,950 g
5	70 g	2,170 g
6	70 g	2,100 g
7	75 g	2,225 g
8	80 g	2,480 g
9	100 g	3,000 g
10	120 g	4,720 g
11	120 g	3,600 g
12	150 g	4,650 g
		31,085 g/year

At birth, average weight of the hatchling was 19 grams, average carapace length 4.0 cm and average carapace width 2.9 cm.

Average weight gain after one year was slightly over 5,600 grams (5.6 kilos), at which time the carapace length was 33.6 cm and its width 28.6 cm.

Figures 3 and 4 show how the meristic characters of a turtle vary from birth to the age of 12 months.

CONCLUSION

The protection of the endangered turtle species Chelonia mydas can no longer remain the concern of one country or territory, but requires the cooperation of all the countries in the Pacific. In addition, rearing of this species in captivity appears to be an efficient and not very costly method of conservation.

To sum up:

average weight of a turtle reared in captivity after one year	5,620 g
average length of shell (carapace)	33.6 cm
average width of shell (carapace)	28.8 cm
total food consumption of a turtle during the first 12 months of life	31 kg.

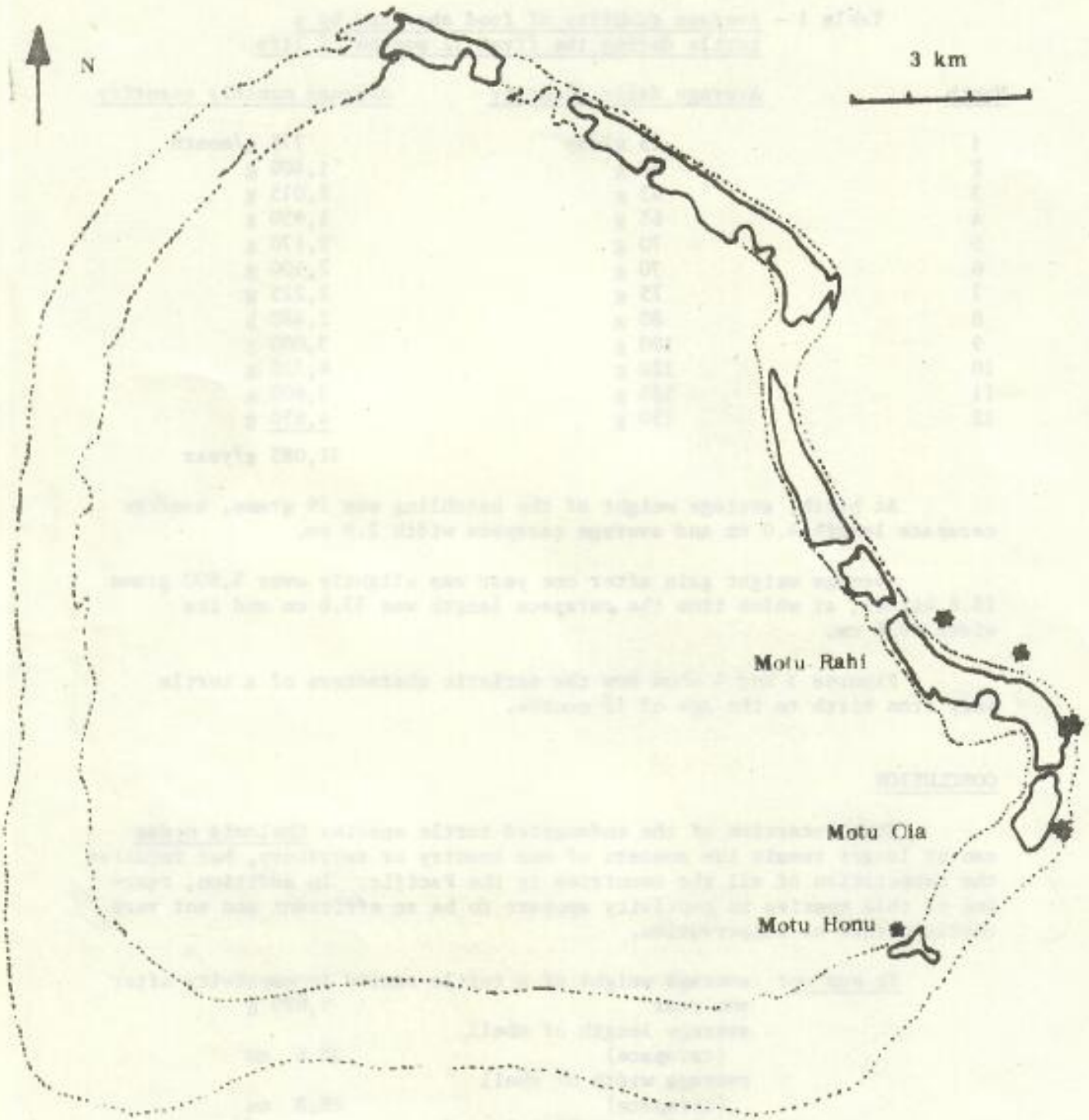

Fig.1 : Scilly Atoll

* High concentrations of green turtle nesting.

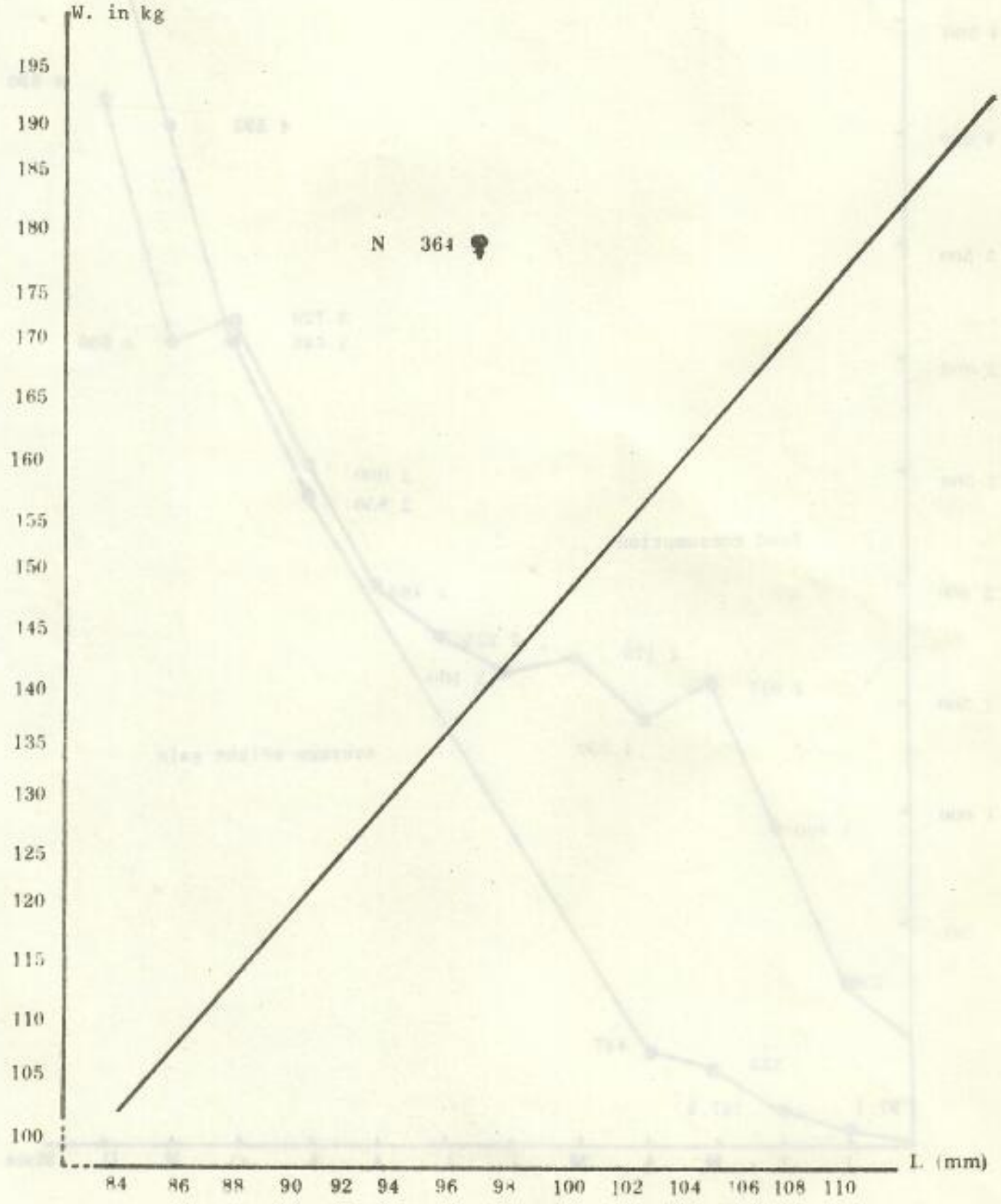

Fig.2 : Length/Weight ratio for 364 females
(Scilly Atoll)

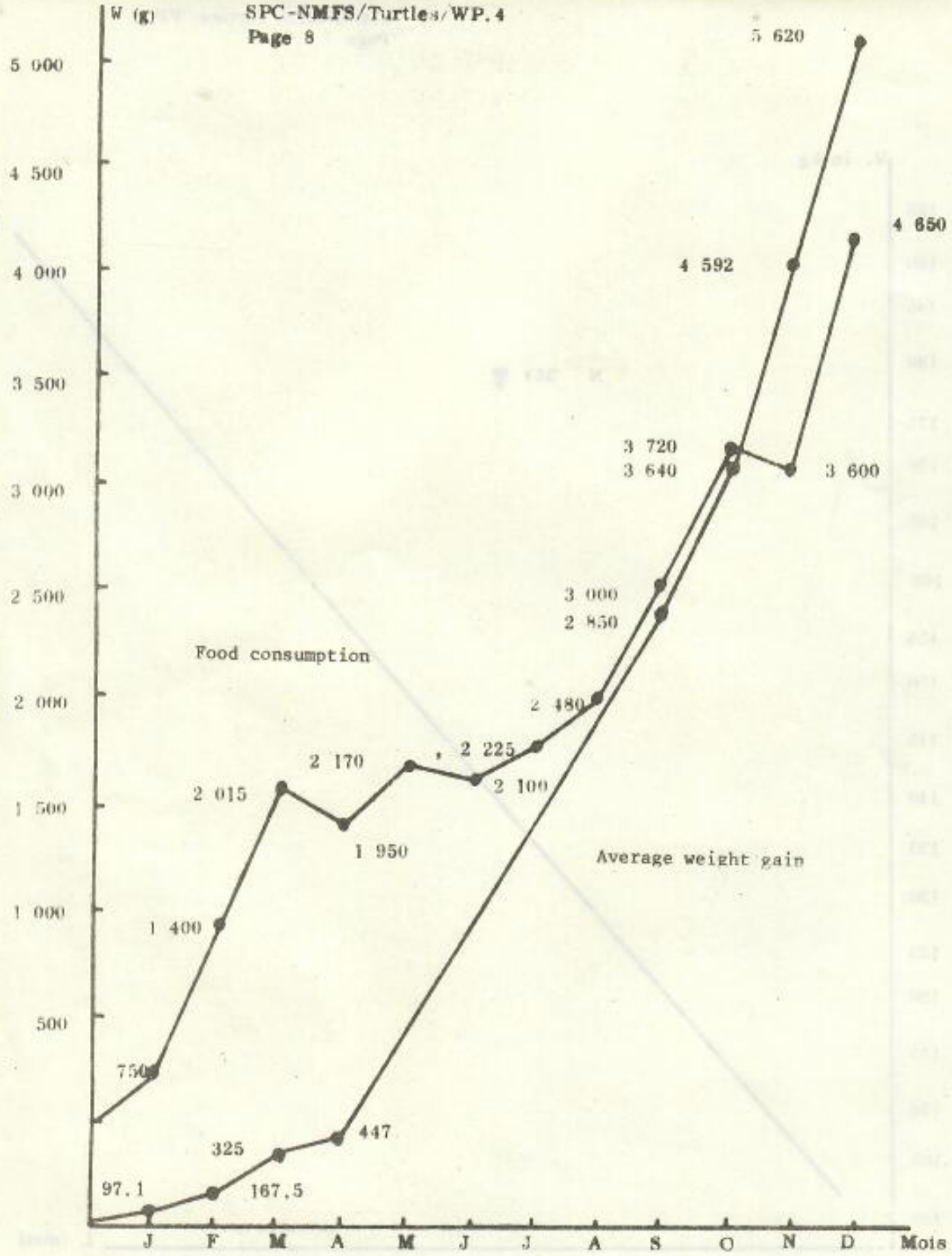

Fig. 3 : Growth over 12 months (16/12/71-16/12/72)

(Avatoru, Rangiroa, Tuamotu)

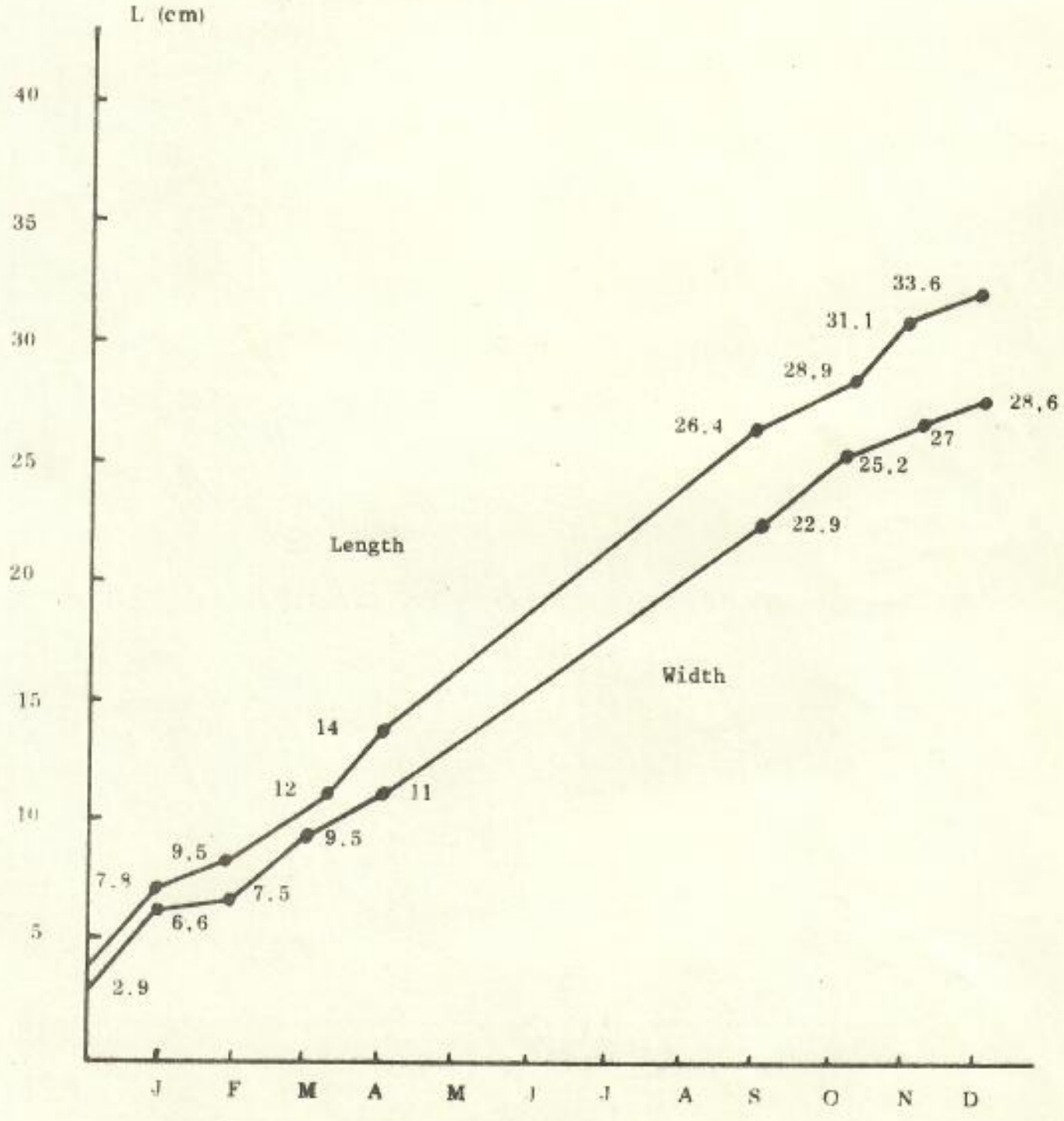

Fig.4 : Growth of shell over 12 months
(Avatoru, Rangiroa, Tuamotu)

ANNEX : TURTLE TAGGING

DATE : 30/04/72

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
13	F	98	69	76	15		SCILLY	
14	F	98	70	77	14		"	
15	F	99	75	79	13		"	
16	F	102	78	85	15		"	
17	F	92	74	79	11			
18	F	101	77	84	14		"	*1
19	F	101	72	78	12		"	
20	F	97	68	74	11		"	
21	F	96	72	77	12		"	
22	F	93	70	74	12		"	
23	F	99	75	82	12		"	
24	F	97	72	76	12		"	
25	F	106	82	82	12		"	
26	F	102	71	77	14			*2
27	F	101	74	74	12		"	
28	F	94	69	78	12		"	
29	F	101	73	77	12		"	
30	F	98	79	82	11		"	
31	F	92	74	73	13		"	
32	F	104	73	82	12			
33	F	103	85	85	13		"	
34	F	102	80	75	14		"	
35	F	98	72	73	13		"	
36	F	93	80	74	12		"	
37	F	101	77	82	11		"	
38	F	94	73	75	12		"	
39	F	93	72	79	12		"	*3

*1 - Captured in Tonga on 9/08/72 - Vavau Islands (2,760 km - Weight 127 kg).

*2 - Captured at Rabi (Fiji) on 26/07/72 (2,091 km - Weight 114 kg).

*3 - Captured Maskeline Islands (New Hebrides) on 14/09/73 (length 140 cm).

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
40	F	97	79	74	12		SCILLY	
41	F	98	74	79	12		"	
42	F	93	72	72	12		"	
43	F	104	73	77	12		"	
44	F	96	70	75	13		"	
45	F	94	74	80	13		"	
46	F	100	80	78	11		"	
47	F	105	74	83	12		"	
48	F	101	77	80	13		"	
49	F	94	76	78	11		"	
50	F	105	82	86	13		"	*4
51	F	101	69	79	13		"	
52	F	89	69	77	13		"	
53	F	92	76	79	13		"	
54	F	98	75	79	14		"	
55	F	95	78	80	13		"	
56	F	101	78	82	14		"	
57	F	101	84	86	11		"	
58	F	94	79	74	13		"	
59	F	99	75	80	13		"	
60	F	104	72	79	11		"	
61	F	92	72	70	11		"	
62	F	93	71	82	12		"	
63	F	99	75	73	13		"	
64	F	99	74	82	13		"	
65	F	102	79	77	13			
66	F	95	71	76	10		"	
67	F	102	72	76	12		"	
68	F	103	74	81	11		"	
69	F	102	76	77	12		"	
70	F	94	72	76	10		"	
71	F	96	73	75	12		"	
72	F	104	78	79	11		"	
73	F	94	76	78	13		"	

*4 - Carapace broken; had knit again.

DATE : 5/12/72

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
101	F	102	79	85	13	132	SCILLY	
102	F	92	69	70	12	75	"	
103	F	99	76	81	12	129	"	*5
104	F	100	73	77	13	134	"	
105	F	107	74	78	13	135	"	
106	F	97	73	83	12	123	"	
107	F	103	76	82	13	129	"	
108	F	103	71	83	12	139	"	
109	F	98	73	78	13	127	"	
110	F	104	74	79	12	123	"	
111	F	100	74	80	13	117		
112	F	96	67	69	11	95	"	
113	F	108	82	90	13	160		
114	F	84	64	74	11	94	"	Cut to the bone
115	F	97	66	77	12	116		
116	F	104	82	86	12	147	"	
117	F	94	74	78	13	142	"	
118	F	88	70	72	10	92	"	
119	F	93	64	69	12	90	"	
120	F	98	75	79	12	128	"	
121	F	92	69	75	11	98	"	
122	F	82	65	72	12	84	"	
123	F	96	72	81	12	120	"	
124	F	100	74	80	13	124	"	
125	F	98	73	77	12	108	"	
126	F	101	77	84	12	140	"	
127	F	99	75	78	13	136	"	
128	F	96	75	80	13	132	"	
129	F	102	86	88	13	135	"	
130	F	100	76	80	13	120	"	
131	F	97	77	83	13	130	"	
132	F	100	76	82	12	134	"	
133	F	92	65	72	12	95	"	
134	F	97	72	75	12	113	"	

*5 - New Caledonia, 15/01/75

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
135	F	93	72	76	12	115	SCILLY	
136	F	103	83	86	13	141	"	
137	F	98	82	81	13	147	"	
138	F	88	67	73	12	106	"	*6
139	F	93	72	78	12	110	"	
140	F	89	72	76	12	110	"	
141	F	102	76	84	12	150	"	
142	F	108	84	94	14	200	"	
143	F	83	69	76	11	95	"	
144	F	90	67	72	11	94	"	
145	F	102	73	81	13	130	"	
146	F	101	86	82	12	136	"	
147	F	98	75	78	13	147	"	
148	F	98	74	80	12	116	"	
149	F	100	76	83	13	135	"	
150	F	92	69	76	11	94	"	
151	F	86	68	75	12	104	"	*7
152	F	90	68	66	12	98	"	
153	F	98	76	80	13	130	"	
154	F	84	65	68	12	95	"	
155	F	95	74	77	12	124	"	
156	F	103	77	82	13	145	"	
157	F	98	75	81	13	135	"	
158	F	92	70	73	12	105	"	
159	F	96	78	76	12	105	"	
160	F	97	75	78	12	116	"	
161	F	90	70	72	12	100	"	
162	F	101	79	83	13	152	"	
163	F	106	82	88	13	153	"	
164	F	85	69	72	11	93	"	
165	F	100	81	86	12	158	"	
166	F	102	77	85	12	161	"	

*6 - July 1974, captured in the New Hebrides, Malekula.

*7 - Captured on 15/05/75 in New Caledonia, Baie de Gomen.

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
167	F	103	80	86	13	138	SCILLY	
168	F	106	78	85	13	178	"	
169	F	93	67	72	11	108	"	
170	F	97	72	75	12	131	"	
171	F	92	65	84	11	101	"	
172	F	98	74	78	12	116	"	*8
173	F	98	74	80	12	121	"	*9
174	M	88	66	70	10	85	"	
175	F	78	68	70	11	100	"	
176	F	90	75	79	12	115	"	
177	F	101	69	78	13	145	"	*10
178	F	95	75	77	12	137	"	
179	M	95	69	72	12	110	"	
180	M	183	72	73	12	105	"	*11
181	F	102	80	81	13	155	"	*12
182	F	100	79	78	12	140	"	
183	F	92	72	81	12	115		
184	F	93	68	78	11	110	"	
185	F	99	70	82	12	120	"	
187	F	93	72	81	12	140	"	
188	M	96	71	74	11	120		*13
189	F	97	74	80	12	135	"	*14
190	F	91	69	72	12	110	"	
191	F	90	69	72	12	105	"	
192	F	102	77	81	13	150	"	
193	F	96	77	80	12	125	"	
194	F	92	78	70	12	117	"	
195	F	100	75	78	12	145	"	*15

* 8 - Bite scar on both front flippers

* 9 - Captured in the New Hebrides, Anatom, in October 1973

*10 - Plastron misshapen

*11 - Captured on 3/10/74, in Fiji, Kandavu Island

*12 - Captured on 15/10/74, " " "

*13 - Plastron misshapen

*14 - Right front flipper missing

*15 - Plastron injured

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
196	F	93	72	74	12	120	SCILLY	
197	F	100	75	78	12	137	"	
198	F	98	71	77	12	155	"	
199	F	86	63	71	12	105	"	
200	F	105	79	82	13	143	"	
201	F	97	75	81	12	118	"	
202	F	92	74	79	12	115	"	
203	F	89	69	74	12	120	"	
204	F	98	69	80	12	140	"	*16
205	M	85	63	66	11	95	"	
206	F	94	71	75	12	110	"	*17
208	F	90	63	70	12	107	"	
209	F	93	71	75	12	125	"	
210	F	97	75	79	13	145	"	
211	F	93	73	81	13	135	"	
212	F	95	72	76	12	142	"	
1301	F	102	69	77	12	130	"	
1302	F	92	75	79	12	142	"	
1303	F	94	74	76	12	140	"	
1304	F	93	69	73	11	120	"	*18
1305	F	108	81	86	13	183	"	
1306	F	97	76	80	12	155	"	
1307	F	86	70	76	11	105	"	
1308	M	91	65	66	11	90	"	
1309	M	90	66	74	11	105	"	
1310	F	102	83	84	13	140	"	*19
1311	F	103	79	83	13	150	"	
1312	F	89	63	72	10	90	"	
1313	F	98	77	83	13	139	"	
1314	F	96	75	77	12	125	"	

*16 - Right front flipper missing

*17 - Plastron misshapen, scar

*18 - Left front flipper missing

*19 - Carapace split, right front flipper missing

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
1315	F	91	68	72	12	110	SCILLY	
1316	F	94	94	76	12	123	"	
1317	F	100	79	80	12	140	"	
1318	F	101	80	84	13	145	"	
1319	F	97	77	82	12	140	"	*20
1320	F	100	88	88	12	140	"	
1321	F	91	70	72	11	110	"	
1322	F	93	76	82	12	140	"	
1323	F	93	75	76	12		"	
1324	F	94	72	76	11		"	
1325	F	92	70	75	12		"	
68	F	109	84	92	13		"	
69	F	94	71	80	11		"	
70	F	98	75	78	12		"	
71	M	86	68	70	11		"	
72	F	92	69	74	11		"	
73	M	90	67	70	11		"	
74	F	95	75	74	11		"	
75	F	96	75	78	11		"	
1326	F	100	80	85	12		"	
1327	F	106	78	85	13		"	
1328	F	95	93	80	12		"	
1329	M	87	68	70	11		"	
1330	M	102	79	78	12		"	*21
1331	M	90	69	75	11		"	
1332	M	95	71	72	12		"	
1333	F	105	81	85	12		"	
1334	F	101	80	81	12	160	"	
1335	F	92	72	74	12	110	"	
1336	F	94	74	83	12	140	"	
1337	F	105	76	84	14	165	"	
1338	F	93	69	76	11	103	"	
1339	F	96	74	78	11		"	
1340	F	97	69	76	12		"	

*20 - Plastron abraded

*21 - Captured on 1/08/74 in Fiji, Druadrua Island.

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
1341	F	90	65	66	11		SCILLY	
1342	F	95	75	90	13		"	
1343	F	94	75	77	13		"	
1344	F	99	72	79	13	137		
1345	F	98	77	81	12	140	"	
1346	F	96	73	77	13	145	"	
1347	F	91	71	76	11	105	"	
1348	F	95	72	77	12	110	"	
1349	F	102	83	95	13	140	"	
1350	F	92	70	74	12	135	"	
1351	F	98	76	78	12	145	"	
1352	F	98	76	77	13	150	"	
1353	F	101	76	80	12	125	"	
1354	F	91	73	82	12	115	"	
1355	F	90	81	78	12	123	"	
1356	F	80	75	78	11	101	"	
1375	F	100	72	75	12	128	"	
1357	F							
1358	F	104	79	82	13	170	"	
1359	F	90	72	73	11	110	"	
1360	F	93	71	73	11	105	"	
1361	F	87	68	75	12	95	"	
1362	F	104	75	83	13	140	"	

DATE : 19/2/73

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
1363	F	103	74	85	13	143	SCILLY	
1364	F	104	73	81	13	125	"	
1365	F	85	68	72	11	103	"	
1366	F	97	74	80	14	105	"	
1367	F	102	78	81	13	140	"	
1368	F	91	71	74	12	115	"	
1369	F	94	72	78	12	120	"	
1370	F	86	68	70	11	86	"	
1371	F	88	61	64	11	105	"	
1372	F	95	75	74	12	110	"	
1373	F	105	89	99	13	150	"	
1374	F	98	75	93	12	120	"	
1375	F	93	74	81	12	108	"	
1376	F	98	74	92	12	140	"	
1377	F	99	79	81	12	132	"	
1378	F	92	72	77	12	120	"	
1379	F	95	73	78	12	131	"	
1380	F	80	65	69	11	85	"	
1381	F	93	73	81	12	110	"	
1382	F	96	73	76	10	105	"	
1383	F	100	83	78	14	145	"	
1384	F	101	74	80	12	130	"	
1385	F	94	72	75	12	120	"	
1386	F	99	81	87	12	140	"	
1387	F	97	74	78	12	130	"	
1388	F	98	79	80	12	110	"	

DATE : Février 1973

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
1437	F	100	79	85	13	160	SCILLY	
1438	F	93	74	74	11	102	"	
1439	F	92	74	77	12	103	"	
1440	F	90	75	77	12	112	"	
1441	F	95	72	77	12	122	"	
1442	F	97	74	80	13	125	"	
1443	F	97	81	80	13	135	"	
1444	F	97	75	77	13	125	"	
1445	F	88	65	73	10	96	"	
1446	F	97	75	77	12	120	"	
1447	F	89	68	78	11	102	"	
1448	F	102	78	86	13	130	"	
1449	F	104	78	89	13	150	"	
1450	F	104	78	82	13	150	"	
1451	F	80	69	74	11	99	"	
1452	F	90	72	73	11	105	"	
1453	F	98	75	82	12	125	"	
1454	F	80	65	67	11	80	"	
1455	F	90	67	70	11	97	"	
1456	F	89	64	69	12	110	"	
1457	F	100	78	84	13	145	"	
1458	F	102	82	89	13	170	"	
1459	F	99	77	79	14	135	"	
1460	F	87	70	72	10	110	"	
1461	F	94	74	77	12	118	"	
1462	F	98	74	77	13	150	"	
1463	F	96	67	75	12	110	"	
1464	F	90	68	74	10	96	"	
1465	F	95	74	76	11	130	"	
1466	F	88	69	72	12	105	"	
1467	F	86	65	72	11	90	"	
1468	F	100	78	82	12	117	"	

DATE : 7/12/74

No.	Sex	Carapace length	Carapace width	Plastron length	Head width	Weight kg	Tagging place	Comments
1502	F	102	78	80	12	130	SCILLY	*22
1503	F	86	75	76	12	115	"	*23
1504	F	97	71	81	115	115	"	*24
1505	F	94	67	72	11	120	MOTU ONE	
1506	F	95	70	75	11	106	"	
1507	F	95	72	78	11.5	105	"	
1508	F	96	75	77	12.5	125	"	*25
1509	F	97	76	77	11	110	"	*26
1510	F	94	75	78	12	115	"	*27
1511	F	105	83	84	16	167	"	
1512	F	102	78	85	12	142	SCILLY	
1513	F	89	68	76	11	102	"	
1514	F	95	73	78	11.5	120	"	*28
1515	F	93	72	74	11	110	"	
1517	F	99	72	79	12	125	"	
1518	F	102	75	80	11	120		
1519	F	95	77	80	11.5	140	"	
1520	F	94	70	76	11	110	"	
1521	F	99	79	82	12	145	"	
1522	F	101	77	79	11.5	155	"	*29
1523	F	90	70	74	11	100	"	*30
1524	F	90	72	75	12	90	"	
1525	F	90	72	73	11.5	100	"	
1526	F	100	80	85	12	110		

*22 - Carapace split; left rear flipper missing
*23 - Carapace split, right rear flipper missing
*24 - Left side broken
*25 - Right rear flipper missing
*26 - Right rear flipper missing
*27 - Parasite on plastron, scar tissue on left side of carapace
*28 - Injury on left side of carapace
*29 - Enclosure
*30 - Right front flipper missing