RAPPORTS DE MISSIONS

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Gilbert DAVID

L'INSTITUT FRANÇAIS DE RECHERCHE SCIENTIFIQUE
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/David, G.

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Nouméa : ORSTOM. Décembre 1992. 66 p.
Rapp. Missions : Sci. soc. : Géogr. ; 2

Ø98AGRIC; Ø98RURAL2

AGRICULTURE TRADITIONNELLE ; PECHE ARTISANALE ; ECONOMIE DE SUBSISTANCE ; TRADITION / PACIFIQUE SUD

Imprimé par le Centre ORSTOM
de Nouméa
Décembre 1992

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RAPPORT DE LA MISSION

Du 6 au 10 juillet s'est tenue sur le campus de l'Université du Pacifique sud à Suva (Fidji) la première conférence internationale sur les savoirs traditionnels, qualifiés ici de sciences, des peuples du Pacifique insulaire. L'intitulé de la conférence prête délibérément à la discussion. Qualifier les savoirs traditionnels de sciences n'est pas neutre. C'est refuser la place exclusive dont jouit la science occidentale comme outil de production de connaissances sur les milieux physiques et biologiques du Pacifique ; c'est reconnaître d'emblée le rôle des savoirs traditionnels, considérés généralement comme un simple folklore, comme autre outil de production de cette connaissance ; c'est souligner aux yeux des dirigeants du Pacifique insulaire la valeur économique et sociale de ce véritable patrimoine culturel que constituent ces savoirs, patrimoine dont trop souvent ils n'ont guère conscience, ou qu'ils jugent de faible intérêt dans la réalisation de leur objectif principal qu'est le développement et l'intégration de leur pays à *l'Economie monde.*

L'objectif principal de cette première conférence était donc triple :
- d'une part réunir divers spécialistes en ethnobotanique, en ethnomédecine, en ethnozoologie, en agriculture et pêche traditionnelles de manière à rassembler le plus large éventail possible de connaissances dans ces domaines ;
- d'autre part souligner l'intérêt actuel et futur de ces connaissances dans l'économie villageoise des océaniens et montrer le caractère opérationnel d'une large part d'entre elles pour planifier le développement ;
- enfin sensibiliser les Pouvoirs publics du Pacifique à l'urgence qu'il y a à prendre en considération les savoirs traditionnels pour assurer la viabilité des petits Etats et Territoires de la région.

Cette conférence était programmée depuis trois ans. Elle avait déjà été reportée plusieurs fois, les bailleurs de fonds, qu'il s'agisse des Organisations Internationales ou des Gouvernements Occidentaux, étant peu intéressés par le sujet. Son organisation cette année n'a été rendue possible qu'en raison du soutien financier du Gouvernement Français. Deux personnalités politiques du Pacifique se sont associées à la conférence. Il s'agit tout d'abord du Premier Ministre de Fidji, le Général S. Rabuka, qui a présidé les cérémonies d'ouverture de la conférence et a prononcé un discours remarqué (cf Annexe 1), retardant d'autant son départ pour Honiara, aux îles Salomon, où se tenait l'assemblée générale du Forum du Pacifique. Il s'agit ensuite de Sir T. Davis, ancien Premier ministre des Iles Cook, qui a participé à l'intégralité de la conférence et a accepté d'en tirer les conclusions.

La conférence s'est déroulée en 12 séances d'une demi-journée, chacune consacrée à un thème spécifique, exceptée la première séance qui, présidée par R. Thaman de l'U.P.S., a permis de brosser un rapide panorama des connaissances

scientifiques traditionnelles du Pacifique insulaire (cf Annexes 2 et 3). Ont ainsi été évoqués par ordre chronologique [1]:

- l'agriculture et l'utilisation du sol traditionnelles *;
- l'exploitation traditionnelle des ressources marines * ;
- la médecine traditionnelle;
- les méthodologies d'étude *;
- les réponses culturelles aux pratiques modernes *;
- la conception et l'utilisation traditionnelles des matériaux;
- divers savoirs concernant les plantes, les animaux et la nourriture *;
- le langage et le développement des connaissances ;
- les rapports entre l'Education et le développement *;
- les impacts du développement *;
- les savoirs scientifiques traditionnels et la politique des sciences dans le Pacifique Sud *.

La journée du mercredi 8 juillet a été consacrée à trois sorties de terrain, chacune permettant de découvrir un écosystème spécifique et son genre de vie associé. Etaient ainsi proposées :

- une sortie dans le delta de la Rewa permettant de découvrir les villages vivant de l'exploitation de la mangrove et d'une petite agriculture pratiquée sur les terres humides limitrophes ;
- une sortie dans une des plus longues vallées pénétrant l'intérieur très montagneux de l'île de Viti Levu ;
- une sortie permettant de découvrir la côte et les montagne de la partie nord de Viti Levu.

D'une manière générale, les pays insulaires du Pacifique étaient bien représentés à la conférence. Tous avaient envoyés un ou plusieurs représentants, les délégations les plus nombreuses étant celles de la Nouvelle Zélande, forte de 13 représentants dont six mahoris, et de la Polynésie Française, forte de 9 membres dont Y. Lemaitre de l'ORSTOM, deux scientifiques du musée de Tahiti et un groupe de praticiens traditionnels. Ce groupe, composé de trois guérisseuses et guérisseurs expérimentés, de deux apprentis et d'une porte parole, a rencontré un succès médiatique certain et a fortement contribué à sensibiliser l'opinion publique fidjienne aux bienfaits de la médecine traditionnelle polynésienne. Un reportage de la Télévision fidjienne et divers articles de la presse nationale lui ont été consacrés (cf Annexe 4) et une rencontre avec le premier ministre fidjien à son retour de la réunion du Forum a été organisée.

L'ORSTOM était l'unique organisme de recherche français présent à la conférence. Y. Lemaître a présidé la séance consacrée à la médecine traditionnelle et y a présentée une communication intitulée "*traditional medicine and history in Tahiti*". Cette activité scientifique s'est doublée d'une activité "DIST" tout à fait considérable puisque ses avis ont été sollicités à plusieurs reprises dans la presse fidjienne et à la télévision (cf Annexes 1,3 et 4). Pour ma part j'ai présenté une communication d'A Walter, de la mission ORSTOM de Port-Vila, consacrée à l'arboriculture fruitière en forêt au Vanuatu (cf Annexe 2), intitulée : "*to know*

[1]Les séances auxquelles j'ai assisté sont indiquées par une *

for a surviving : the Vanuatu's fruit tree arboriculture," et une synthèse consacrée aux enseignements qu'apporte l'étude de la pêche traditionnelle à la planification de la politique de développement de la pêche artisanale commerciale en eaux côtières (cf Annexe 5), intitulée "*the modern value of traditional village fishing in fisheries development planning in the Pacific Islands : some thoughts on the case of Vanuatu*". Compte tenu de l'emploi du temps chargé de la conférence, un papier préparé par G. Bourdy en association avec A. Walter, sur l'ethnomédecine au Vanuatu n'a pu être présenté ; il figurera néanmoins dans les compte rendus de la conférence qui devraient paraître au début 1993 sous la forme d'un ouvrage coédité par l'U.P.S. et l'Université d'Hawaii.

Le principal mérite de cette conférence est d'avoir montré la connaissance intime qu'ont les peuples du Pacifique de leur environnement et l'ingéniosité avec laquelle ils ont su le mettre en valeur pour le plus grand profit des communautés villageoises en exploitant au moindre coût énergétique les ressources vivantes qui le peuplent, même lorsque cet environnement s'avérait particulièrement défavorable à l'homme, soit par excès de sécheresse ou au contraire par excès d'humidité, soit en raison d'une trop forte pente, soit en raison d'une périodicité très élevée des passages de cyclones ou de dépressions tropicales. Cette mise en valeur de l'environnement revêt trois formes principales.

La construction de nouveaux écosystèmes - comme les billons d'ignames en plaine inondable, les îlots artificiels destinés à la culture des taro *colocasia* et *cyrtosperm* en zone marécageuse,[2], les tarodières irriguées[3] , ou les fosses à compost des atolls polynésiens ou micronésiens[4], plus favorables à l'agriculture que les écosystèmes "naturels" - en est la forme la plus connue et la plus aisément identifiable car elle laisse une traduction visuelle très nette dans le paysage. Il s'agit de surcroît d'une mise en valeur du milieu naturel particulièrement familière aux scientifiques occidentaux puisque de tels exemples se rencontrent sur l'ensemble des continents, là où les conditions écologiques sont peu favorables à l'homme, et qu'ils procèdent d'une double volonté d'une part d'intensifier la productivité du milieu naturel, assimilée ici à son rendement, concept également familier aux scientifiques occidentaux et aux planificateurs du développement qui en ont fait "le crédo" de la modernisation du secteur primaire, et d'autre part de minimiser les contraintes climatiques, édaphiques, pédologiques et topographiques de l'environnement et les risques naturels qui leur sont associés.

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[2]H. Manner du département de géographie de l'université de Guam a consacré un très intéressant exposé à ce sujet, présenté à travers l'exemple des tarodières de l'atoll de Puluwat, dans les Etats Fédérés de Micronésie.

[3] Seules les tarodières irriguées de la partie septentrionale de l'île de Viti Levu à Fiji ont été évoquées lors de cette conférence. La communication a été présentée par R. Kuhlen, du département de géographie de l'U.P.S.

[4] Plusieurs exemples particulièrement parlants de ces fosses à compost ont été donnés par Mr Baiteke, Secrétaire général de la Commission du Pacifique Sud, dans sa communication sur l'agriculture traditionnelle à Tuvalu.

Ce souci de minimiser les risques obéit à la recherche d' une sécurité alimentaire optimale des communautés villageoises. Il a conduit les océaniens a fonder leur agriculture sur une polyculture d'une rare diversité, tant en ce qui concerne le nombre des espèces cultivées que le nombre des cultivars au sein d'une même espèce, qui associe de manière systématique des tubercules, des légumes et des fruits présentant des périodes de maturité différentes. Cette diversité des cultures a pour corollaire dans le milieu marin une grande diversité des espèces capturées à laquelle répond une diversité exceptionnelle des techniques et des stratégies de pêche.

L'utilisation exhaustive dans les domaines alimentaire, cosmétique et thérapeutique du milieu naturel océanien est la troisième des formes de mise en valeur de l'environnement que nous puissions identifier. Elle est beaucoup moins perceptible que les deux précédentes, sa traduction visuelle dans le paysage étant des plus discrètes. Elle ne peut donc être correctement appréhendée qu'à la suite de longues enquêtes de terrain. Ce thème a particulièrement été développé par R. Thaman et A. Walter. Le premier auteur, avec le dynamisme dont il est coutumier, a dressé un vaste tableau des savoirs traditionnels océaniens concernant la forêt et ses formes d'utilisation, soulignant notamment que l'agriculture et l'utilisation des forêts océaniennes forment chacun un système dont la viabilité nécessite la pérénité de l'ensemble de l'écosystème qui les environne et le maintien des savoirs traditionnels qui les animent.

La seconde communication, quant à elle, a porté sur le rôle alimentaire des essences forestières à noix et amandes et sur la gestion de ce patrimoine par les communautés villageoises. Ce dernier point, tout à fait novateur, a suscité un vif intérêt de la part de l'auditoire. C'est en effet d'une véritable gestion dont il est question. Une gestion de l'espace forestier et des espèces fruitières le composant qui s'apparente à un jardinage très extensif, caractérisé par le faible nombre d'heures de travail consacré à chaque partie de cet espace. . On touche là un des points cruciaux du genre de vie traditionnel en Océanie, qui n'a malheureusement pas été assez mis en valeur lors de cette conférence puisque seules deux communications y faisaient référence, celle d'A. Walter et la mienne. Cette minimisation du coût énergétique des activités de production, mesuré en temps de travail, est une des principales contraintes à l'intensification des rendements et à l'accroissement de la productivité des parcelles destinées à la monoculture, objectifs que mettent en avant toutes les politiques de développement rural dans la région. Les communautés villageoises ne maximisent jamais le rendement de la terre mais toujours la productivité du travail. Cette règle s'applique à l'échelle du "calendrier" annuel des cultures, les tâches agricoles étant scindées en un grand nombre d'activités qui chacune ne nécessite qu'un petit nombre d'heures ; elle s'applique également à l'échelle de la génération pour les grands "aménagements agricoles" comme les terrasses ou les trous à compost. Ces aménagements demandent en effet pour leur construction un investissement considérable en temps de travail. En revanche, par la suite, la somme de travail requise chaque année pour leur mise en valeur est tout à fait minime comparée aux efforts qu'il eut fallu entreprendre pour atteindre une production équivalente si ces aménagements n'avaient pas existé.

La méconnaissance de cette règle explique, pour une large part, les échecs des projets de développement mis en oeuvre dans la région ces vingt dernières années. Accroître par un facteur 2 le temps de travail dans l'espoir d'un doublement des rendements agricoles est une logique qui peut rencontrer l'approbation des paysans bretons ou picards, certainement pas celui des agriculteurs océaniens. D'une manière identique, il est illusoire d'espérer accroître la productivité du travail dans un secteur particulier de l'activité agricole si cet accroissement se fait au détriment des soins accordés aux autres cultures. La connaissance des sociétés et savoirs traditionnel présente donc un intérêt indéniable pour la planification du développement. C'est là un point de vue qui est encore largement minoritaire parmi les Pouvoirs Publics du Pacifique Insulaire et même parmi les anthropologues, ethnobotanistes et ethnozoologues étudiant les savoirs traditionnels ; gageons cependant qu'il n'en sera plus de même dans un proche avenir et que l'étude des savoirs traditionnels sera reconnue à sa juste valeur.

Le dernier jour de la conférence a été marqué par une intervention très stimulante du Professeur R. Crocombe qui, dans une communication intitulée "*Future of Pacific*", a livré quelques réflexions s'inspirant de sa longue expérience du Pacifique. Dans une première partie introductive, il a rappelé la vitesse à laquelle l'économie monde se modifiait. Les changements sont tels que les fondements de la prospective en sont modifiés, la référence au passé notamment, en tant que source d'information pour esquisser les tendances structurelles du futur, perd une grande partie de sa pertinence. Quelques grandes tendances peuvent toutefois être ébauchées.

a) Le Pacifique a traversé successivement depuis cinq siècles trois sphères culturelles dominantes. Il s'agit jusqu'au 18è siècle de la sphère espagnole, qui a principalement affecté la Micronésie, puis de la sphère franco-anglaise, la France et le Royaume Uni se taillant chacun leur zone d'influence, enfin de la sphère américaine qui, au delà de ses satellites territoriaux du Pacifique, exerce depuis une quarantaine d'années dans la région un rôle culturel prépondérant notamment par l'intermédiaire des médias. Nous sommes à l'aube d'une nouvelle période marquée par la prépondérance de l'Asie du Sud-Est dont l'impact culturel sur le Pacifique sera à l'image de la puissance de sa technologie à l'échelle mondiale, multiplié par un facteur correcteur positif induit par la proximité.

b) A l'échelle mondiale, le local tend à se fondre dans le général. Ceci n'implique cependant pas une totale uniformité. La globalisation de l'espace et de l'économie, processus relevant de la petite échelle, se traduit à moyenne et grande échelle par la création de lacunes, de trous, qui sont autant de niches écologiques qui confèreront à qui saura les occuper de véritables espaces de liberté, autorisant une latitude indéniable par rapport au modèle dominant. Le Pacifique a là une opportunité à jouer[5].

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[5]R. Crocombe s'est expliqué beaucoup plus longuement sur cet aspect dans la suite de sa communication, prenant l'exemple de la culture matérielle traditionnelle qui, dit-il, ne restera vivante qu'à la condition expresse qu'elle trouve une justification économique. Le tourisme en est une, a-t-il souligné. illustrant ces propos de l' exemple des grandes

c) Face aux changements, il conviendra de se garder des excès d'enthousiasme comme des idéologies trop appuyées. L'adaptation au futur demandera un grand pragmatisme et une volonté de privilégier les actions positives au détriment des réactions négatives, qualités qui semblent mieux partagées chez les femmes que chez les hommes.

d) Les femmes sont donc appelées à jouer un rôle grandissant dans les sociétés océaniennes qui a court terme devront affronter les problèmes structurels liés à l'accroissement démographique de la région, où de nombreux Etats voient leur population doubler tous les 20, 30 ans.

R. Crocombe s'est ensuite interrogé sur la communication et les rapports culture-communication. La culture, a -t-il souligné, ne doit pas être "sacralisée", attitude qui conduit à la figer et qui entraîne à terme sa disparition. Les anciens navigateurs océaniens nous montre la voie en la matière[6]. affirme-t-il. Ils ont toujours su utiliser à leur profit la technologie la plus performante de leur époque. Ainsi, lorsque les Européens ont introduit le nylon, ils l'ont employé sans hésiter. Il convient donc de suivre leur exemple et d'utiliser au mieux les opportunités qui se présentent au monde océanien tant en matière de technologie que de culture et de communication.

"*Tout système d'information fermé entrant au contact d'un système d'information ouvert est obligatoirement englobé par celui-ci*" a rappelé avec force R. Crocombe. La disparition progressive des langues vernaculaires en Mélanésie en est un exemple très clair. Doit-on combattre ce processus ? A la logique du coeur et des racines pour laquelle le maintien des langues vernaculaires est essentiel et passe par leur introduction ou leur généralisation dans le système éducatif, R. Crocombe oppose la logique de la raison qui, dénuée de toute idéologie et de toute affectivité, prône l'ouverture au monde à travers les langues véhiculaires. Il y a une différence croissante souligne-t-il entre la langue maternelle et la langue des ancêtres. Un nombre croissant d'océaniens, notamment les urbains, ont pour langue maternelle une langue autre que celle de leurs ancêtres. Il s'agit d'un processus irrémédiable et il serait vain de s'y opposer[7]. En revanche, outre l'une ou deux des trois langues véhiculaires du Pacifique (l'anglais, le français et le "pidgin"), il serait souhaitable conseille R. Crocombe que tous les océaniens maîtrisent dans un proche futur une langue asiatique afin de se préparer à la domination culturelle et économique de l'Asie sur le Pacifique au 21ème siècle.

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pirogues des îles Cook où le maintien d'une tradition maritime hauturière et des savoirs techniques concernant la construction et la navigation de ces pirogues pourrait passer par le tourisme, tourisme à la fois "d'aventure" et culturel.

[6]Cette remarque a été largement inspirée par Sir T. Davis pour qui l'étude de la navigation traditionnelle a toujours constitué une passion.

[7] On remarquera ainsi que l'Université du Pacifique Sud, dont R. Crocombe a été un des dirigeants durant de nombreuses années, n'a jamais inscrit l'enseignement des langues vernaculaires du Pacifique à ses programmes, à la différence du "bichlamar" et du "pidgin", langues véhiculaires..

Cette conception très réaliste ne s'embarrasse guère des problèmes de perte d'identité culturelle et d'acculturation qui peuvent résulter de sa mise en application. Elle tranche d'ailleurs nettement sur le discours habituellement tenu lors de la conférence selon lequel le maintien de la langue vernaculaire est une priorité. *"Notre langue est notre terre et notre terre est notre langue"* ont maintes fois souligné les intervenants océaniens dans leurs communications. Se pose donc inévitablement la question suivante : *"Comment concilier la pérénité des cultures des peuples océaniens et leur nécessaire ouverture au monde ?"* Ce sujet crucial a fait l'objet de deux communications particulièrement intéressantes, respectivement intitulées *"Bridging the traditionnal and the modern : understanding the role of information in development in the South Pacific"* et *"Incorporation of traditional knowledge into science education policy"*, l'une de la part d'E. Williams., qui, ces dernières années, était responsable de l'information à l'Université du Sud Pacifique, l'autre de la part de N. Petaia, directrice assistante au Ministère de l'Education du Samoa occidental. R Crocombe ne partage absolument pas leur point de vue. La nécessaire ouverture sur le monde des océaniens est étroitement conditionnée par l'efficacité des moyens de communication, constate-t-il, et le pire d'entre eux est le système universitaire, le meilleur étant la télévision ; ainsi souligne-t-il très provocateur, aux Cook où il habite, la télévision après seulement deux ans d'existence a fait plus pour l'éducation de la population que l'université et la culture traditionnelle réunies. On est là dans un débat particulièrement aigu qui divise les intellectuels et les dirigeants du Pacifique insulaire. Pour beaucoup d'entre eux, la télévision est considérée comme un instrument d'acculturation plutôt que d'éducation, susceptible à terme d'entraîner ou d'accélérer la destructuration sociale du pays ; ils sont donc fermement opposés à sa mise en place. Le débat a à peine été esquissé durant ce colloque mais le peu qui a été dit sur le sujet montre qu'il est difficile à l'heure actuelle de se faire une opinion définitive sur l'impact de la télévision sur les populations océaniennes, les rares expériences existant dans la région étant encore trop récentes.

La conclusion de la conférence a été donnée par Sir T Davis qui, après avoir salué l'importance que revêtent les savoirs traditionnels dans la vie quotidienne des océaniens, a invité les auditeurs à réfléchir sur la nécessaire harmonie entre savoirs traditionnels et science. La science, a-t-il rappelé, est là pour résoudre vos problèmes. Elle ne doit pas prendre la place de votre culture mais plutôt servir à la fortifier car la solution des problèmes à venir viendra de la connaissance.

ANNEXE 1.

EXTRAIT DE LA LETTRE D'INFORMATION
DE L'UNIVERSITE DU PACIFIQUE SUD
DU 8 JUILLET 1992

THE UNIVERSITY OF THE SOUTH PACIFIC BULLETIN

VOLUME 25 NUMBER 24 10 JULY 1992

FIJI PM OPENS SCIENCE MEETING

Traditional science of the Pacific peoples, as well as modern innovations, had a role in the future development of the Pacific Islands, the Prime Minister, Major General Sitiveni Rabuka, told a gathering of scientists at the University of the South Pacific.

He was speaking at the opening of the Science of Pacific Island Peoples Conference, being held 6-10 July at the University of the South Pacific.

There had been a tendency to favour modern innovations. The conference was an attempt to redress this situation and find a balance, the Prime Minister said.

He praised the University in taking the initiative to hold the conference, and for teaching some traditional science in its courses, such as traditional fishing techniques and land management.

He said the University was influential in the life of the Region. It was encouraging that it was teaching some aspects of traditional science and technology alongside modern science.

The Prime Minister pointed out that tradition played an important part in people's lives, no matter what their background.

They tended to follow the patterns and life-styles of their parents and elders. The knowledge such patterns were based upon had been developed over hundreds or thousands of years.

Changes occurred, and if they led to improvements in peoples lives, they gradually became part of traditional knowledge.

The Fiji Prime Minister, Major General Sitiveni Rabuka, with the Vice-Chancellor, Esekia Solofa, at the traditional Fijian welcoming ceremony before the opening of the Science of the Pacific Island PeoplesConference.

Some of the problems today could be due to how quickly changes are made. People may not have time to fully investigate the effects of particular changes, he said.

It was often difficult to decide whether changes were really beneficial, and not all were equally acceptable to everyone.

But there was great pressure for change which was having an impact on the traditional life of Pacific islanders.

The Prime Minister set the University the difficult task of trying to marry valuable traditional science with modern innovations.

To P.2

USP is a regional University serving Cook Is, Fiji, Kiribati, Marshall Is, Nauru, Niue, Solomon Is, Tokelau, Tonga ,Tuvalu, Vanuatu and Western Samoa

Traditional Medicine Helps Heal Culture

Traditional medicine had helped Tahitians adapt culturally to their new environment, scientist Yves Lemaitre told a traditional science conference at the University of the South Pacific.

Another scientist urged development of "neo traditional science" of Pacific people, dedicated to the art of living well through the use of sustainable resources.

Traditional healing and the traditional uses of marine resources were debated by scientists at yesterday's session of the Science of the Pacific Island Peoples at the University.

Dr Lemaitre, of the Orstom Centre in Tahiti, spoke about traditional medicine and history in Tahiti.

He said people generally had a misunderstanding that traditional medicine never changed. Some beneficial changes were made.

Because most knowledge of past Tahitian traditional medicine came from Europeans, it was difficult to get deep insights into the actual meaning of Tahitian medical ideas, theories, classification of diseases and healing practices.

In pre-contact Tahiti, health was good compared to European standards of that time. Some diseases, such as scrofula, skin diseases, rheumatism and ophthalmia, filariasis existed.

Herbal treatments were given for some. There was no treatment for others, Dr Lemaitre said. The knowledge of cures was held by medical specialists, some of them priests.

There were skilful traditional surgeons, who could heal severe wounds, fractures, and amputations of limbs. They were also able to operate on the skull, and replace damaged bone with coconut shell.

Contact with Europeans changed the environment in which the Tahitians had lived for centuries, and the organisation of their society. This in turn affected their medicine.

Epidemics occurred of diseases which the Tahitians were not resistant to.

In the nineteenth century, Tahitians added various forms of European medicine to their health resources, and developed herbal remedies for imported as well as pre-European diseases.

Social changes disrupted the passing on of medical information, which used to be done by rhythmic recitation.

However, Tahitians were still attached to their herbal remedies, and lacked some confidence in European medicine, especially when it was unable to

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Several hundred scientists from throughout the South Pacific and from universities and other institutes abroad are attending the conference.

There are also participants knowledgable in traditional scientific practices, including agriculture, marine resources and fishing, traditional medicine (ethnobotany), and design and materials for construction, boat building and mat weaving (ethnomathematics).

The discussions cover a wide range of traditional scientific knowledge. There will be particular effort to identify and record knowledge which is in danger of being lost or forgotten.

From there talks go on to the place of traditional science in today's world, and the impact of western knowledge and development.

Scientists also considered how valuable traditional scientific knowledge could be incorporated in development planning and into science teaching.

Eminent scholars chaired the sessions at which speakers present their papers, and also the plenary sessions.

Sir Tom Davis, former Prime Minister of Cook Islands, takes the chair for the final session before a review of the conference and recommendations on Friday 10 July.

The first session of the Conference listened to overviews on traditional scientific knowledge.

Speakers included Professor Bill Clarke, former USP Geography head, on traditional land use and agriculture and Dr R. Johannes, marine biologists with CSIRO Australia.

Dr Johannes said some of his biology colleagues dismissed the knowledge gained by Pacific Islanders during centuries of practical experience as 'anecdotal'. While their own specialised knowledge was based on studies carried out over shorter periods under conditions where being wrong did not involve the risk that they and their families would go hungry.

The afternoon session examined traditional agriculture and land use.

Amongst the speakers was the Secretary-General of the South Pacific Commission, Mr A. Baiteke, who gave a paper on traditional agriculture in Kiribati.

Other Pacific Islanders knowledgable in their own land management traditions who gave papers in this session included Mr J. Keitadi, who spoke about traditional taro growing in Vanuatu, Mr R. Moeka'a on traditional agriculture in Cook Islands, Mr A. Tolova'a of Western Samoa on agriculture tradition in Samoa, and Mr Sampson Tahuniara, who spoke on the unique yam cultivation practice in Guadalcanal, Solomon Islands.

He said the shifting cultivation practices (posi) which protected and maintained the land, and produced healthy crops, was now under threat from population and land pressures, migration, new technology and tastes.

The Fiji Prime Minister with the Chairman of the Conference Committee, Professor John Morrison.

control epidemics and imported diseases.Dr Lemaitre said a modern health care system had progressively been set up, but Tahitians still liked to look to traditional medicine, and consulted masseurs and herbalists.

Differences in traditional medicine practice now and in the past included the present day reliance on herbal medicines. Surgery is limited to very simple operations such as piercing abscesses. Massage and steam baths are very popular.

He said traditional medicine had to adapt to new diseases, new plants, and new ideas. In doing so, it probably helped the Tahitians to survive and thrive in their new environment.

It was no exaggeration to say that some form of cultural adaption to the new environment had taken place with traditional medicine, Dr Lemaitre concluded.

At the other session on traditional marine practices, Ms Marjorie Falanruw, of the Yap Institute of Natural Science, spoke about traditional fishing on Yap.

She described fishing methods using sticks, poisons, nets, spears and traps. One of the most exciting ways was to capture flying fish with hand nets while standing in sailing canoes.
This method was developed into an art, for which young men were trained.

Management of marine resources which scientists talk about now could not be achieved unless there was some means of managing people's use of these resources, Ms Falanruw said.

On Yap, this management seemed to have been provided by a complicated social hierarchy which put people on about five social levels.

Community fishing was initiated by the chiefs and done by young men. This limited the best fishing gear and techniques to a portion of the population, and helped limit over-exploitation.

Fishing areas needed the consent of the local overseer, which prevented over-exploitation. The networks of ranks and relationships provided checks and balances against one chief exerting total power or influence.

There were also beliefs and rituals which affected fishing activities, and influenced even individual fishermen.

There were cultural practices which had conservation value, such as collecting limited number of leaves from seagrass, and restricting exploitation of resources in a particular area to allow stocks to build up for some special upcoming event.

Ms Falanruw said fishing pervaded all aspects of the Yap culture, from story to dance to everyday survival and relations between people.

She said the division and apportioning of resources, and limits on access, were sound principles of fisheries management. But the conservation value of other practices was not so clear.

For instance, spawning fish in lagoons were exploited, while fishing in the open ocean where fish were less vulnerable was restricted.

In the last few generations, it seemed people were more concerned with who had the rights to what fishing resources, than in managing the limited resources. Perceptions of resource limits, if they were present in the past, were not apparent today, Ms Falanruw said.

More people were fishing and using non-traditional methods such as spearguns and monofilament nets, and there was a definite trend towards fishing for profit.

Ms Falanruw said it had been suggested that Pacific people should be planning for the kinds of lives they wanted to lead. She suggested a system of sustainable resource use which incorporated satisfaction into its process.

"Wealthy countries often achieve their affluence by using the natural resources of others and by producing pollution as a by-product," she said.

"A more basic measure of the wealth of a people in the future will be the ratio of their population to their own resources, and the possession of a satisfying system of using those resources on a sustainable basis."

She said the past link between people and their environment provided a precedent for management which could continue to evolve if recognised and enhanced by the application of natural science. "There is much need to develop a neotraditional science of Pacific peoples dedicated to the art of living well through sustainable use of resources," Ms Falanruw concluded.

ANNEXE 2

RESUMES DES COMMUNICATIONS

AALBERSBERG, BILL and PARKINSON, SUSAN

TRADITIONAL PACIFIC FOOD TECHNOLOGY

The mythical view of Pacific Islands as lands of perpetual fecundity belies the reality of food scarcity in times of war, drought, hurricanes or flood. Food supply is a perpetual problem on smaller islands. High temperatures and humidities encourage post-harvest food loss. In response to this a wide variety of techniques were developed using universal food preservation strategies such as lowering water activity (drying, smoking, salting, baking, saccharifying) and acidification.

Of special note perhaps is the pan-Pacific technology of fermenting carbohydrate staples (especially breadfruit) which besides preserving the food also prepared an important ceremonial exchange gift of unusual taste.

BAITEKE, ATANRAOI

TRADITIONAL AGRICULTURE IN KIRIBATI

Dependence on traditional food crops will continue to play an important role in the subsistence existence of an I-Kiribati atoll dweller. Traditional agricultural methods and practices need scientific testing and examination to improve quality, productivity and sustainability. There is still available, a body of knowledge possessed by families. These "secrets" should be further researched incorporating the skills and knowledge of experienced local experts whose contribution should be acknowledged and appropriately rewarded. There is always a reluctance to reveal and share these secrets because they are considered family heirlooms. It is their "land" and "life". Sharing of information on traditional and other non-traditional food crops should be encouraged in the implementation of economic development so that it presents people on outer islands with a wider range of special economic opportunities for self-sustenance. This paper sets out the observations of an I-Kiribati practitioner who has been interested in knowing the nature of these secrets and their applicability to problem-solving and decision-making.

BARE, J-F.

TALKING ECONOMICS IN TAHITIAN, A FEW COMMENTS

This paper presents some of the semantic specificities of economic categories, while exploring their possible translation into a given language, Tahitian in the case, as spoken in the Society Islands (French Polynesia). It draws attention to the semantic and linguistic aspects of international economic relations. It also stresses the importance, to this day, of the translation issue in anthropology.

Abstract of an article to appear in Pacific Studies (The Institute for Polynesian Studies, P O Box 1979, LA'IE HAWAI'I 96762 USA, Vol.15 no.3, September 1992). Translated from the French Version in L'Homme, Paris, Janvier Mars 1992, no. 121; 143-164.

BIGGS, BRUCE

HOW DID MAORIS TALK ABOUT WHAT THEY KNEW?

In the west scientific and technological discourse is conducted in meta-languages whose vocabularies are distinct from that of non-scientific discourse.

The meta-languages of science and technology drew, and continue to draw, their vocabulary from the classical languages Greek and Latin which were available equally to English, German and French speaking scientists and technologists. Massive borrowing from these languages has provided a layer of technical language distinct from the language of everyday talk. Lawyers, doctors and physicists communicate in their respective disciplines language which conveys precise meaning partly, at least, because it is not couched in ordinary vocabulary.

The case in Fiji and Polynesia was very different. In particular New Zealand Maori was without significant contact with any other language for perhaps a thousand years. Granting that Maoris had some technical knowledge (e.g., of weaving and wood-working techniques) and some theories about the universe (e.g., the nature of the heavenly bodies, the evolution of their world) how was this embodied in language?

My paper will examine the proposition that, unable to borrow a second layer of vocabulary from other languages, ordinary vocabulary was used but that esoteric discussion took place in a special mode that employed personification and other kinds of metaphor to mark it apart.

BOWDEN-KERBY, AUSTIN W.

ETHNOBOTANY AND TRADITIONAL MEDICINE IN MICRONESIA

The prevailing attitudes towards traditional medicine and knowledge in Micronesia are resulting in rapid erosion of knowledge in certain cultural groups. As herbal medicine is tied to an ancient religion, the attitude towards this former religion indicates the degree to which herbal knowledge is retained and passed on in the culture. A survey of students at the Community College of Micronesia confirmed that attitudes towards the old beliefs indeed correlate with the degree of personal knowledge of herbal medicine.

BROWN, PAUL

A NEW BASIS FOR THE HISTORY OF AUSTRALIAN SCIENCE

A framework is proposed that is both explanatory and predictive, for developing a history of Australian science. It suggests that transplanted Eurocentric science (connected to ideals of European progress) is but one of three types of scientific activity in Australia. There is also Aboriginal science (connected to ideals of sustainability and to cultural imperatives such as "First Law") and, finally, a modern Australian science/knowledge based around new sustainability objectives. The perspective agenda of the framework proposes that Australian science ought to be constrained in constructive ways by elements of Aboriginal science. The framework is explored from a revisionist perspective that is Aboriginal and Environmentalist, rather than from the Eurocentric point of view which characterises much historical study of Australian science.

BURNS, G.L.

AMIDST OUR PEOPLE : TOURISTIC IMPACT AND LOCAL KNOWLEDGE IN BEQA

A tourist hotel, the first of its kind, recently opened on the island of Beqa in the Fiji group. Managed by an American couple, the privately owned Marlin Bay Resort is situated on land under a 99 year lease contract. Staff are employed from villages on the island.

This paper explores the impact of the hotel on the villagers of Beqa. Drawing on ethnographic data gained through fieldwork, discussion centres on changes that have occurred since the hotel commenced construction and anticipated changes.

Particular attention is paid to the influence of tourism on the attitude to traditional firewalking knowledge and practices, by incorporating material on the commercialization of firewalking together with documentation of the first performance held at the new hotel. Firewalking, and the new hotel on Beqa, provide valuable case studies for evaluating the impact of external contact, and modern values of traditional knowledge.

CLARKE, WILLIAM C.

TRADITIONAL LAND USE/AGRICULTURE

The peoples who first arrived in the Pacific Islands faced the task of transforming the natural forest - which of itself did not meet many human needs -- into landscapes that did meet both needs and more elaborated socio-cultural goals. So began the process of removing and modifying forest; of manipulating soil and land surfaces; of cultivating, protecting, and transporting favoured species of plants; of domesticating new species or increasing varietal diversity within species; of developing ways to manage the supply of water to crop plants; and of learning how best to lessen the damage caused by pests and diseases of crops.

In their utilization of land and their agronomic experimentation, Pacific Islanders sometimes made mistakes and damaged land resources; they also developed a large and sophisticated repertoire of useful plants, effective land- and crop-management techniques, and agricultural systems that ranged from very land extensive to highly intensive. My paper reviews this repertoire, not so much in an attempt to catalog its diversity or devise a typology for it as to examine how it served Pacific Islanders in their efforts to produce items of value from the land. Also examined is how land use over time affected and was affected by Pacific-Island environments, social arrangements, and changing demographic patterns. The dynamic character of land use and agriculture is emphasised.

KEYWORDS: Traditional management of Land resources, Landscape Modification, Degradation and Depletion of Land Resources, Adjustment, Agricultural Intensification

CROSBY, ANDREW

FIJIAN COSMOLOGY AND THE PRE-COLONIAL NATION

At the time of European contact Fiji comprised a state-like political arrangement of confederated lands offering tribute and allegiance to centralised chiefly policies. Although not encoded by written charter or decree, the "constitutional" legitimacy of these policies was mutually recognised to enable formalised ceremonial and economic exchanges, wars and treaties to take place between them.

The rules by which these exchanges and conflicts occurred and by which the policies were constituted were derived in practice from a cosmological belief system. Fijian chiefs were characterised as gods that usurped popular authority in return for divinely empowering the reproductive potency of the people, their land and society. Only when the rules of this belief system were flagrantly breached, as in the active participation in Fijian wars by Tongans and Europeans during the nineteenth century, was the cosmology challenged.

This paper investigates the pragmatic qualities of the pre-colonial Fijian cosmology as an indigenous political science: a standardised system of knowledge by which the expected outcomes of political moves could be predicted and manipulated. The paper reviews the archaeological and historical literature of Fiji for clues as to the origin and duration of such a standardised system and investigates its homogeneity throughout the Fijian archipelago.

Given the necessary association of unified political and belief systems with the creation of national identity, the paper questions whether Fiji as a nation-state was truly born as a result of the implementation of a colonial government or whether a case can be made for extending the characterisation of Fiji as a "nation" into pre-colonial history.

CROWE, D.W.

TONGAN SYMMETRIES

A natural instinct for pattern symmetry is revealed in a variety of Tongan arts and crafts, including old decorated war clubs, modern basketry, and decorative rafter lashings.

The underlying geometry of the symmetries superficially apparent in these patterned creations can be revealed by systematic pattern analysis. Suitable methods for such analysis were developed by crystallographers in the late 19th century for monochromatic patterns. More recently these methods have been extended to the study of dichromatic patterns.

Several of the 17 monochromatic plant patterns are found in decorative carvings on Tongan war clubs. The two coloured strands prevalent in contemporary basket-making yield examples of some of the 46 dichromatic plane patterns. Further examples are found in the dichromatic rafter lashing work of Tamale of Niutoua and his school, and in the mat-like rafter decorations in the Basilica of Nuku'alofa. Illustrations of all of these are presented.

REFERENCES

1. Crowe, D.W. and Denes Nagy, Cakaudrove-style Masi Keas of Fiji, submitted to Ars Textrina (Winnipeg).

2. Washburn, D.K. and D.W. Crowe, Symmetries of Culture : Theory and Practice of Plant Pattern Analysis, University of Washington Press, Seattle and London (1988).

CROWE, D.W. and TORRENCE, ROBIN

TWO-COLOUR SYMMETRY IN ADMIRALTY ISLANDS SPEAR BINDINGS

The bindings of the obsidian-bladed spears formerly produced in the Admiralty Islands provide an interesting sequence of coloured symmetries. Although three colours, black, red and white, are often used, the most characteristic patterns are "two-colour" black-red patterns on a white "background". Examples in the Australian Museum (Sydney) and the Field Museum (Chicago) illustrate all five two-colourings of the two-dimensional pattern pmm (in the notation introduced by crystallographers).

Some speculations are made concerning the artistic, technological and commercial development of these particular patterns. Illustrations of the five predominant types, and their possible antecedents will be presented.

REFERENCE

1. Washburn, D.K. and D.W. Crowe, Symmetries of Culture : Theory and Practice of Plane Pattern Analysis, University of Washington Press, Seattle and London (1988).

DAVID, G.

THE MODERN VALUE OF TRADITIONAL VILLAGE FISHING TO PLAN FISHERIES DEVELOPMENT IN OCEANIA : SOME REFLECTIONS ABOUT THE CASE OF VANUATU

The rational exploitation of marine coastal resources is a priority for the Pacific Islands. Emphasis has often been placed on the development of a commercial structured fishing sector based on the specialization of the means of production and fishing techniques for catching a small range of high commercial value species.

After ten years and often more of fishing development in the Pacific Islands this policy can be deemed to have been a failure in many cases. The reasons of this failure can be found in the lack of adaptation of the development programmes to the socio-economic and cultural constraints inherent to village communities and to ecological constraints inherent to the Pacific islands coastal marine environment. Contrary to commercial structured fishing, the traditional village fishing is completely adapted to these constraints, mainly in terms of production modes and resource management. These different topics are discussed through the example of Vanuatu and some proposals are made for the integration of traditional practices in modern coastal resource development programmes.

KEY WORDS: coastal environment, commercial fisheries, subsistence activities, traditional fishing, Pacific Islands, Vanuatu.

FAIRBAIRN-DUNLOP, PEGGY

IE TOGA : YESTERDAY AND TODAY A STUDY IN CHANGING PRODUCTION AND USE BEHAVIOURS

Much of the literature pertaining to women and women's place in developing nations proposes that in the post-contact period the goods women traditionally made have been replaced by manufactured goods. As a result, women have lost their recognised avenues of economic participation and hence, their ways of maintaining status in society (see Boserup 1970, Rogers 1980).

This paper argues that this scenario is not necessarily so, but depends on how a society has responded to the influx of new ideas and processes which characterises the post contact era. I will show that women's handcrafted goods are still highly values in Western Samoa, for home use, exchange, and for ceremonial purposes. In fact, in recent years their importance has increased. This increase has brought about changes in production and use behaviours compared to those recorded in traditional times. I look specifically at the ie toga, its place in traditional society and its place today.

The major part of this paper is based on research undertaken in three Western Samoa villages in 1989. This research included household surveys and time-allocation studies conducted over 50 households.

FALANRUW, M.V.C.

TRADITIONAL USE OF THE MARINE ENVIRONMENT ON YAP ISLANDS

It is a truism that island cultures are adaptive to the island environment. This paper seeks to explore the fit between an island culture and its marine environment. The traditional use of the marine environment on Yap is described in terms of fishing methods, knowledge of the marine environment, preparation of marine products, management of resources and stories relatingg to the marine environment. A diversity of methods and target species is disclosed along with many specializations in gear and procedure, some elevating particular fishing methods to ceremony and art. Social interactions related to fishing were numerous and complex. The buffering effects of these factors on the exploitation of marine resources is discussed and the "closeness of fit" between culture and marine environment is assessed. Prospects for incorporating the buffering effect of traditional use patterns into modern development efforts are not as clear.

FINAU, SITALEKI A.

TRADITIONAL HEALTH PRACTICES IN A MODERN PACIFIC : A DILEMMA OR BLESSING?

Traditional health practices have played an important role in health of the Pacific peoples throughout the ages. They have been used to prevent diseases, cure ailments, avert threats, confer identity and redistribute wealth. Socio-economic changes and advent of technological medicine have transformed the standards of normality, perception of diseases, availability of medicinal plants, and the understanding of health. Therefore the utilisation and role of traditional health practices have deteriorated necessitating an examination of their future in the Pacific societies. The choices are that we preserve traditional health practices as museum relics and a reminder of our past or we find their appropriate place in the dynamics of the modern Pacific. We must balance between our desire to preserve our heritage and the practical daily realities of our new aspirations.

GARDNER, RHYS AND PAWLEY, ANDREW

KNOWLEDGE OF PLANTS AMONG *SPEAKERS OF WAYAN, FIJI*

In Wayan, a dialect of the Western Fijian language spoken on Waya Island in the Yasawas, over 400 plant categories are distinguished by name. The structure of the Wayan taxonomy of plants will be examined and compared with that of botanists. Some observations will be made about the changing ecology of Waya and the changing botanical knowledge of the population.

GERAGHTY, PAUL

LINGUISTICS AND SAILING TECHNOLOGY

No abstract available.

GINA-WHEWELL, LAMOUR

ROVIANA WOMEN IN TRADITIONAL FISHING

Traditional fishing management in Roviana, while having a system with variable division of labour between women and men, was complimentary and allowed an extensive utilisation of marine resources. Salt and fresh water crustaceans, molluscs, and seaweeds, which provided an indespensible source of protein in the diet of Roviana families, were gathered by women.

This paper aims to discuss the following:

i. Women's acceptable roles in relation to:
   - fishing grounds and target species
   - equipment
   - techniques and methods

ii. Seasonal variations which determine the time for fishing

iii. The impact on women's traditional fishing by contemporary fishing resource management practices

HAAMI, BRADFORD

MAORI TIKANGA KNOWLEDGE OF THE KIORE (POLYNESIAN RAT)

My part of this joint presentation with Mere Roberts will look atrictly at the Maori tikanga knowledge of the Kiore (**Polynesian Rat**).

This presentation will study the arrival of the kiore on the hekenga o nga waka ki Aotearoa (arrival of the Maori to Aotearoa), the importance of the kiore as a food source and the traditions that have been developed within Maori culture surrounding the kiore, over the past 1000 years.

Within those traditions the kiore was highly respected and chants carvings, fauna, pa'a, villages, lands and people were named after the kiore. It was also important in the retention of lands and waters. The presentation will also look at the kiore's demise through introduced predators and with their demise the demise of the knowledge also. It has been over a hundred years since Maori have heard of the kiore with most thinking they were truly extinct.

The final part of this presentation will be the cooking and preserving of the kiore in the traditional hue or gourds which I hope to prepare and present at the hui. Something not done for over 100 years.

HELU, FUTA

THE ETHNOSCIENCE OF KAHOKAHO YAM CULTIVATION

No abstract available.

HILDENBRANDT, DANIEL

USE OF VIDEO IN TRADITIONAL SCIENCE STUDIES

Video can be used in various ways to record, examine and communicate traditional science skills and knowledge. Video will be shown to illustrate the ways in which Pacific island techniques in agriculture, design and conservation can be captured and disseminated.

HILL, LANCE

TRADITIONAL KNOWLEDGE IN PAPUA NEW GUINEA

In Papua New Guinea today, the seeming omnipotence of western science and technology is in danger of overshadowing an important resource - the traditional knowledge base and its accumulated wisdom. This paper demonstrates that the underlying base is extensive; and has implications and application for the current resource development process.

HILL, LANCE

TRADITIONAL KNOWLEDGE AND SCIENCE AND TECHNOLOGY POLICY IN PAPUA NEW GUINEA

This paper overviews the development of science practice and science and technology policy development in Papua New Guinea. It then focusses on approaches directed to a fruitful synthesis and application for traditional and western knowledge in the areas of medical plants and faunal survey. The following benefits are identified : enhancement of respect and confidence in the traditional knowledge base; enhancement of education curricula and teaching materials; development of information and data bases for planning purposes; provision of opportunities for collaboration between scientists and community experts and the potential identification of opportunities for project development.

JOHANNES, R.E.

TRADITIONAL ECOLOGICAL KNOWLEDGE AND THE FUTURE OF MARINE RESOURCE MANAGEMENT IN THE PACIFIC ISLANDS

Practical empirical knowledge about local marine resources - much of it unknown to western science - remains encyclopedic in some Pacific Islands. It's potential value in fisheries management, environmental impact assessment and the siting and management of marine protected areas is almost impossible to exaggerate. Yet it is haemorrhaging into oblivion because of insufficient appreciation of its value not only by western scientists, but also by Islanders. Pacific Islanders also developed centuries ago, all the basic marine fisheries conservation measures "invented" in the West beginning in the early 1900's. A greatly accelerated effort is needed to blend this traditional knowledge and practice with that of western science; both have their weaknesses as well as their strengths and each can benefit the other.

KEITADI, JACK

TRADITIONAL TARO GROWING IN SOUTHERN VANUATU

No abstract available.

KUNATUBA, PENIASI

THE ROLE OF TRADITIONAL KNOWLEDGE IN ENVIRONMENTAL PLANNING

No abstract available.

KUHLKEN, ROBERT

TUATUA NI NAKAUVADRA : A TRADITIONAL FIJIAN TARO AGROSYSTEM

Prior to European contact, Pacific Island peoples developed sophisticated agricultural systems for the production of root crop staples. Irrigated terraces designed for taro (Colocasia esculenta) cultivation comprised one such traditional agrosystem. In Fiji, irrigated taro terraces can be found in a number of locations on several islands. Many of these systems have been abandoned.

One of the most extensive terrace complexes in Fiji is situated on the northern flanks of the Nakauvadra Range, near the northernmost point of Viti Levu. Research in progress indicated that streams draining the upper slopes were diverted to irrigate a series of north-facing contour terraces. No longer in use, many of these terraces have suffered the destructive effects of grazing and modern sugarcane farming.

The Nakauvadra Valley is an important and mythically charged site in Fijian culture. Some oral historical accounts relate the first arrival of the Fijian people to this area. From Nakauvadra, early Fijians are said to have dispersed to other locales within the archipelago. Many of these subsequent settlements also exhibit abandoned, and, in some cases, still operative terrace systems. Thus, the Nakauvadra terraces are important not only because of the size and complexity of the systems, but also because of their location in this valley which occupies such a central position in Fijian legend.

This paper describes the nature and extent of the Nakauvadra terraces, outlines possible reasons for their abandonment, and examines this in the context of existing literature on taro irrigation systems elsewhere in Fiji and the Pacific.

LEMAITRE, YVES

TRADITIONAL MEDICINE AND HISTORY IN TAHITI

The traditional medicine of Tahiti has changed as transformations occurred in the ecological environment and in the society itself as a consequence of the contact with Europeans which started in 1767. The main sources for a reconstruction of these changes are the writings of the navigators and missionaries. In pre-european times, because of the frequent wars, surgeons practised trepanation, and repaired fractures with skill. They had a knowledge of osteology and anatomy. Massage was commonly practised. The use of pharmacopeia was mainly limited to the external treatment of a few diseases, and the general level of health was good. For other diseases priests asked for the goodwill of the gods and required the expiation of the transgressors. In the 19th century epidemics followed one another, pharmacopeia became the most important part of medicine, with complicated recipes and calculated measurements of ingredients, perhaps under the European influence. Knowledge related to surgery disappeared almost completely for want of observation and practice after the end of the wars and the religious changes. About 1860 the demographic trend reversed and population growth increased slowly at first, and epidemics became uncommon, but the pharmacopeia remained the most important part of the Tahitian medicine. History explains that it includes today some medicines whose names indicate that they were aimed at diseases presently unknown. Traditional medicine refers also to the past for the explanation of the efficiency of the medicines. Their power is attributed to the mana of the ancestors who still give recipes through dreaming. It has not prevented experimentation, the traditional medicine of Tahiti has been able to adapt to the diseases and plants that were introduced. The medical success of this adaptation could be only limited at the time of the epidemics, but it has proved socially efficient for the institution since traditional medicine is still alive in Tahiti.

MANNER, HARLEY

THE PULUWATESE TARO MOUND

People have developed many adaptive strategies of resource use, reflective of their environment. These strategies can be seen in the more traditional subsistence agriculture and agroforestry systems of Pacific Island atolls. A case study is presented from Puluwat Atoll in western Chuuk, Federated States of Micronesia, where the Puluwatese build elaborate mounds (maa), for the cultivation of Colocasia and Cyrtosperms taro, which are represented by a large number of locally named cultivars. These mounds exemplify an understanding of biological, chemical and physical processes and constraints by the Puluwatese. The implications of cultivar numbers and Puluwatese ethnobotany are discussed.

The data and observations suggest that except for differences in terminology, equipment, Puluwatese science, as well as that of other Pacific Islanders, used the same methodology (of observation, experimentation or trial and error) as did Western science, in developing their adaptive systems of resource use.

MARJORAM, TONY

FROM THE GROUND UP : SCIENCE AND TECHNOLOGY POLICY AND INDIGENOUS SCIENCE AND TECHNOLOGY

If science and technology are understood to be the interconnected attempt to understand and apply knowledge to existence, based on observation and experiment, then Pacific islanders have been extremely resourceful in the development of sophisticated indigenous science and technology in situations of limited physical resources. Not only have islanders developed systems of navigation and agriculture based on an understanding of cosmology, local ecology and environment, they have created a vast range of products and process technologies including highly developed and refined suspension bridges and racing canoes.

Unfortunately, most of these products and processes began to be displaced and lost in the face of colonisation and the transfer of technology from the West that has increased in the more recent past. Technology is the most powerful force for social change and, whilst this may be acknowledged, there are considerations regarding technology transfer that are of crucial importance in terms of development and dependency in the region that remain relatively neglected. Technology from Western industrially developed countries is 'shaped' in the West for Western economic, social, environmental and technological conditions (and to a large degree, has shaped the West), and embodies certain Western values - such as a mechanistic approach to the world. When Western technology is transferred to non-Western, non-industrial and less-developed countries, various effects and impacts occur - such as displacement and dependency, but also including environmental degradation and more profound social and cultural impacts arising from a less mechanistic, more harmonious view of nature and the world. This is particularly in the small, environmentally, socially and culturally sensitive island Pacific.

This paper examines indigenous technology in the island Pacific (which is taken to include both traditional and introduced but established technology, which like culture, is never static) and the impact of Western technology. To promote less dependent development, science and technology policy plays an important but equally neglected role. Indigenous science and technology needs to be recognised and built upon, rather than neglected and displaced. The undoubted benefits of Western technology need to be maximised, and unwanted impacts minimised. The paper presents an analysis and discussion of these issues in the island context.

MINERBI, L.

HAWAIIAN SANCTUARIES, PLACES OF REFUGE AND INDIGENOUS KNOWLEDGE IN HAWAII

Study of the role of Hawaiian sanctuaries and places of refuge in fostering cultural continuity and peace in Hawaii by promoting the exercise of basic human rights of Native Hawaiians. The peaceful coexistence between the larger society and the indigenous islanders requires programs consistent with principles of nonviolence, social justice and ecological vitality. The paper studies the concepts, needs, rationales for places of refuge and sanctuaries of indigenous people in Hawaii.

Native Hawaiians are at the bottom of the socio-economic health indicators in Hawaii. Yet they are embarked in Hawaiian cultural renaissance and a quest for sovereignty. Hawaiian Sanctuaries and Places of Refuge are an essential repository of indigenous culture, knowledge and traditions. The exercise of basic human rights, particularly those of indigenous people under pressure by a larger or dominant society, requires "sanctuaries" and "places of refuge" which foster indigenous spiritual, traditional, developmental and cultural survival. These rights are expressed in the present and future stewardship by Native Hawaiians of certain programs and places important to them.

This study surveys Hawaii examples of traditional places of refuge and sanctuaries (pu'uhonua) and contemporary rural communities and projects. Hawaiians and the general public in Hawaii would benefit from Native management of these places. The focus is on new institutional and planning aspects for the establishment or enhancement of such places.

MOEKA'A, RANGI

TRADITIONAL AGRICULTURE IN THE COOK ISLANDS

No abstract available.

MURALIDHAR, S.

LANGUAGE, COMMUNICATION AND LEARNING IN SCIENCE

In recent years a number of studies have addressed the complexity of the language of science and its relevance to the learning and acquisition of science concepts. Studies have shown that even students whose mother tongue is English experience difficulties in dealing with the specialist terminology used in school science. This being the case, the problems faced by pupils learning science in a second language are bound to be even greater.

In this paper, a number of examples from a recent study of science classrooms in Fiji are used to illustrate the extent of the problem and to discuss implications for teaching and learning science.

It is argued that the quality of communication is an important factor in promoting the understanding of science, especially when the main sources of information for the majority of our students are the textbook and the teacher. It is suggested that pupils need to be given more opportunities and encouragement to communicate their thinking both orally and in writing, and that teachers and curriculum designers need to pay greater attention to how ideas are communicated to students and how ideas are received from students.

MUTU, MARGARET

MAORI SCIENCE AND THE CROWN RESEARCH INSTITUTES OF NEW ZEALAND

For the past 18 months or so, the New Zealand Government has been restructuring its science department and in doing so has been pursuaded of the need to consider the place of Maori science in its research programme. Such a consideration derives, in the main, from the crown's responsibilities under the Treaty of Waitangi.

The restructuring exercise is resulting in the establishment of ten Crown-owned independent National Research Institutes. The institutes will all be research companies with their own statute, traditional company structure and commercial powers, each with their own board and management structure. Their role will be to produce science and technology of both high quality and relevance to users which include industry, government and the Maori people.

At present each of the Institutes has an Establishment Board responsible for setting up the CRI on a firm scientific and commercial footing. After receiving advice from a committee of Maori elders, the Minister of Research, Science and Technology appointed Maori directors to six of the ten Establishment Boards.

The paper then, sets out to discuss three areas pertaining to the science in New Zealand and the Crown Research Institutes. First I will discuss the responsibilities of both the Crown and Maori under the Treaty of Waitangi with respect to recording, preserving and developing the knowledge referred to as "Maori Science". Much of this knowledge relates to natural resources which, in terms of the Treaty, are still owned by Maori. I will then consider the role of the CRIs in carrying out the Crown's research responsibilities in the field of Maori science before offering some thoughts on the task of ensuring that this is done, a task that inevitably falls to the Maori directors of the CRIs.

I am currently one of the six Maori directors, but the views expressed in the paper are mine and not necessarily those of either the National Institute of Atmosphere and Water (on which I serve) or the other Crown Research Institutes.

NAGY, DENIS

ETHNOMATHEMATICS

No abstract available.

PARK, GEOFF

THE POLYNESIAN FOREST - BRINGING THE CONNECTIONS BETWEEN PEOPLE, AND NATURE, TRADITIONAL KNOWLEDGE AND BELIEFS INTO THE CONSERVATION/DEFORESTATION DEBATE

Throughout Polynesia the forest is disappearing, faster than it ever has been; the forest that is not only the home of animals and plants found nowhere else on Earth, but that has founded and sustained Polynesia's unique cultures and their traditional well-being.

At the same time, conservation biology, the spearhead of scientifically-based environmentalism, is more active in the Pacific than it has ever been, in the fight to conserve the areas of land and the conditions necessary for the continued evolution of the unique natural life of the Pacific islands.

Conservation biology is the discipline of environmentalists with training in the life sciences who use their specialities in direct service of conservation. It is a crisis discipline, like cancer biology, that tries to find ways to rescue life at risk or prevent its demise. Most conservation biology in the Pacific is undertaken by westerners. In their great anxiety about the rate at which Pacific fauna and flora have become endangered, most have had as their basic assumption, or starting point, the notion that the Polynesian people themselves have been the root cause of the islands' continuing loss of biological diversity. None express the matter more forcefully than Janet Franklin and David Steadman have recently in the international journal Conservation Biology:

> "During the past several millennia, hundreds if not thousands of Polynesian land bird populations have been reduced or eliminated by human activities... people have colonised nearly every one of the roughtly 800 inhabited islands in the Pacific Ocean. The spread of people across the Pacific was accompanied by massive losses of species...Humans have caused these extinctions and extirpations through (1) habitat alteration, especially the clearing of forests, browsing and grazing by introduced herbivores, and the introduction of non-native plants; (2) direct predation; (3) predation by human-introduced mammals; and (4) diseases introduced by non-native birds."

Some Polynesian cultures have completely deforested their island; what Jared Diamond calls the "self-inflicted ecological disaster" of Easter Island being the obvious example. But despite the extinctions of birds, there are plenty of examples of close, intimate and long-sustaining co-existence with the Polynesian forest evolving in the 3500-4000 years in which people have been in Polynesia. The early accounts of European travellers like Bougainville and D'Urville are full of them. But there are hardly any examples of Polynesian cultures retaining the relationship through the recent era of Europeanisation.

Right now across Polynesia, many native species and their ecosystems are in trouble and may not survive the combined impact of the two cultural waves. The rapid population growth in Pacific countries, the influence of Christianity, the development of export crop economies and the widespread modern use of non-traditional hunting and fishing techniques such as shotguns and dynamite are all factors that have decimated nature throughout Polynesia. But both the European and Polynesian cultures have, as a fundamental part of their cultural base, a deep respect for nature.

The idea of the sacred forest is not foreign to Polynesia. "We want the forest, yet fear the spirits" says an ancient Samoan proverb. The forest, its trees and birds are at the heart of identity that flows from the ancient memories and values of island people. When the umbilical cord, or iho to Maori, of an auspicious child was placed on trees or buried beneath them it was with the ancient knowledge of Polynesian cultures that trees have souls, and that ancestral ghosts as well as the souls of gods and demons inhabited them. Trees symbolise the fruitfulness of life. Some have the powers of conception. The tree under which that iho was placed was so often kahikatea, named by the first Polynesians to Aotearoa, by title for trees particularly well-endowed with fruit that has been used right through the evolution of Polynesian culture and language.

It is by this essential relationship to place and nature - by names, spirits, myth, ritual and traditions, as well as sustenance - that identity and culture are forged.

As the cultures of Polynesia have been on the move, so has the traditional relationship with nature. There is considerable evidence that it was, in the main, a mutually sustaining relationship, that there has, in fact, been a far more unsustainable demand on the Polynesian forest since the arrival of European influences than there were in the days of the traditional culture. The question becomes whether, for nature conservation, there is a case to revitalise the traditional ways and their requisite knowledge.

Conservation biology and nature conservation are endeavours dependent on **knowledge**. By and large, biologists' knowledge of traditional Polynesian relationships with nature is severely limited. We know there must be consequences for such ignorance, but we do not appreciate the extent of the ignorance itself. On the other hand many island people who argue the case for traditional ways have a similar ignorance about the biology of conservation and the consequences of traditions unchecked by the ecological realities of the late 20th century.

There are many wonderful ideas and approaches being discussed to advance nature conservation in the Pacific. But there are many obstacles in front of progress. This conundrum between the beliefs of western conservation biologists and Pacific traditions is at the heart of them. To make progress there must be some better convergence of knowledge than is occurring. The paper therefore looks at some of the issues that arise when conservation biology intersects with cultural change in Polynesia. It discusses the kind of integration that is going to be needed if the ancient forests of Polynesia are going to have the indigenous people as well as outside experts working together to save them.

PARRY, J.T.

THE USE OF AERIAL PHOTOGRAPHY IN THE ANALYSIS OF PRE-EUROPEAN FISH WEIRS, TERRACING, RAISED-BED AND POND-FIELD AGRICULTURE IN VITI LEVU, FIJI

Human disturbance of the landscape leaves a lasting imprint. In situations where human activity has reshaped the ground deliberately in the construction of walls, banks, terraces, mounds and ditches a certain degree of the original relief is retained after abandonment. These relic traces are often more readily understood when viewed from the air than when seen on the ground. The details captured on the air photograph provide the interpreter with speific information regarding the position, size, shape and function of the original features. In this study, earthworks associated with in-shore fishing (moka), rain-fed agriculture (were), irrigated agriculture (vuci taga), raised-bed (dua lovo) and pond-field (vuci ni wai) agriculture will be examined. Type examples from the Ra coast, the Sigatoka valley and the Rewa delta will be discussed and the techniques for aerial photography and photo interpretation demonstrated.

PAUL, MAANU C.

MAORI SCIENTIFIC BODY OF KNOWLEDGE

Maui the eponymous ancestor of Maori - indigenous people of Aotearoa (New Zealand) climbed to the seventh heaven of Ranginui, to Hui te Rangiora to obtain three (3) kete of knowledge. One kete contained the total scientific body of knowledge of the Maori.

The present Western body of knowledge scientific practitioners fail to recognise the validity of the Maori body of knowledge and in doing so are the poorer for such a practice and exercise an academic superior stance which delimits their own development.

Kimihia rangahaua kei hea koutou e tama ma.

Seek, research where are you our sons.

He aha te mea nui i te Ao? Maku e ki atu. He tangata, he tangata,

What is the greatest thing on earth? I will answer. It is people, it is people.

Maori concepts of science are founded on the kete of knowledge which is underpinned by the concept of Tino Rangatiratanga. The Continuity of Consciousness is the most potent force of Tino Rangatiratanga. The definitions of Tino Rangatiratanga predate the colonialist era and also are applicable today.

The concept of the Continuity of Consciousness as described for all Pacific Island Peoples by Poka LAENUI of Waienae, Hawaii is fundamental to understanding the rigour of our empirical scientific code of practice and the excellance of our oral scholarship.

There is a holistic approach to science for the Maori who refuse to atomise the constituent parts of the sum total of objects of scientific matter. Instead of looking at the individual portions the Maori studies the total body in its entirety.

The supreme science model for the Maori is the human body. This represents a perfect machine in action, flawlessly and simultaneously providing hydraulic and pneumatic functions as well as electronic and chemical processes. But beyond these functions there is the added dimension of supernatural action based upon the spiritual context of the scientific researchers.

In these days of concern for the environment, the Maori scientific theories are constantly derided and ridiculed by Western practitioners. Our modes of fishing are directly opposed to the Western way; we take the smallest fish and leae the largest fish to breed. The Westerner always aims to catch the largest fish. Their laws prohibit the taking of small fish.

Our conservationary practices are based on centuries of empirical studies, but more than this they are intrinsically interrelated with Tangaroa the god of the sea, Tanemahuta the god of the forests, and Tawhirimatea the god of the winds.

Papatuanuku the earth mother is scientifically linked to Te Whare Tangata, the house of the people, the reproductive organ of the female.

Crucial to all this is the question of, "who owns the scientific body of knowledge".

PAWLEY, ANDREW

ON THE CLASSIFICATION OF MARINE ANIMALS IN THE WAYAN DIALECT OF THE WESTERN FIJIAN LANGUAGE

In Wayan, a dialect of the Western Fijian language spoken on Waya and Viwa Island in the Yasawas, marine animals are classified in several hierarchically-structured terminologies, or taxonomies. Some observations will be made on these taxonomies, with a particular focus on the nature of the higher order categories and on the question to what extent these are motivated mainly by utilitarian as opposed to purely intellectual considerations.

PETAIA, NU'UFOU

INCORPORATION OF TRADITIONAL KNOWLEDGE INTO SCIENCE EDUCATION POLICY

No abstract available.

POND, WENDY

AN INTRODUCTION TO OCEANIC CLASSIFICATION OF THE INSECT FAUNA

Because there are thousands of species of insects, each Oceanic name groups many species together, revealing systematic principles of classification. The paper describes some aspects of naming and classification shared by Oceanic societies and other aspects unique to particular places.

The impact of European classification is described and strategies for ensuring the continued use of Oceanic classification are suggested.

The outline of a bicultural nature study book is presented. This paper introduces the Conference to the Oceanic insect fauna and its sounds, and encourages further research by amateur natural historians.

THEMES:

Oceanic science, impact of external contact, critical assessment of bicultural science.

ROBERTS, MERE

CULTURAL KNOWLEDGE AND TRADITIONS PERTAINING TO THE POLYNESIAN RAT IN AOTEAROA

The origin, dispersal routes and grographic distribution of Polynesian rats (Rattus exulans), known in Aotearoa as the Kiare, has been discussed in relation to current anthropological theories and archaeological evidence (Roberts 1991). In this paper, Maori tribal accounts and cultural cultural traditions pertaining to its arrival and presence in Aotearoa are examined.

SIEGEL, JEFF

TRADITIONAL BRIDGE-BUILDING TECHNOLOGY IN PAPUA NEW GUINEA

One of the most impressive of Papua New Guinea's indigenous technologies is that of bridge-building. With their detailed knowledge of both locally available materials and structural principles, Papua New Guineans have built footbridges of various designs, spanning up to 90 metres. This paper describes the materials used and the different types of bridges: girder, suspension and cantilever (as well as combinations of these types). It gives some historical background showing that such impressive bridges were in existence before European contact. Then it describes in detail particular bridges from different areas of the country, emphasizing materials, construction methods, maintenance and associated linguistic terminology. The paper concludes with a discussion about the appropriateness of this traditional technology in the modern world.

SMITH, A.J.

THE RELEVANCE OF CUSTOMARY MARINE MANAGEMENT PRACTICES TO SUSTAINABLE DEVELOPMENT IN YAP STATE, FSM

Yap State, as with most Pacific island regions, faces the economic reality of having to generate revenue through development projects. Often these development activities, especially in the marine sector, conflict with subsistence activities and adversely impact on coastal habitats and resources. In the past Yap State has been known for its conservative approach to development. More recently, however, escalating economic pressures have seen both the government and private sectors increasingly promoting development. Some questions which need to be asked are: Is the nebulous concept of 'sustainable development' feasible environmentally and culturally in Yap State's situation? Can customary marine management practices be incorporated into development planning and procedures? Should those practices be incorporated? This paper contends that in Yap's circumstances the answers are: possibly; partially; and where practical and beneficial. The approaches taken by Yap State's Marine Resources Management Division - from the documenting of traditional fisheries practices to the development and implementation of the marine resources and coastal management plan - are reviewed. Some key issues that still require consideration are identified, and some of the options to resolve them are examined.

SOTHEESWARAN, S.

TRADITIONAL MEDICINE IN THE PACIFIC ISLANDS - THE SCIENTIFIC EVIDENCE

Traditional systems of medicine, practised in various parts of the world, have served man through the ages to alleviate suffering and disease. Traditional medicine has had a wide measure of support among the peoples of the Pacific Islands and continues to be popular even in this scientific age. The Pacific Region is particularly rich in the resources necessary for the practice of traditional medicine. In the last hundred years, while the modern or the western system of medicine was being introduced to all countries of the Pacific Region, traditional medicine has survived, side by side, and still is the choice of a large number of people, especially in the villages.

How effective is the Pacific traditional system of medicine? About 250 different herbs are used for the treatment of various ailments in Pacific Island villages. Some of these herbs are also used in other traditional systems of medicine in other tropical countries. Scientific evidence is now available for supporting the use of some of these herbs as remedies for disease. The scientific evidence available on some selected herbs is summarised. This evidence and the evidence available on a few other herbs will be discussed in greater detail.

SOTUTU, MARGARET

MAT MAKING - A FIJIAN CRAFT WITH A MATHEMATICAL BASE

The mat is an important item of domestic use, of trade and for social activities. There are two basic materials used - Kuta (swamp flax) and Voivoi (Pandanus).

The use to which the mat is put will determine the size, pattern, colours and design. The formal and repetitive nature of most patterns used in Fijian mats requires a mathematical basis for their design and weaving. Designs are often drawn from regular patterns found in nature - shells, flowers, leaves of certain plants, etc. A range of designs are portrayed and discussed.

SPENCER, MARY

***LANGUAGE, KNOWLEDGE AND DEVELOPMENT* - THE MICRONESIAN WAY**

A review of the status of indigenous and English languages in Micronesia will be presented within the context of present and projected economic development and societal change. The roles of orality and literacy in Micronesian home languages and in English will be described, and a discussion given of the connection of these two ways of knowing, exploring and expressing oneself. Finally, these rather abstract topics will be illustrated with examples from contemporary science education curriculum and instructional approaches, and with some of the practical environmental science issues of the area which are intertwined with language, culture, and ways of knowing.

TAFATU, MORRIS H.

TRADITIONAL AGRICULTURE ON NIUE : *ITS SUBSEQUENT EFFECTS*

This paper will review crop cultivation on Niue and include discussion on the introduction of crop varieties, where the Niuean settlers came from, the 'fragment style' of planting and the reasons for it, cropping times, modern systems versus old, and the likely impacts of modern farming systems on the future productivity of the soils of Niue.

TAHUNIARA, SAMSON

TRADITIONAL AGRICULTURE SKILLS AND PRACTICES IN MARAU - BIRAO, GUADALCANAL

With the transitional period in agricultural production in the Marau-Birao area of Guadalcanal, yam and taro are highly valued root crops. Therefore, in many ways, the most traditional skills and practices used in the production of these crops are well known and conserved by the villager. Although these skills and practices may seem to be so primitive, their fundamental concepts are well accepted in modern agriculture.

This paper aims to discuss:
(i) Shifting cultivation in yam production
(ii) Selection of planting material
(iii) Time of planting
(iv) Preparation of planting material
(v) Cultivation methods and tools used
(vi) Planting method
(vii) Management practices
  (a) Weeding
  (b) Staking
  (c) Pest and weed control
  (d) Maintaining soil fertility

TANIERA, TEMARA

TRADITIONAL FISHERIES IN KIRIBATI : SURVIVAL AND SUSTAINABILITY

The Kiribati people, well known for their skills in fishing and navigation, have in the past understood the sea, the stars and the behaviour of fish. They have developed complex and varied fishing methods and a broad ecological knowledge to ensure their survival in the fragile and vulnerable atoll environment.

This paper will explore and discuss the traditional knowledge and practice of fishing methodologies such as the use of indigenous plants for poisoning fish, fish drives using coconut fronds, fish traps, traditional diving and lures and fishing without hooks. The way in which each gear functions in relation to fish behaviour, lunar cycles and seasonality on the islands of Makin, Nikunau, Nonouti, Marakei, Arorae and Aranuka will be highlighted. Social factors such as taboos, rituals and the traditional conservational practices will also be examined. The significance of birds, fish behaviour, navigation and myths regarding specific species, such as tuna, turtles, flying fish and sharks will be discussed.

The traditional knowledge and practices documented will be analyzed in light of current concern regarding conservation and the management of marine resources for sustainable development.

THAMAN, R.R.

PACIFIC ISLAND AGROFORESTRY : A TRADITIONAL SCIENCE UNDER THREAT

This paper focuses on the nature of traditional Pacific island agroforestry as a 'Science' under threat. Specific focus will be placed on the species composition (taxonomy), horticultural practices, ecological functions and cultural utility of tree and tree-like species. Stress will also be placed on the central importance of trees and of traditional arboracultural knowledge as a basis for sustainable development for Pacific societies. It is argued that traditional agroforestry science has been neglected in the drive for modern development, often in the name of modern aid-funded 'exotic agroforestry' development.

As a result of this benign neglect, sometimes due to blatant disregard or ignorance of existing agroforestry systems on the part of the development community, traditional Pacific island Agroforestry Science is under threat. The paper is based on over 25 years research on agroforestry systems from Papua New Guinea in the east to the smallest atolls of Polynesia and Micronesia.

THAMAN, R.R.

THE ETHNOBOTANY OF PACIFIC ISLAND MANGROVE AND COASTAL STRAND SPECIES : A BASIS FOR CULTURAL AND ECONOMIC SURVIVAL OF PACIFIC PEOPLES

This paper will focus on the vast ethnobotanical knowledge that Pacific peoples have of their coastal and mangrove plant resources. A case study is presented of the utility of 140 widespread or locally important species found from the continental island of New Guinea to the smaller oceanic islands of Micronesia and Polynesia (including Hawaii and Easter Island). The analysis shows that there are over 1000 uses in some 73 use categories, with 128 uses for coconut, and over 20 uses each for 15 species and only 3 species with no recorded uses.

Stress is placed on the scientific basis for many of these uses, which are essentially the same throughout the Pacific. It is argued that this ethnobotanial knowledge and products and functional utility of these widespread coastal and mangrove species constitute a major cultural and economic resource, replacement of which by imported substitutes would either be impossible or extremely expensive.

Given the problem of worldwide recession, deterioration in terms of trade and runaway inflation, it is argued that this ethnobotanical inheritance is critical to the cultural and economic survival of Pacific peoples.

TJAMEI, L.

MINING IN PAPUA NEW GUINEA - A CASE STUDY OF WAU/BULOLO

Gold was discovered in Papua New Guinea around the beginning of this century. In 1920, a gold rush occurred in the Wau/Bulolo region, which attracted a lot of foreigners into the area. Mining activities developed from sluicing, tunnelling, then to dredging, where gold was extracted through amalgamation and eventually an open cut mine, commissioned in 1984, extracting gold by cyanide leaching, (CIP), and ceased operations in 1991. Hundreds of labourers that were hired to work in the mine between 1920 and 1979, owned blocks of land that were leased to them by the company and continued with small scale gold mining. The indigenous people were not only alienated from their land and their culture shattered, but were deprived from participating in any economic development in their own area. This paper will present a case study on the impact of mining on social and ecological environment of the indigenous people of Wau/Bulolo region.

TJAMEI, L. and TIMI, D.

MEDICINAL PLANT SURVEY OF PNG

The Wau Ecology Institute is carrying out a survey of medicinal plants in Papua New Guinea by visiting villages and talking to their medicinal plant experts (medicine men). Information on traditional usage is recorded and the specimens collected are screened for active compounds. The medicinal plant specimens are identified and stored in the Wau Ecology Institute Herbarium and the Medicinal Plant Database. This is to systematize the traditional knowledge gained through the accumulated results of medicinal plant research in Papua New Guinea.

TOLOA, FOUA

TRADITIONAL MARINE RESOUCE USE IN TOKELAU

No abstract available.

TOLOVA'A, A.

AGRICULTURAL AND FISHING PRACTICES IN SAMOA : PAST AND PRESENT

Samoan agriculture dependent on a few crops was labour intensive and relied on simple tools fashioned from wood or stone or, with the coming of the early traders, steel. Food would be prepared in a certain way, divided according to rank and served on hand made materials. Staple crops like taro could be cooked in various ways for the sake of variety. Foods both cooked and uncooked were treated in different ways in order to preserve them.

Many different fishing techniques are still used today. Despite aid grants for nets, moto boats and other fishing paraphenalia, many fishermen still fish by any one of 3 different types of canoe and rely on knowledge from head fishermen as to the times and places in which to catch various types of fish. They tend also to rely more upon weather and sea patterns and phases of the moon than do those in large motor boats (alia).

Samoa's shift from a subsistence to a cash economy and its reliance on aid and advice from overseas as how to develop the country has led to a decline in traditional knowledge and increased reliance on overseas skills and technology. Science has provided labour saving devices and ways of harvesting larger amounts of food sources. There have been many changes both good and bad. This paper focuses on the changes agriculture and fishing practices have undergone in the past few decades.

TURNBULL, DAVID

PACIFIC NAVIGATION AND ITS SIGNIFICANCE IN THE COMPARISON OF SCIENTIFIC TRADITIONS

The paper considers the ways in which all knowledge production systems including modern science are inherently local. The differences between systems lie in the technical devices and social strategies developed to enable the knowledge to move and have appplication beyond the immediate context of its production.

Pacific navigation has developed technologies of representation that unlike modern science rely neither on writing or calculation but are jointly mental and experiential. It has also developed social strategies for its transmission and application which differ from those of modern science at least as far as the received view of science goes. A reappraisal of Pacific navigation provides additional evidence for the recognition that scientific traditions are best seen as bodies of practice rather than as systems of theories. It also has implications for the necessity of recognising the value of local knowledges and the ways in which they can be integrated.

WALSH, RICHARD

TRADITIONAL GAMES ON NORTH PENTECOST, VANUATU

This paper will discuss the different kinds of games, the ages at which different types of games are played, and the time of day they are played. Some of the games will be described and the scientific values of the games outlined. These values include health purposes, enhancing the ability to think quickly and give an answer, learning the names and characteristics of plants in the forest, and the names and features of different kinds of birds.

WALTER, A.

TO KNOW FOR A SURVIVING : THE VANUATU'S FRUIT TREE ARBORICULTURE

Vanuatu's horticulturists use about forty of the country's local fruit tree species, not counting those brought in at the time of the european contact.

Among these, they regularly use about ten species including, for the main ones, the Artocarpus altiis, Barringtonias, Canarium, Evia dulcis and Inocarpus Fagifer. This ancient exploitation has led to a reduction of numerous morphotypes located and often named. So, Vanuatu is a country where the biodiversity of the fruit-tree species is still important and traditionally maintained. Entirely built on an accurate knowledge of nature and its biological systems, fruit-tree arboriculture shows the essential aspects of the systems of subsistence in Vanuatu:

1. On the one hand, these systems are built on diversity.
2. On the other hand, the exploitation of an important number of plants that compose them is based more on an unceasing management of the stock than on a real cultivation.
3. This management is made possible through the intimate knowledge that arboriculturists have of each tree.
4. It results in the satisfaction of wants for a work, upon the whole minimum.

Let's add to this that further attentions assigned to trees would easily lead to an increase of production, the excess being able to be commercialized. However, not to unbalance the system, we still have to establish how and to the prejudice of which sector, the times reserved for the gree works can be increased.

WHISTLER, W.A.

FOLK PLANT NOMENCLATURE IN POLYNESIA

As a general rule, plants with uses or remarkable characteristics have local names, while unused and inconspicuous plants do not. The ancestors of the present day Polynesians gave names for the significant plants in their surroundings, but when these seafaring people discovered and populated new islands, unfamiliar plants were encountered that had to be named. Plant names, like the languages they comprise, are not static, and may change with time. The changes may be effected by completely new names being given to well-known plants, but more frequently they are created by unintentional but fairly predictable linguistic changes that result in the same plant being called by similar names (cognates) on different islands or archipelagos.

One important aspect of ethnobotany is the compilation of checklists of local plant names with their equivalent scientific names. This present paper is based on a comparison of plant names of Samoa, Tonga, the Cook Islands, Tahiti and Hawai'i collected during field work and literature reviews in Polynesia. It is presented from a botanical rather than a linguistic point of view, as an aid to identifying Polynesian plants from their local names.

WIHONGI, DELL

MAORI OWNERSHIP OF THE NATURAL RESOURCES OF AOTEAROA

A consortium of Maori tribes has reasserted the rights of Tino Rangatiratanga over the indigenous plants and animals of New Zealand in a recent claim under the Treaty of Waitangi. They claim that successive Governments have removed the Maori right to manage the indigenous biota and have excluded Maori from sharing the benefits of the commercial development fo flowers, shrubs and trees. They have, in effect, been dispossessed of a major spiritual, cultural and scientific resource and alienated from an important and sustaining economic resource. They are seeking a return to full rights over the fauna and flora of New Zealand and to all the genetic resource contained therein. The implications of this claim for the management of and research into native species will be discussed.

WILLIAMS, ESTHER

BRIDGING THE TRADITIONAL AND THE MODERN : UNDERSTANDING THE ROLE OF INFORMATION IN DEVELOPMENT IN THE SOUTH PACIFIC

The failure to attribute much significance to information in the study of development has its roots in certain attitudes to information largely the consequence of a cultural behaviour which precludes information seeking habits and the continued reliance on traditional ways of knowing. This paper attempts to explore the relationship between information and communication techniques and political and economic development through a brief Pacific history, identifying social changes which have influenced the direction of growth and alteration. It argues that irrespective of the historical era, information and communication play a key role in the process of development and serve the needs of cultures as transmitters of values, of knowledge, of change and stability (through language, conversations, dance, music, storytelling, drama, traditions). With the rapid introduction and use of modern information-communication technologies (telecommunications, computers, broadcasting, television, film) countries of the Pacific are faced with making political and economic choices. Can information-communication technologies be utilised to improve the living standards of the people? Since much of the new technology is developed by industrialised countries will this perpetuate a development dependency on the West? Do countries want to retain the resulting politico-economic linkages with the developed countries? Do we have a choice? Are there alternatives? Total rejection of the new seems unrealistic in the present day when the countries of the region are now part of an international marketing and information suystem promoting increased export industries. But on the other hand if countries do not have the trained manpower and the resources to use and sustain these information-communication technologies then technology is not enough. Working with some theoretical formulations on the subject the paper suggests that a balance in using the traditional and the modern forms of information and communication could ensure a more equitable, manageable and effective distribution of information for development.

WINSLOW, D.J.

INDIGENOUS KNOWLEDGE AND SUSTAINABLE DEVELOPMENT IN THE PACIFIC ISLANDS

Indigenous knowledge is often lost in the process of incorporation into the market economy because it becomes less relevant to the new situation and because it is systematically devalued by the process of specialization that competitive market production involves. This paper argues that if it is to be successful, economic productive activity needs to be fostered within the cultural frameworks of Pacific island societies. If we want to know how to design development practices that are more compatible with indigenous social systems, we need to embrace the world views of Pacific islanders, including their ways of organizing their understandings of their social and material environments.

An essential aspect to the use of natural and human resources is the inclusion of indigenous cultural knowledge into the development paradigm. From an anthropological perspective, incorporating the environment into development involves incorporating the socially constructed environments of Pacific cultures. The experiences of Pacific peoples in managing their natural environment should be an essential element in a more relevant approach to development in the region. However, it is precisely this cultural aspect which is absent from many proposed solutions to the current development challenges facing the Pacific island nations today.

This paper argues for a new "cross-cultural" perspective to development in the Pacific, one which allows for the exchange of ideas and integrates cultural approaches to development needs. It is neither an imposition of foreign cultural models of development, nor is it a refusal to integrate useful concepts and experiences from other socieites. It implies exchange and cross fertilization and would involve a democratic dialogue between donors and recipient communities with an emphasis on new forms of development co-operation that promote participatory development using decentralized channels.

WORKMAN, ANN M.
LINDA CRUZ-ORTZ
DEBBIE QUINATA

SURUHANAS, SURUHANOS YAN I CHECHO NIHA

THE USE OF TRADITIONAL HEALERS ON GUAM

The suruhanas, suruhanos, and hilots, healers and herbalists of Guam, are still practicing the island's traditional medicine. Although the public media and the suruhanas themselves have expressed concern that their healing practice is disappearing in the wake of the modernization process, data from this research study does not support this belief. Secondary analysis of available survey data from three surveys (1978, 1980 and 1985) provides information on the use of traditional healers. About one in four people in the sample seek out the services of traditional healers. An Island wide Health Needs Assessment Survey (1985) illustrated that 1 in 3 people use the services of traditional healers. In addition, Chamorro women, women of childbearing age and young people (less than 35 years of age) show a greater frequency of use of the services of traditional healers than their respective counterparts. Interviews with suruhanas supported an earlier study that noted that most of the clients of the suruhanas are women and children. These interviews also documented that many suruhanas specialize in the treatment of women's problems (problem'a famalo'an). Specific practices of massage and medicinal plants used for the treatment of ailments by 25 suruhanas and suruhanos are presented (two of these are Filipina hilots).

Persistence of the practice of traditional medicine on Guam and use of these services indicate a value for the traditional knowledge and skills of healers. Moreover, interviews with patients and practitioners of traditional medicine indicate that traditional healers provide skills (mainly massage) that Western medical providers do not. Many practitioners feel that their herbal medicines and teas are effective for specific ailments; one practitioner felt his 16 ingredient tea should be analyzed and patented regarding its effectiveness.

Data from this study illustrate the need for more research about the use of indigenous healers among the peoples of the Pacific islands as well as ethnobotanical studies which could provide more information about the properties of indigenous and introduced plants used for medicine.

ANNEXE 3

EXTRAIT DE LA LETTRE D'INFORMATION
DE L'UNIVERSITE DU PACIFIQUE SUD
DU 17 JUILLET 1992

THE UNIVERSITY OF THE SOUTH PACIFIC BULLETIN

VOLUME 25 NUMBER 25 17 JULY 1992

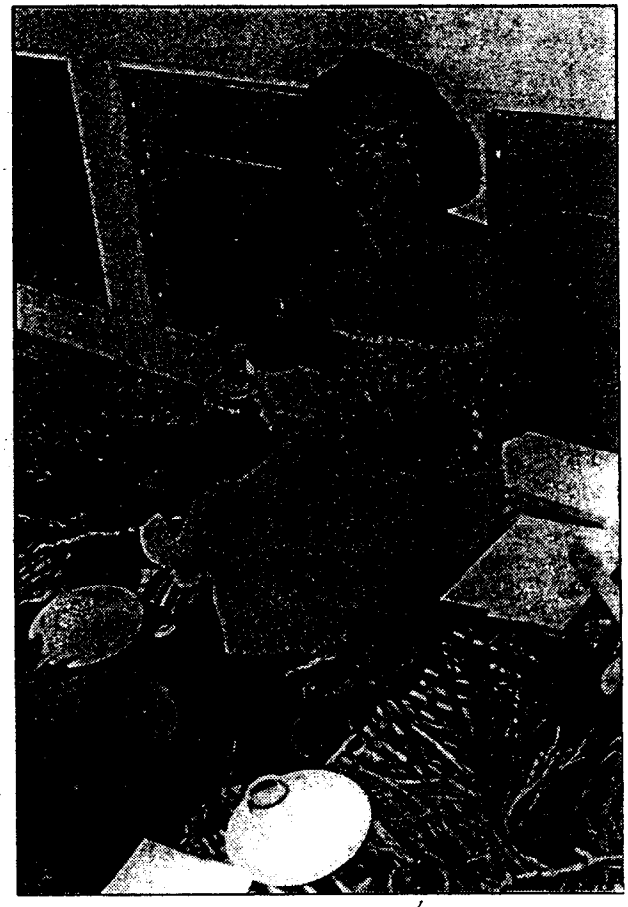
SEEKING TO KEEP TRADITIONAL SCIENCE

Participants at the Science of the Pacific Island Peoples Conference have recommended that traditional knowledge should be included in formal science education in Pacific schools.

They also want traditional knowledge, values and usage to be part of impact studies before development projects are begun.

Research on Pacific Island culture and tradition by people from outside the Region should be done in collaboration with indigenous people, and the materials deposited in the USP Library, they said.

These recommendations were included in a statement issued at the end of the week-long conference held at the University last week, which drew scientists, academics, and indigenous people with traditional knowledge, from throughout the Region and beyond.



Traditional healer, Frider Lombard, giving a demonstration of her skills.

Participants asked the University to introduce courses in applied anthropology, to help graduates understand their own cultures and enable them to assist their communities to deal with changing patterns of living.

They also want the University to give appropriate recognition to indigenous experts by awarding appropriate degrees, and by promoting indigenous curricula and pedagogy in science to stand alongside western curricula and pedagogy.

Participants said that the ownership of indigenous scientific knowledge should be recognised, and that non-indigenous people should stop trying to tell the stories of the indigenous people of the South Pacific.

They recommended that traditional healing be recognised as complementary, rather than opposed, to modern medical science.

In a recommendation to the Government members of the South Pacific Forum, participants asked for the development of a Pacific-wide strategy to cover exploitation of natural and cultural resources. The aim is to secure legal ownership of these resources for native peoples and encourage the flowering of traditional knowledge and culture while repairing and protecting the natural island environment.

Legal agreements concerning the industrial use of substances isolated from plants and animals should require their cultivation and harvesting within the Region, avoiding the laboratory synthesis of these materials.

Collection of wild medicinal plants should be monitored and royalties used to support projects for preserving the environment, the recommendation said.

Other recommendations dealt further with education, training and research in traditional practices and values.

Some urged that workers in agriculture and forestry, in government departments and aid agencies, have training in local techniques and values, especially traditional ecologically benign practices.

Further conferences and workshops should be held, participants recommended, particularly to work on the development of education courses and on ways for institutions to represent the skills, traditions, and knowledge of Pacific peoples. To P2

VALUE IN PACIFIC SCIENTIFIC WAY

The Pacific way of managing resources could be very valuable to the rest of the world, Micronesia scientist, Marjorie Falanruw, suggested at the end of last week's traditional science conference.

The Science of the Pacific Island Peoples Conference attracted academics, scientists and Pacific Islanders with traditional knowledge. They discussed agriculture, marine management, ethnobotany and traditional healing, ethnomathematics, navigation, building, and a range of other traditional science and skills.

They examined what traditional knowledge was still available, whether it was worthwhile trying to preserve, and how it might be included into today's development and education.

Some speakers suggested that Pacific traditional science was not necessarily a different science from that developed in the West. But Pacific Islanders had a different way of looking at things.

In a Press conference, participants from Polynesia, Melanesia and Micronesia said Pacific Islanders had a holistic approach, taking in physical, social and spiritual factors. It added a human side to science.

They expressed gratitude to the University and conference organisers and sponsors for holding a meeting at which traditional science had been acknowledged, and for the first had involved so many Pacific science practitioners.

Mrs Falanruw, a biologist from the Yap Institute of Natural Science, said Pacific societies had a tradition of using

From P1

The recommendations also mentioned specifically work to be done on the cultures and practices of non-indigenous peoples whose beliefs and values had been affected by the Pacific environment. Programmes which promoted the idea of a Pacific identity, not only an island nationality, were to be encouraged.

Marjorie Falanruw, Laurence Tjaimie , YvesLemaitre and Tahitian healer Frider Lombardspeaking at the Press conference.

and sharing resources, rather than the western concept of exploitation of resources for profit.

Social mechanisms were developed to conserve and apportion resources, particularly in situations of dense population and limited resources.

As the world faced a future of population growth and dwindling resources, the Pacific could play a big part in showing a system which was superb at sharing resources.

The use of this approach with an input of knowledge from pure science could be valuable for the whole world.

Ms Falanruw described the Pacific Island approach as "nature intensive technology", quite different from labour intensive technology or the dollar intensive technology of development.

Nature intensive technology could be the way of the future, and it could start right here in the Pacific, she said.

Dr Yves Lemaitre, of ORSTOM, Tahiti, emphasised the capacity of traditional knowledge to adapt to change. This ability to adapt to new developments and environment enabled it to continue to exist.

For instance, a great many people still used herbal medicine and traditional healers. One of the traditional medical practitioners from Tahiti, Ms Frider Lombard, said it was hoped to form an association of traditional healers in other Pacific island countries as had happened in Tahiti.

They could then form a South Pacific organisation which could exchange information, protect medicinal plants, and preserve knowledge of healing skills. They could also seek official recognition as healers.

The healers also passed a resolution asking the organisers of the next South Pacific Festival of Arts to include them in the activities.

Environment Officer Laurence Tjaimei, from the Wau Ecology Institute in Papua New Guinea, said it should be remembered that traditional knowledge had developed over thousands of years. Improvements were time-tested before being accepted into the body of traditional knowledge.

Modern experiments were done over a relatively short period before being generally made available, sometimes to peoples' cost.

Mr Tjaimei said he hoped there would be a possibility of a South Pacific Centre which could work on traditional and pure science combined.

Mrs Falanruw added that if the Pacific Science conference had been held earlier, the recent United Nations Earth Summit to discuss environment issues would have gone much better.

in harmony with the environment. If this was possible, it would allay the threat of modern science to the extinction of traditional science.

Long before the need for marine fisheries conservation was even considered or recognised, Pacific islanders had devised in one form or another the basic means of fisheries conservation which was in use today, Fiji Director of Fisheries, Mr Peni Kunatuba, said in his paper on traditional knowledge and environmental planning.

The finiteness of marine resources among the Pacific islands became obvious long before it did in larger, more resource abundant continents. Survival for these communities had for centuries depended on carefully regulated use of the resources.

While traditional knowledge was fast eroding from today's society, together with the various ethics that underpinned them, it was important for resource managers to understand them, Mr Kunatubu said.

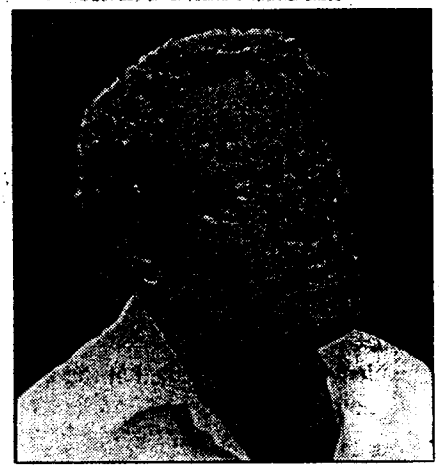
Modern management measures patterned after traditional ones were more likely to be understood and respected by island fishermen. Acceptance of management schemes was especially critical to their success in the Pacific islands. Enforcement of management had to come largely through internal social pressures and influence of communal leaders and traditional hierarchy, he said.

Dr R. Johannes, of CSIRO Division of Fisheries in Tasmania, also emphasised the encyclopedic knowledge of local marine resources in some Pacific Island fishing cultures, much of it unknown to western science. Yet much of it was disappearing into oblivion because of a lack of appreciation of its value by western scientists and also islanders.

Both traditional and western science had their weaknesses, he said, but a blending of their strengths offered an improved approach to marine resource management.

Dr Johannes suggested that by not teaching traditional knowledge in schools, it was an implicit, if not intended, assertion that it was not worth learning. He also commented that in attempts to revitalise Pacific culture, the specialised ecological knowledge islanders developed to ensure their physical survival was given less attention than artistic production.

Dr David Turnbull, of Deakin University, Australia, was another scientist who said that if the essentials of the traditional knowledge system could be



Participant Mr A. Tolova'a, of the O Le Siosiomaga (Environment) Society in Western Samoa.

grafted on to the new social circumstances, there may be, if not a Pacific renaissance, at least cultural survival.

In his paper on Pacific navigation and its significance in the comparison of scientific traditions, he raised the problematic question of ownership of traditional knowledge and the right to talk about it.

He considered systems of Pacific navigation to be fully scientific traditions which had devised ways of moving and assembling their knowledge that were radically different from those of modern science.

There were insights to be gained by establishing a dialogue between knowledge systems in general and modern science and Pacific navigational knowledge in particular.

Professor Lance Hill, of the University of Papua New Guinea, also arguedthat the traditional science knowledge base was extensive and could provide many opportunities for a fruitful synthesis and application between traditional and western knowledge.

The seeming omnipotence of western science and technology was in danger of overshading the traditional knowledge base and its accumulated wisdom. Traditional resource use patterns were breaking down.

Professor Hill said the underlying approaches and values of traditional resource use argued for a recognition of the value of traditional knowledge, wisdom and practice and a closer examination of how they could be brought into harmony with western science and technology.
Science and technology policy had to be directed towards the development of a sustainable society. The resource base existed. Its nature dictated that the realisation of its potential would be heavily dependant on the transfer of overseas technology and technicity.

Esther Batiri Williams, of USP Library, stated that modern and new information technologies must not replace completely the old. Traditional and modern had to by synertized to provide more effective, efficient and equitable dissemination of information.

Reverting totally to traditional ways would not work at this time. But some understanding and respect had to be reached to gain some certainty and confidence.

She said it was time countries of the Region realised that traditional ways of knowing and modes of communication had a significant impact on national development.

Oral traditions and traditional ways of knowing would continue to play an important role in passing information.

The effective traditional information and communication techniques should be developed further and made part of the normal planning process, and the use of drama, dance, poetry, writing and storytelling promoted as an effective means of getting messages to people.

THE SCOPE OF PACIFIC SCIENCE

Almost 70 papers covering traditional agriculture and fishing practices, herbal medicine, navigation, building and decoration, scientific languages and ways of keeping knowledge, the impact of modern science and possibilities for retaining and teaching traditional science were presented at last week's Science of the Pacific Island Peoples conference.

Many of them examined past practices, what was happening to traditional knowledge today, and possibilities for the future.

Mr Atanraoi Baiteke, Secretary-General of the South Pacific Commission, spoke on traditional agriculture in Kiribati. He said traditional food crops would continue to play an important role in the subsistence existence of an I-Kiribati atoll dweller.
But traditional methods needed scientific testing to improve quality, productivity and sustainability. "Family secrets" needed further researching, and the skills and knowledge of experienced local experts should be acknowledged and rewarded.

Mr Baiteke explained there was always a reluctance to reveal and share these secrets because they are considered family heirlooms. But the sharing of traditional and non-traditional information should be encouraged as part of development, so that people on outer islands would have a wider range of economic opportunities for self-sustenance.

At the conference opening, from left, Esther Williams of USP, Dr Harley Mannerof Guam, wife of the Fiji Prime Minister, Mrs Rabuka, Cema Bolabola of the Fiji Centre, and A. Workman of the University of Guam.

He was interested in knowing the nature of the "family secrets" and their applicability to problem-solving and decision-making.

He added that it was important to respect traditional agricultural beliefs and practices that had proven to be productive, even though they lacked scientific basis.

Foua Toloa, Mose Pelasio and Robert Gillett, of the FAO Regional Fishery Support Programme, examined whether traditional marine conservation in Tokelau could be adapted to meet today's situation.

They said the people of Tokelau felt the traditional system had served them well over the centuries, but were aware of the need for modifying it reflect recent changes.

Amongst modifications under consideration was the restoration of authority to a Council of Elders.

It was also believed that biological information from stock assessment studies could be used to enhance traditional management.

It was essential the educated elite be convinced of the positive value of including traditional knowledge instruction within primary and secondary schools, the paper said.

At the conference opening, from left, Professor J.T. Parry, of McGill University, Canada, and Professor R. MacLeod, of the Australian National University.

Traditional health practices in the modern Pacific were examined by Dr Sitaleki Finau, of the South Pacific Commission. He said traditional medicine to Pacific peoples was part of their culture and a way of life. It was dynamic and evolved around the economic, political and cultural life in the society.

The traditional medicine response may not agree with the Western scientific logic and rationality, but it did not necessarily invalidate it as an effective means of controlling and alleviating illnesses, he said.

The ultimate yardstick was the ability of a healing practice to restore functions and enable people to fulfil their obligations to themselves and society with further endangering his physical and social environment.

Often traditional medicine was considered simply as a " handful of herbs, headful of superstitions, old traditions lingering on as redundant, ineffective practices", Dr Finau said. But his paper pointed out some conveniently forgotten advantages of traditional medicine, and weaknesses shared by traditional and modern medicine, often attributed only to traditional medicine. He argued for coexistence rather than integration of the two health sub-systems.

For an appropriate health care system in the modern Pacific, both traditional and western scientific medicine had essential roles. Each could contribute to each other, with traditional medicine focusing on holistic health care, and western scientific medicine specialising in mechanistic organ repairs.

The former needed to be revived as another vehicle for self-reliance and self-determination. The latter, like money, was a new method of doing things which had to be controlled to serve communities' needs, and not vice-versa.

Traditional medicines should be subject to trials of efficacy using scientific study designs, while delivery of government health service used more of the humane and holistic approaches of traditional healers, Dr Finau said.

Ganeshan Rao, of the University Library, with a Fiji Museum display of traditional fishing technology mounted in the Library foyer during the conference. The Pacific Information Centre, based at the Library, produced a Preliminary Bibliography on Traditional Science and Technology in the Pacific Islands for the participants at the conference.

The operation of newly-established National Research Institutes in Aotearoa/New Zealand was described by Dr Margaret Mutu, of Auckland University. Maori directors have been appointed to seven of the Establishment Boards to set up the operations of the institutes.

Dr Mutu said that under the Treaty of Waitangi made with the Maori, the Crown guaranteed, amongst other things, the preserve and develop Maori science, to ensure their research and development needs were adequately served, and give Maori access to science in New Zealand so that both Maori and Western science is used for sustainable development for the nation.

Dr Mutu described some of the conflicts between modern scientists and those with traditional knowledge. She was endeavouring to overcome these problems and build some meaningful and relevant Maori initiatives into the new Institutes. She felt her hardest job would be to get appropriately trained Maori staff in place. This had to begin back in schools and universities, where appropriate teaching programmes for Maori science were not yet in place.

There was no question about the place and role that traditional knowledge and science could play in development, according to Ms Nu'ufou Petaia, of the Western Samoa Education Department. Much information was around, but much was still to be unfolded and recorded.

Because of the advance of modernisation, there was a decline in the use of traditional knowledge and some may even be extinct. Even much of the knowledge in use today was not documented and could be lost if not protected.

Ms Petaia outlined some suggestions for incorporating tradition through educational policies. These included promoting positive attitudes towards traditional knowledge, finding the best ways to teach traditional knowledge, involving local experts, and promoting research and storage of the information.

She asked whether research could prompt innovative inventions to make existing traditional practices more effective, efficient and mass producing, yet keep the technique precise and still

ANNEXE 4

ARTICLES DU DAILY POST DES 9 ET 10 JUILLET

Traditional medicine aids cultural healing too

TRADITIONAL healing and the traditional uses of marine resources were debated by scientists at a session of the Science of the Pacific Island Peoples at the University of the South Pacific.

Traditional medicine had helped Tahitians adapt culturally to their new environment, scientist Yves Lemaitre said, while speaking on Tahiti's traditional medicine and its history.

He said people generally thought traditional medicine never changed. Some beneficial changes were made.

Because most knowledge of past Tahitian traditional medicine came from Europeans, it was difficult to get deep insights into the actual meaning of Tahitian medical ideas, theories, classification of diseases and healing practice.

There were skilful traditional surgeons, who could heal severe wounds, fracture and amputations of limbs. They were also able to operate on the skull, and replace damaged bone with coconut shell.

Contact with Europeans changed the environment in which the Tahitians had lived for centuries, and the organisation of their society which in turn affected their medicine.

Epidemics occurred of diseases which the Tahitians were not resistant to.

In the nineteenth century, Tahitians added various forms of European medicine to their health resources, and developed herbal remedies for imported as well as pre-European diseases.

Social changes disrupted the passing on of medical information, which used to be done by rhythmic recitation.

However, Tahitians were still attached to their herbal remedies, and lacked some confidence in European medicine, especially when it was unable to control epidemics and imported diseases.

Differences in traditional medicine practice now and in the past included the present day reliance on herbal medicines. Surgery is limited to very simple operations such as piercing abscesses. Massage and steam baths are very popular.

At the session on traditional marine practices, Ms Marjorie Falanruw, of the Yap Institute of Natural Science, spoke about traditional fishing on Yap.

She described fishing methods using sticks, poisons, nets, spears and traps. One of the most exciting ways was to capture flying fish with hand nets while standing in sailing canoes. This method was developed into an art, for which young men were trained.

Managements of marine resources which scientists talk about now could not be achieved unless there was some means of managing people's use of these resources, Ms Falanruw said.

On Yap, this management seemed to have been provided by a complicated social hierarchy which put people on about five social levels.

Community fishing was initiated by the chiefs and done by young men. This limited the best fishing gear and techniques to a portion of the population. The networks of ranks and relationships provided checks and balances against one chief exerting total power or influence.

There were also beliefs and rituals which affected fishing activities and influenced even individual fishermen. There were cultural practices which had conservation value, such as collecting limited number of leaves from seagrass, and restricting exploitation of resources in a particular area to allow stocks to build up for some special upcoming event.

Ms Falanruw said fishing pervaded all aspects of the Yap culture, from story to dance to everyday survival and relations between people.

She said the division and apportioning of resources, and limits on access, were sound principles of fisheries management. But the conservation value of other practices was not so clear.

For instance, spawning fish in lagoons were exploited, while fishing in the open ocean where fish were less vulnerable was restricted.

Mama Repa with a flask containing traditional medicine

LOMBARDO Frides holds a up a herb used in making traditional medicine.

D. Post 09.07.92.

'Save traditional knowledge'

DELEGATES at the regional conference on traditional science say there is a need to preserve traditional knowledge because it has a lot to contribute to the development of the South Pacific people.

And there is a growing optimism that the "nature intensive technology" of Pacific islanders could be the way of the future.

A biologist with the Yap Institute of Natural Resources, Margie Falanruw, said yesterday the concept of nature intensive technology was an alternative to the labour intensive technology of the Western world.

"It will be the way of the future and could very well start in the Pacific," she said.

Ms Falanruw said the conference was the first of its kind where traditional input was recognised.

"Science in the Pacific is based on sharing rather than on exploitation for profit," she said, adding it was important that the social mechanisms be conserved.

"If this conference had come sooner there would have been no need for the Earth Summit in Brazil."

Papua New Guinea ecologist, Lawrence Tjamei, noted that Pacific Islanders took a long time to gain knowledge that they had of the benefits of plants and animals.

"In many cases this took hundreds of years and we need to safeguard this knowledge," he said.

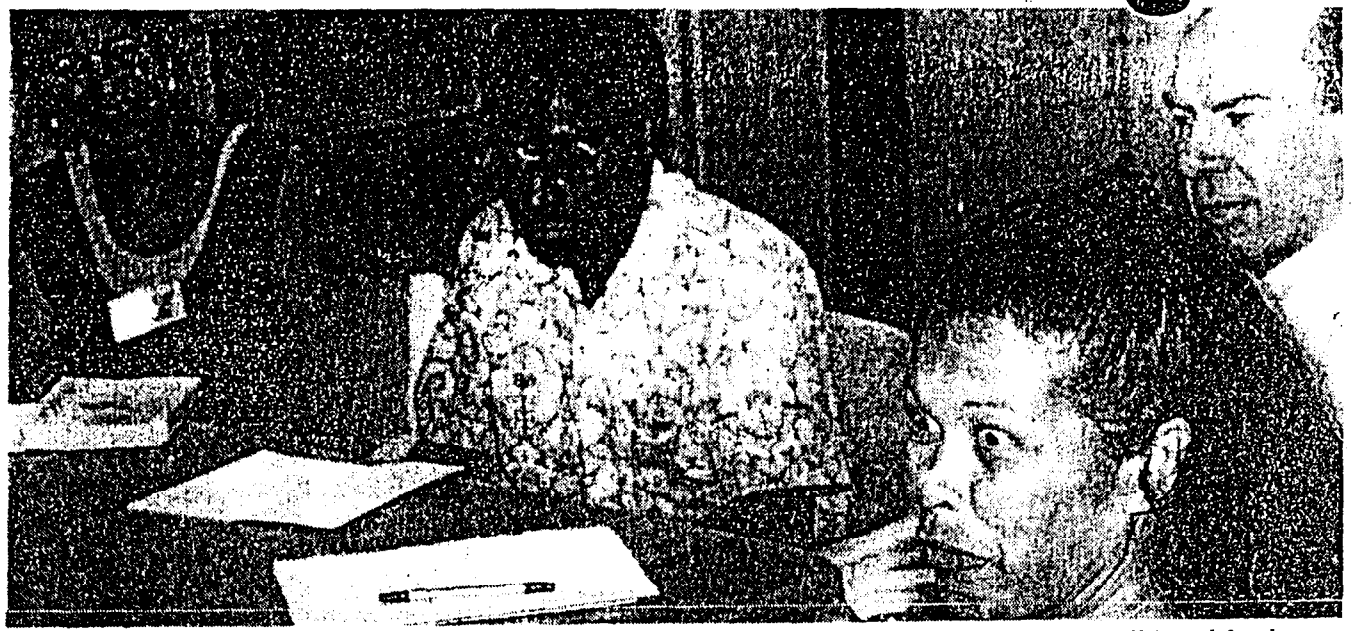
He said there was a need for island governments to realise the importance of the traditional aspect of development and set up a centre where it was given proper recognition.

Tahitian traditional healer, Ms Frider Lombard, said the conference had put them in touch with people interested in all aspects of traditional life and in many ways it had given practitioners an opportunity to "come out of the dark".

She said that while Western scientific study in Tahiti had not given recognition to the work of traditional healers, the idea was becoming accepted.

"In the past five years over 90,000 people in my country visited traditional healers," she said.

She added that while traditional herbs favoured by Fijians were different to those in Tahiti there was always the possibility that they could learn from each other to protect a way of life.



TAHITIAN traditional healer, Ms Frider Lombard (right), emphasises a point on traditional herbs. Looking on are Yap Institute of Natural Resources biologist, Margie Falanruw, ecologist Lawrence Tjamei (PNG) and Tahitian academic, Dr Yves Lemaitre. They have been participating in the conference on traditional sciences, currently underway at the University of the South Pacific. Photo by Sitiveni Moce.

"We can share with open hearts our knowledge," she said.

Tahitian academic Dr Yves Lemaitre said traditional knowledge added a human side to science which incorporated all aspects including the social and the spiritual.

"Traditional science is adaptable and receptive to innovation," he said.

He cited the example of the 19th century when the islands were hit by a series of epidemics, adding that people survived because they were able to establish the surgical values of plants which helped them overcome the new strains.

The delegates expressed the need for the people of the region to work together in this regard and that their governments had a role to play.

There was general agreement that the way of managing resources Pacific-style was better because it was one of sharing rather than exploitation.

D. Post 10.07.92.

THE MODERN VALUE OF TRADITIONAL VILLAGE FISHING IN FISHERIES DEVELOPMENT PLANNING IN THE ISLAND PACIFIC : SOME THOUGHTS ON THE CASE OF VANUATU[8]

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Abstract

The rational use of marine coastal resources is a priority for the Pacific Islands. Emphasis has often been placed on the development of a commercial structured fihing sector based on the specialization of the means of production and fishing techniques for catching a small range of high commercial value species. After ten years and often more of fishing development in the Pacific Islands this policy can be deemed to have been a failure in many cases. The reasons of this failure can be found in the lack of adaptation of the development programmes to the socio-economic and cultural constraints inherent to village communities and to ecological constraints inherent to the Pacific islands coastal marine environment. Contrary to commercial structured fishing, the traditionnal village fishing is completely adapted to these constraints, mainly in terms of production modes and resource management. These different topics are discussed through the exemple of Vanuatu and some propositions are made for the integration of traditional practices in modern coastal resource development programmes.

Key words : coastal environment, commercial fisheries, subsistence activities, traditional fishing, Pacific Islands, Vanuatu.

Introduction

In Vanuatu, as in many nations of the island Pacific, the development of artisanal fishing in coastal waters represents an economic priority. Small scale traditional fishing had been the object of little research at the time when policies for development of artisanal fishing were formulated. The sketchy knowledge that existed on the subject tended to indicate that here was a low-efficiency type of activity, unlikely to generate a lasting increase in fisheries production. To base a fisheries development policy on small scale traditional village fishing appeared as a dangerous utopia. It was assumed that the challenge facing Vanuatu in developing its fisheries sector could only be met through modern structured methods. This challenge consisted of :
- keeping up with the growing demand among both urban and rural populations for protein food of marine origin;
- improving the trade balance for these marine food products by encouraging exports while minimizing imports of canned fish.

The efforts in this domain were directed toward the opening of new fishing grounds by using motorized craft, equipped with reels, to fish the outside face of the reef wall, at depths of 100 to 400 m, well outside of the effective range of traditional paddle-propelled native canoes, and well beyond the narrow band of fringing reefs where, in the absence of a lagoon, fishing has traditionally been practiced.

During the last decade, considerably more information about traditional fishing methods and fishing development has become available. Also, the various fisheries development projects have produced a certain amount of feed-back. Gradually, the preconceived understanding of traditional fishing that the planners had accepted is beginning to broaden. They no longer view this type of activity merely as "an accumulation of gear and techniques in daily use since time out of mind". The

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[8]Paper presented for the Science of Pacific Island Peoples Conference, The University of South Pacific, Suva, July 6 to 10 1992

real picture, they are discovering, is more complex. Increasingly, traditional fishing is viewed as a workable system which brings together a resource, a technology (fishing gear and techniques, fish preserving methods), a population (producers and consumers), its social and cultural environment (traditional lore and customs, rules and regulations), and the inter-relationships based on the exchange of goods and information that can cement all these elements together and balance the system[9]. So far as such a "traditional fishing system" exists,there is also a "commercial artisanal fishing system". Fisheries development can only be analyzed in terms of "system". This systemic approach opens up new vistas for research; it turns out to be particularly useful when we wish to compare traditional versus artisanal types of fishing, and the logic that underlies them. It will enable us to address the following questions :
- a) can a better understanding of the traditional fishing system be of any use in planning fisheries development ?
- b) by a reverse approach, is it possible to modernize this system of traditional fishing in order to turn it into a commercially profitable enterprise ?
In other words, can the development of artisanal fishing be based on traditional fishing ?

We shall only deal here with the first of these questions. For this, we shall make use of the results of a program carried out by ORSTOM in Vanuatu since 1983, in close co-operation with the Fisheries Department, under the name "Artisanal Fishing and Subsistence". We shall consider three major topics :
- the role of traditional fishing in the social, economic and cultural environment of the islands, and the limitations that this context imposes on fisheries development;
- the manner in which the fishing grounds have traditionally been governed;
- the extrapolation of this traditional approach to resource management to modern fishing methods.

1. The role of traditional fishing in the social, economic and cultural environment of the islands.

In traditional society, not only the major social events but the whole of daily life is governed by "custom", a generic term that we shall use and understand as meaning "a network of cultural behaviour patterns in human relationships, aimed at preserving the community structure of the villages and guaranteeing its continued existence". In Vanuatu, the village, foundation of all community life, is first and foremost a society of abundance, as the term is used by Sahlings (1976), where gift giving and exchange assume a primary role. It is also a society which is constantly under threat, from either natural or man-made hazards. During the course of centuries, the structure of the village has had to confront three main dangers : famine, war, and social destabilization. It is as a response to these threats that social, economic and cultural behaviour patterns have evolved to become "custom". Fishing, as other aspects of village life, was conditioned by these influences, among which the two most important ones were a rejection of specialization, and a search for social cohesiveness.

1.1. The rejection of specialization.

When we study the integration of fishing activities within the island social, economic and cultural context, the most noticeable fact is that, whether island-wide or at village level, fishing is never reserved for specialized individuals. For the fisherman, fishing is never the only activity. The majority of the foreshore population engages in fishing, although agriculture is everywhere the primary survival activity, and the main source of income for rural households. This rejection of specialization, and preference for diversified activity, are one of the characteristics of Melanesian society. It can be explained by the diversity of the available food resources, and by a constant preoccupation with minimizing the risk of food shortages. Since the land, in Vanuatu, is remarkably fertile, the risk of chronic long-term famine is insignificant. Occasional short-term food shortages, however, are always a possibility as a result of a period of drought or of a hurricane, with the smallness and relative isolation of the islands compounding the population's vulnerability to such

[9]This concept of "fishing system" has only been used for the last twenty years or so. It was introduced by such pioneers as Rhode Island University's Polnac and Sutinen (1979), or ICLARM's Smith (1979), and became adopted in the South Pacific in the course of regional conferences such as the S.P.C.'s symposium on coastal fishing resources in the Pacific of 1988, or the conference organized in 1989 by ACIAR in Hobart (Campbell, Menz and Waugh, 1989).

accidents. For village communities, adapting to these threats has resulted in a systematic search for diversity, in the methods of food production as well as in the diet itself. This concern for diversity can be observed in the planning of the vegetable gardens, and the great variety of traditional foods consumed. Alongside the usual root crops, we find not only the catch of hunters and fishermen, but a whole range of wild forest nuts, berries, fruit, roots and edible leaves which can bridge the gap in cases of temporary shortages of the basic root crops. In a similar manner, the reef flats and the nearby shallows which make up the traditional fishing grounds have traditionally provided a "larder", little used in normal circumstances, but drawn upon in time of need. During these periods of food shortage, fishing was likely to become intensive, but in time of plenty the stock had time to renew itself, with temporary bans on fishing often helping the process along.

Only in the most extreme geographical situations, where high population density, low agricultural productivity due to shortage of arable space, combined with a favourable marine environment of extensive reef flats, seagrass beds and mangroves, does fishing cease to be simply an alternative food supply in time of need to become the main source of food for the population. Traditional lore concerning the maritime environment, the species that populate it, and the means of catching them, is therefore very rich and occupies a place of choice in the culture of the population of these areas. This maritime culture is quite evident in the traditional nomenclature for fish species in the vernacular languages. It is evident in quantitative terms, with all the reef species having at least one name, and sometimes several, in which case the different names correspond to different growth stages of each specie. It is evident in qualitative terms, with the different species named according to their anatomical characteristics, the type of environment in which they are found, or the type of fishing tackle used in their capture. One finds this type of situation mostly on the small islets located close to the shore of the main islands, where for centuries certain tribes have sought shelter from their "mainland" enemies.

So the burden of history still plays a significant role in the importance of fishing among village activities. This influence can be positive, as we have just seen, when it complements ecological determinism. It can also be negative. To a great extent, the settlement of the coastline is the product of the country's colonial history. Many of the present residents of the foreshore areas came originally from inland villages which they abandoned in the first half of this century, or later still, in order to congregate around the missions, which were all located near the waterfront. Faced with a totally alien environment - the sea - these "bush" people had to invent, in the space of a few decades, a whole new culture adapted to this environment. Very often, the new lore was developed in relationship to the old land-oriented knowledge, and is fragmentary at best : some parts of the marine world and some of its fauna lack names; sometimes one name serves for several species; often the names given to the varieties of fish, squid, shellfish or lobster are taken from those of land plants and animals.

1.2. The search for social cohesiveness

This is a type of adaptation which can lead to social destabilization, which can in turn lead to the kind of boredom and caged-in feeling which affects many small isolated communities. Once this destructuring process is begun, it is very difficult to reverse, since there is no longer the possibility of a collective effort to do so. It then leads inevitably to the break down or the scattering of the community, possibly even to the point of total physical destruction of the population, as was the case with the "Bounty" mutineers once they reached the island of Pitcairn.

There are two major factors that may help prevent this very serious danger. On one hand, there is the complexity of social interaction, some of the most spectacular forms of which are the "pig trade" and the "mat trade" practiced by men and women of northern Vanuatu, the famous land-diving of southern Pentecost, the circumcision rites and the Toka celebration of Tanna. On the other hand, there is the strong cohesive force which comes of a tradition of decision making by consensus. This is an extraordinary tool for resolving disputes. Any potential threat to peace and harmony is first expressed orally before it has a chance of turning into active hostilities. It is submitted to the wisdom of the adult men of the village who will discuss it at great length. Handed around the community in a fascinating pattern of speeches, the threat gradually loses its emotional, and potentially violent, character. It is polished and refined through this process of speech making, until a consensus is reached on the necessity for a particular course of action, or for the discouragement of any action, so as to avoid any danger to the survival of the community.

As far as developing artisanal fisheries is concerned, this preventive process against a possible destructuring of village communities, the result of a long evolution of traditional society, often results in powerful obstacles to innovation. Any initiative on the part of the authorities can only be accepted by village society if it fits in with the collective or personal aspirations of the population, and only as long as it isn't perceived as a threat to community peace and harmony. In this context, individual success is regarded with a great deal of suspicion. The motivation for such an economic success, in other words the desire for personal monetary gain, is seen as contrary to the principle of communal economy which looks askance at individual wealth and would prefer to see any income shared among the entire community, and applied to fostering community survival by adding yet another facet to its range of resources and thus lessening its vulnerability to the outside world.

2. Traditional management of the fishing grounds

2.1. The limitations imposed by the environment

Fishing, in Vanuatu, takes place at the level of the village community. The village provides the triple function of place of residence for the fisherman, centre for the unloading of the catch, and primary consumer market. The location of the fishing grounds is greatly a function of the location of the villages. They are usually situated near the villages, and are limited to the shallower sections of the foreshore : the inter-tidal zone and those areas below the low-water mark that are less than 10 m deep, and to the areas that are sheltered from the prevailing ocean swell. The inter-tidal zone offers the greatest variety to the fisherman. It can be divided into four types of marine environments : the reef flats[10], the beach, the mangrove, the seagrass beds, and the mouths of rivers. Generally speaking, fishing on these types of grounds depends on two parameters : the presence of fish and its abundance 11, and the presence of the fisherman 12. We shall consider each of these two parameters in turn.

2.1.1. Factors affecting the presence of fishermen on the fishing grounds

They are essentially of meteorological nature : the state of the sea and the weather conditions, particularly wind velocity and precipitations. They determine the working conditions on the fishing grounds, and therefore shape the fisherman's decision as to whether or not he will go fishing at all that day. The importance of this factor, of course, will not be the same for the inter-tidal zone as for the more distant fishing grounds accessible only by sea, especially considering that the available craft tend to be small and have poor sea-going qualities13. It is not unusual for a fresh breeze and a well formed sea to prohibit all fishing activities. Apart from the area of actual breakers, the inter-tidal zone is far less affected by the state of the sea. River mouths are often protected by sand spits. Extensive beaches are usually located inside deep bays. Mangroves and seagrass beds invariably grow in fine sediments, a type of bottom only found in areas well sheltered from ocean swells and wind-produced waves. In such areas, the presence or absence of fishermen is far more influenced by variations in conditions of precipitations and temperature.

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10 In Vanuatu, an island group devoid of laggons, coral formations are limited to a narrow band of fringing reefs, offering two very distinct fishing zones : the shallow reef flats and the first few meters of the outer reef slope.

11 By "abundance", we mean the total population numbers of the stock that is fished.

12 Generally speaking, the fisherman will take from the stock a quantity of fish varying with the effort that he has expended and his productivity. This productivity is measured as a fisherman's output per unit of time. It will depend both on the abundance of the resource and on the efficiency of the device used, and can be considered as a ratio between the number of target specimens present on the fishing grounds and the number of such specimens caught.

13 Most of the outings are done in small outrigger dugout canoes propelled with paddles. Their nautical performance is poor, and they are not well suited to offshore travelling. The few sailing canoes are superior in this regard. They are usually larger than the paddled kind, and can reach lengths of up to 10 meters. The greatest concentration of canoes is found on the island of Malekula, with fully one third of the total canoe population of the whole group.

2.1.2. Factors affecting the presence and abundance of fish life

In all the ecosystems of the inter-tidal zone and of the reef slope we find a great variety of ecological niches, and a marked specialization of the species that fill them, both from the point of view of their feeding habits and of their type of habitat. Over 80 species are fished for just in the mangroves and seagrass beds around the Maskelyne islands, off the S-E point of Malekula (David, 1985). During the course of the inventory of Vanuatu's marine resources carried out by A.I.M.S. in 1988 (Donne and Navin; Williams, 1990), 469 species of fish were identified visually, among which Pomacentridae, Scaridae, Labridae, Acanthuridae, Siganidae, Chaetodontidae were, in order of decreasing importance, the most common. Coral reefs are the ecosystem offering the greatest specific diversity. It is not unusual for over a hundred species to be identified within a single hectare of reef. This great specific diversity goes hand in hand with a wide geographical distribution for any one specie. Suitable biotopes for each specie tend to be small in extent - we use the term of microbiotope - , and often unconnected to each other. The sum of all these microbiotopes constitutes a three dimensional mosaic, with each element holding a micro-population composed of a small number of individuals of the same specie. Because, at the scale of the fishing grounds, these micro-populations are scattered far from each other, there tends to be little migration of fish of the same specie between them. Over a short time period, say a few weeks, each micro-population can be considered as an isolated system, evolving according to its own demographic dynamics. Thus to each of these micro-populations corresponds a micro-stock unit, which is the portion of the micro-population that can be caught by the fishermen's equipment.

Considering their small size, these micro-stock units are vulnerable to over-exploitation by the fishermen, and their numbers per hectare are limited. These two factors, together with the great diversity of the fish biomass, constitute some of the primary limitations to fishing activities. To these we can add seasonal variations in the size of fish populations. This is particularly the case for the small pelagic species like mackerels and sardines (Grandperrin et al., 1982). For the fisherman, there is no way around these limitations ; he must inevitably take them into account in his fishing strategy and his choice of techniques.

2.2. Adaptation of the fishermen to the limitations imposed by the environment

2.2.1. General considerations

There are three basic concepts that can be used to describe the type of adaptation to the limitations [14] imposed by the meteorological and ecological situation that can affect traditional fishing :
- diversity of techniques and strategies used, whether in terms of species targeted or of biotopes worked;
- low cost of the means put to use, whether in terms of hours spent, of energy, or of cash expense;
- control of the access to the resource.

A total of seven main types of adaptation, based on the above concepts, can be identified (Fig. 1). They fall under two categories. On one hand we see "primary adaptation" to the limitations imposed by the environment, such as controlled access to the resource as an answer to vulnerability to over-exploitation. On the other hand, we have "secondary" forms of adaptation, derived from the primary responses. In this way, diversification of the equipment is arrived at as a result of the diversification of the target species, itself a primary response to the limitations of the resource. Among these secondary forms of adaptation, we shall make a further distinction between "secondary adaptations of the first order", which are the immediate result of primary adaptation, "secondary adaptations of the second order", which are themselves the result of a secondary adaptation of the first order (in this manner, the low-cost of the means of production is seen as a result of the diversification of these means of production, with this diversity itself being an adaptation to the diversity of target species), and, similarly, "secondary adaptations of the third order", such as the low-cost of the fishing outings, derived from the low-cost of the means of production (see Fig. 1).

[14] These are basically four in number : the great diversity of the stock, the low abundance of monospecific micro-stock units, the seasonal fluctuations affecting these stocks, and the extreme vulnerability of these stocks to over-exploitation.

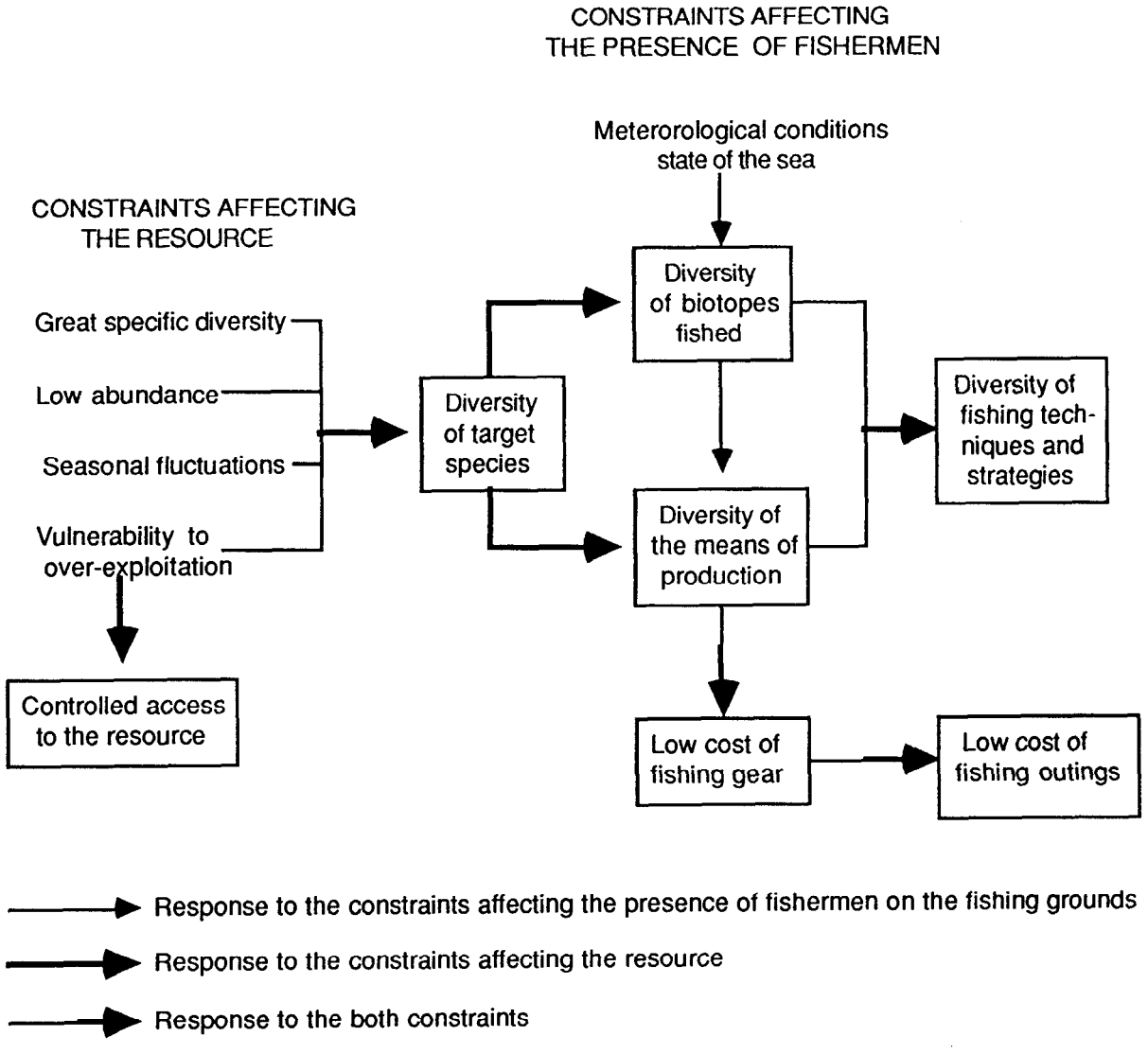

Figure 1. Adaptations of the traditionnal village fisheries in Vanuatu to the environmental constraints

Among the forms of primary adaptation, we shall make the distinction between responses to limitations affecting the fishermen, and responses to those affecting the resource, such as the diversification of target species that we have just mentioned. It isn't practical to make this distinction for secondary adaptations : while there exist exclusive secondary adaptations to limitations affecting the resource (for instance diversification of the means of production), there are no exclusive secondary adaptations to the limitations affecting the fishermen. On the other hand, there exist secondary adaptations that are responses to limitations on both fishermen and resource, as for instance the diversification of techniques and strategies, or the low cost of fishing operations.

We should also note that certain forms of secondary adaptation resulting from limitations affecting the resource are at the same time primary adaptations to limitations affecting the fisherman. In this way, the diversity of the biotopes that are fished is both a primary adaptation to unfavourable sea and meteorological conditions, and a secondary adaptation to the diversity of target species, itself a primary adaptation to the limitations affecting the resource. This same diversification of target species can also be seen as an secondary adaptation to the limitations affecting the presence of fishermen on the fishing grounds resulting from the primary adaptation to these limitations represented by the diversification of the biotopes put to use.

2.2.2. Diversification of target species and biotopes fished

This represents the major adaptation of traditional fishing to the four main types of limitations affecting the resource. It relies on the great specific diversity of the stock, and provides a logical response to the low abundance of monospecific micro-stock units that make it up[15], and to the seasonal variations that affect it. In this way, when one or more species become scarce, whether from such natural causes as seasonal fluctuations or from over-exploitation, it becomes possible to shift the emphasis of the fishing effort to such other species as have remained plentiful on the fishing grounds. A Vanuatu-wide 1984 survey of 943 fishing outings showed that over 100 species of fish, belonging to 32 families, were commonly caught by village fishermen.

Such a diversity of target species can only be achieved by fishing several different biotopes. This diversity of fished biotopes is common to the majority of artisanal fishermen worldwide when we look at their operations over the course of a whole year. However, if we consider only a single outing, we find this diversity to be far more unusual. We believe this to be one of the special characteristics of traditional fishing in Vanuatu. There, it is usual for a fisherman, during the course of a single fishing outing, to try his luck on the reef flat, on the first few meters of the outer reef wall, and within the different biotope of beach, mangrove and river mouth. This habit of sampling different biotopes offers the best insurance against variations in meteorological conditions and in sea state. When rough seas forbid venturing offshore in canoes, it is always possible to shelter in the mouths of creeks, in protected bays or among the mangroves, and to carry on fishing for one or more target species depending on their abundance and diversity.

2.2.3. Diversification of the means of production, and of fishing technique and strategy

The diversification of the means of production is reflected essentially in the diversity of the fishing gear. A wide range of implements is used. The majority are of the throwing or casting type (hand-spears, bow-and-arrow, casting nets, underwater spear guns), or of the passive type (traps, gill-nets, holding pens). This equipment is usually the property of the fisherman. Whereas the materials used in the construction of the devices are usually of industrial origin, the design remains mostly traditional. Generally, they are small in size.

Devices that are specifically made for fishing

Of all fish-catching devices, hand-held lines are the most versatile. They can be used for trolling or for bottom fishing, either from boats or while wading on the outer edge of the shallow coral flats. Given this versatility, it isn't surprising that they should be the most commonly found type of fishing gear. They account for 55% of all fish catching equipment. Each household owns an average of 2.5 such hand-lines. Their design is very simple : usually, a fish hook is attached to the end of a

[15]It would be risky for the fisherman to target his efforts on a single specie when the likelihood of coming across fish of the target specie is low.

length of nylon line, which is then wound around a coca-cola bottle. When used for fishing on or just off the bottom, the line is weighted with a stone, or an old flashlight battery.

Line fishing is hardly a traditional fishing technique in Vanuatu, and eye-witness accounts, such as that of J. Garanger (1972, p.109), show that twenty years ago line fishing was seldom practiced16. The Banks and Torres island groups in the North of the country are an exception to this. At the close of the last century, the reverend Codrington (1891) noted the manufacture of large numbers of mother-of-pearl and tortoise shell fish-hooks, and of the common use of surface lines for the catching of flying fish. Apart from the Banks and Torres groups, then, the hand-held line can be considered as a modern development in Vanuatu, and its use began to spread only recently with the availability of monofilament nylon line and steel fish-hooks in the small general stores of the coastal villages.

From 25 to 30% of fish catching equipment still consists of traditional implements. These are hand spears, bows and arrows, and fish traps. Hand spears and bows are used exclusively by men and youths, either on foot, or from canoes. The use of fish traps is reserved for women and girl-children. Spears are the most common type of traditional implement. They represent 20% of all fish-catching equipment, and 74% of traditional equipment. The most frequently seen model is made of a long bamboo shaft, with four wooden spikes, ten to twenty centimeter long, lashed at the end. Over the last few years, the wooden spikes have been getting replaced by sharpened steel ones. Fishing is done on foot, along the intertidal coral flats or tidal channels through marine sea-grass, or from canoes among the edges of mangrove swamps, over the reef at high tide, or, less frequently, offshore in deep water. Alongside these small spears, of which every household owns from one to three, are longer spears designed for catching turtles. These are made of a shaft of heavy hardwood, fitted at the end with a sharpened metal tip. They are tied to a large plastic float with a few meters of rope, so that the flight of the harpooned turtle may be easily followed after the animal has dived.

Still widely used in certain islands, such as Malekula, the bow and arrow technique has completely disappeared in other places. This represents 5% of the fish-catching equipment used in Vanuatu. Its use is exclusively reserved to the men. Generally, bow-and-arrow fishermen are either older men, faithful to the old techniques, or children and youths, for whom the bow is more of a toy to show off their skill than a serious fishing implement. In either case, the bow is usually used while wading on the coral flats. Fish traps as a fish-catching device are disappearing. They are made of flexible sticks, and their use is by now limited to catching small fish on the coastal reef flats, particularly in tidal pools, and at the mouths of rivers.

Although it has been shown that their use was traditional in the Banks and Torres groups for co-operative fishing ventures, and Father Doucere (1922) noted their widespread use in many parts of the country, gill-nets must be classified as modern equipment. The nets currently in use, the materials they are made of, and the fishing methods and strategies used, have very little in common with the traditional nets and methods of the beginning of the century. The most commonly used type of net is imported from Asia. Typically, it is roughly 10 meters long, 1.5 to 2 meters deep, and is made of synthetic fibres. Considering its high price compared to the disposable income of the average rural household, the purchase of a gill-net represents a major investment, one that can only be contemplated by the wealthier households. Thus it is not surprising that gill-nets currently represent only 4% of all fishing equipment, and that the majority of them are found near the urban centres. Fishing with gill-nets is usually considered a man's task. They are used more often by fishermen on foot than during outings with boats. The device is laid parallel to the direction of the flow, in the breakers along the beach, at the edge of mangroves, or where the fringing reef drops off. This is an active type of fishing, the fisherman remaining near his net, ready to haul it in as soon as an interesting catch has been sighted.

Trickier to handle, casting nets are less common than gill-nets, although their purchase price might be up to 40% lower. They represent only 1% of all fishing equipment. Half of the casting nets are found on the island of Efate and the nearby islets. Exclusively reserved for men, they are used on a rising or a falling tide while wading on the coral flats or at the line of breakers off the beach.

16 For a discussion of traditional fishing techniques, the reader would be well advised to consult the work of Anell (1955).

Whereas the spread of gill-nets through the fishing community took place in a gradual manner, underwater spearfishing caught on rapidly. At this time, one third of all households engaged in fishing own a spear gun, and spear guns represent 10% of all fish-catching equipment. Alongside the standard western-made spear guns are found some of local manufacture, very rudimentary in design, made up of a metal spear and of a rubber launcher attached to a piece of wood, 10 cm long, against which rests the end of the spear. Snorkels are rare, but all divers use face masks. Spear fishing with a gun is usually reserved for the men, but diving in shallow water for the purpose of gathering shellfish (or, more rarely, crayfish) may be undertaken by women, as long as this is done for subsistence reasons only. This explains why diving to gather trocas and large sea snails, both valuable commercial pearl shells, is still the prerogative of the men.

Fish holding pens are the least numerous of the modern devices. There exist only a few dozens, most of them on Efate. The introduction of this type of equipment in Vanuatu is recent, and can be attributed to immigrants from French Polynesia. A holding pen consists of roughly fifty meters of "chicken wire", about 1.5 meters high, stretched on metal uprights stuck in the coral of the fringing reef, or on wooden poles driven into the mud. The wire mesh being subject to rapid corrosion, this equipment has but a short life span. These Polynesian fish holding pens are an improvement on the older traditional type of traps, which consisted of blocks of coral arranged in circular patterns on the coral flats, and designed to retain water as the tide ebbed. It doesn't appear that this older type is still in use anywhere, but the remains of some can still be seen, such as the ones mentioned by J. Barreau (1956) in Aliak, on the West coast of the island of Pentecost, and which were still visible in 1985. These ruins are only a few centimeters high, and are only able to trap very small fish. This is more in the nature of an amusement for children than a genuine subsistence activity. Another type of construction consists of piling up stones in a tidal pool. At the scale of the pool, the construction acts as a miniature artificial reef. On a rising tide, it attracts small fish which enter it for protection, and they are trapped there at low tide. The pile of stones is then dismantled, and the fish gathered. This type of fishing has also been mostly abandoned, and is only occasionally practiced by women and children.

Multi-purpose equipment and one-time implements

Alongside implements which can be unmistakably classified as fishing gear, since the catching of sea-life is their main function, we find some devices which can have more than one purpose, and for which fishing is but one of many uses. The most common among these is the ubiquitous bush knife, one of which at the very least can always be found in every rural household. Fishermen often use them to "cut" fish which have been trapped by the ebb in tidal pools, or while wading on the coral flats at night. The bush knife is wielded as readily by women and youths as by men. Less common, and mostly reserved for the women, are steel rods used for catching octopus at low tide, and for looking for shells under rocks. These are often spears from a native spear-gun, when the household owns such a device.

Apart from the strictly speaking fishing gear, and the multi-purpose tools used in fishing, there is a third category of fishing tools which consists of devices used only once : among others, we will note principally coconut fronds and vegetable poisons. Coconut fronds are used as nets for community fishing. Once woven, they can be assembled to form rude nets, ten or so meters long, often used in the Banks islands to drive small fish toward the beach in narrow bays, where they are then killed with bow and arrow, hand spears, or bush knives. Vegetable poisons are derived from the leaves of the foreshore shrubs barringtonias and derrys, which are either bruised, pounded or shredded before being placed in pools where they poison the whole of the fauna. Very popular during the first half of this century, particularly during the few years following World War Two, the use of explosives - the one-time device par excellence - seems to have mostly disappeared by now, partly on account of the difficulty of supply, and partly because of the government's efforts to ban the practice.

The diversity of the means of production follows logically from the diversity of the target species used in traditional village fishing. Each type of fishing implement is effective only on a small number of species. The vulnerability of any one specie of fish to a particular device depends at the same time on :

- its morphology, particularly its shape, its size, and the size of its mouth 17;
- its feeding habits 18;
- its type of habitat : beach, holes in the coral, vicinity of coral heads,...;
- the depth it lives at 19.

To limit fishing gear to one type of implement would amount to ignoring a large number of edible species which cannot be caught with this particular instrument but which could easily be caught by other means. This preoccupation with adaptation to the fluctuations in abundance and vulnerability of the desired species forces the fisherman to own several kinds of tackle, and especially to use more than one during the course of a single outing, which is more remarkable. In the 1984 survey mentioned earlier, during the 943 fishing trips recorded, 10 types of fishing devices were identified, with 7 being used either by themselves or in conjunction with one or more other instruments during the course of the same outing, and 3 used only together with other devices. The survey recorded 22 methods using two devices together, nine using three, and one using four.

The diversity of the means of production is not simply the direct result of the diversity of target species, but it is also the result of a concern on the part of the fishermen to draw from the greatest possible number of different biotopes, in order to minimize the risk of finding themselves unable to go fishing on account of meteorological conditions or state of the sea (Fig. 1). On one hand, certain types of fishing implements are better suited to certain specific biotopes; on the other hand, according to fluctuations in the environment, it can be a useful to be able to choose between several types of implements in order to take best advantage of a given biotope. In this manner, underwater diving can prove to be a most efficient way to fish the first few meters of the outer reef wall when the water is clear, while that particular technique may be totally useless on the days when the water is muddy, at which time line fishing can become a valid alternative.

By "fishing techniques", we refer here to the use of a fishing device. For any one type of device, there may exist several techniques, varying according to whether the fisherman is or not using a boat, or according to the biotope being fished. Based on this definition, 97 fishing techniques, making use of 39 types of devices or combinations of devices, were identified during the course of the 943 fishing outings of our survey. The biotopes having been deliberately classified into only three categories (outer reef wall and beyond; reef flats, kelp beds and beaches; river mouths and mangroves), this number of identified techniques is grossly underestimated, as the fishermen themselves recognize a much greater number of workable biotopes for their fishing strategies.

2.2.4. The low cost of fishing gear and of fishing outings

It is easy to assess the cost of items of fishing gear when they are manufactured products, bought for cash : the cost is then equal to the market value of the product. This assessment becomes more difficult when we deal with devices made either by the fisherman himself or by members of his family. The "cost" of the device is then determined by the amount of time spent in its fabrication. In either case, the cost of the equipment used in traditional fishing in Vanuatu is invariably low. Generally speaking, the same holds true for housing, agriculture or cattle raising. This is an inherent characteristic of "abundance" societies (Sahlings, 1976). The design of the devices is so simple, and the materials used so common, that their construction is both inexpensive and quick. This allows frequent replacement of the gear. We can add to this the fact that fishing only plays a secondary role within traditional Melanesian society in Vanuatu. Social prestige is acquired by other means. It wouldn't therefore be logical to invest money or effort in sophisticated fishing gear, particularly since the productivity of fishing outings is rather low in any case, from a few hundred grams to 3 or 4 kg at best. When we think of manufactured (= bought) equipment, we must remember that the cash income of rural families is very low in Vanuatu, so that the purchase of fishing equipment represents a low priority in a family's budget, and will only be considered if this equipment is inexpensive.

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17 It would hardly be practical to attempt to catch sardines with a spear gun, on account of the small size of the fish. A net would be far more appropriate.

18 There would be no point in hoping to catch a herbivorous fish on a hook baited with shellfish, or in fishing by day for a specie that feeds only at night.

19 Trying to capture deep-bottom fish by deploying a vertical float-suspended net would be unrealistic. Diving with a spear gun, or fishing with a hand-line, would make far more sense.

The same logic applies to the cost of the fishing outing, which goes some way toward explaining why village fishing grounds tend to be of limited size. Indeed, why expend a lot of energy and time in order to fish distant areas, which, in any case, are unlikely to yield a richer catch than the ones nearer the village, provided these village fishing grounds are husbanded with care. Here, we begin to see one of the fundamental aspects of the logic that underlies traditional societies : maximizing the productivity of labour (in this case, the number of fish caught in a given period), rather than maximizing the output of the natural environment, which here would mean the number of fish caught for a given surface area of fishing grounds. From the point of view of the fisherman, it is more logical to limit his fishing outings to the vicinity of the village, where, for a number of short trips of duration T, he can hope to catch a number X of fish, rather than to prospect more distant areas, where journeys of duration 3T will only result in a production of 2 or 3X.

2.2.5. Control of the access to the resource

Given the small size of the fishing grounds, and the sensitivity of the resource to over-intensive harvesting, traditional fishing has often to face the threat of over-exploitation when serious fishing[20] is maintained over long periods of time. For fishing to remain viable, the activity must be regulated. The traditional solution to this situation is to control access to the resource by means of temporary bans on fishing enforced on the whole village community which owns the fishing grounds. These bans, or taboos, are placed by the community chief during a special "custom" ceremony, and are usually made evident by some sign understood by all, such as a pole stuck in the reef flats. These taboos can be total, in which case they apply to the whole of the useable species, or partial and apply only to the most threatened species. The duration of such interdictions can be highly variable, but it is seldom less than six months and rarely more than three years. Any community member breaking the taboo is liable to a heavy "custom" fine, a deterrent sufficient to make taboo breaking a rare occurrence. The effectiveness of such taboos rests on the fact that the fishing territory is open to the flow of eggs and larvae of fish, invertebrates and shellfish coming from outside. This allows a gradual repopulation of the habitats depleted by over-fishing. This potential for regeneration of fishing stocks, characteristic of the reef environment, is a great asset and offsets its high vulnerability to over-intensive fishing. All species do not have the same potential for repopulating the depleted habitats. Species whose larvae develop in open waters have an advantage when compared with those whose larval stage is mostly spent attached to the bottom. The former, drifting with tides and currents, can cover great distances; the latter can only spread over a small area, and thus can only gradually, step by step, repopulate the depleted habitats from their laying grounds.

Once the temporary ban on fishing is lifted, all members of the village community regain access to the fishing grounds. However, this access remains subject to the permission of the local chief for any outsider to the community. The formality of these authorizations will depend on the legal status of the land to which the fishing grounds belong. The fishing grounds are considered part of village territory, and as such they are viewed with the same feeling of ownership and identification as the land part of the territory21. Where the fishing grounds are thus perceived as an extension of the cultivated gardens within the village territory, access to outsiders is very strictly regulated. This access is usually reserved for groups considered as allies. We may encounter two types of situations : one case would be a neighboring group who has placed its own fishing grounds under temporary taboo and requests permission to share the village's fishing resources for the duration of the ban, another case could be an inland group, holder of a landlocked territory, wishing occasional access to the ocean. In both cases, the granting of a fishing-rights agreement will be the occasion of a traditional ceremony to cement the alliance between the two groups.

When the fishing grounds are perceived as part of the non-cultivated portion of the territory, their have a lesser status, and the granting of access to outsiders follows a less formal procedure. In certain

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[20]The yearly number of fishing outings per hectare of useable fishing grounds is a good way of measuring the intensity of the fishing activity. Where this figure is not available, the density of fishermen on the fishing grounds can also be used.

21 In the island Pacific, as was shown by Bonnemaison (1981 and 1986), the notions of territory and of ethnic identity are very much interweaved. "The sense of ethnic identity is based on, and finds its security in, the depth of its rooting to the land and the degree of intimacy it enjoys with a space that it structures, orders and focuses according to its own aspirations and symbolic representations, in other words its territory."

villages, this access may even be free to all, at least this is claimed by members of the community22. The inalienable relationship between the land and its inhabitants runs so deep in Vanuatu that it would seem extraordinarily for anyone wishing to fish in a territory not his own to fail to inform the rightful owners and seek their permission to do so. Thus, even in cases where outsider access to the resource isn't governed by a set of formal traditional rules and procedures, it is still subject to the traditional usage regarding land-rights common to all Vanuatu, a body of customs which will be implicitly respected.

3. Traditional fishing and the development of artisanal fishing

3.1. Are the two approaches contradictory ?

After this brief survey of the role of traditional fishing in the social, economic and cultural life of the islands, and the ways by which the resources of the fishing grounds are husbanded, we now have some tangible elements on which we can base an inquiry on how traditional fishing can be used as a foundation for artisanal fishing development.

Only ten years ago, simply to ask the question would have seemed bizarre. As far as development planners were concerned, the only model worth following was that of western artisanal fisheries, who, in the space of fifty years, have progressed from small operations close inshore (day outings using small craft of 4 to 10 meters in length) to deep-sea operations using vessels of over 30 meters capable of staying at sea several weeks. The specialists used to consider this type of evolution as universal, and nations could be classified for modernity by their progress along this path of development. The islands of the Pacific were rated as the bottom rung of this ladder, and thus the potential for improvement seemed all the greater, provided these countries were given technical and financial assistance by the international funding organizations. The speed with which artisanal fishing was going to develop was understood to be simply a function of the magnitude of this assistance. Given this type of reasoning, what role could traditional (i.e. archaic, practically prehistoric) fishing possibly have, with its ignorance of motorized craft or of refrigeration and its reliance on devices as hopelessly primitive as spears or bows and arrows ?

Since then, experience has shown that the Pacific was not Europe or America, and that models that worked very well in western countries were not necessarily adapted to the islands of Oceania. In spite of the millions of US dollars spent on development, and of the goodwill and dedication of the fisheries experts and master-fishermen whose task it was to introduce, then to help spread, modern fishing techniques among the village communities of the Pacific, the results are far from spectacular. The production of modern artisanal fishing, subsidized by governments, is growing at a very slow pace, and remains to date greatly inferior to that of unsubsidized and unassisted traditional fishing23.

The failure of current coastal fishing development policies is not due to chance. It can be explained through the fact that the development model followed is poorly adapted both to the physical limitations inherent to the Pacific island ecosystems, and to social, economic and cultural limitations inherent to traditional village society (David, 1990a and 1991). The first type of limitations cannot be overcome; traditional fishing has adapted to them. If artisanal fishing is to be developed, it too will have to adapt to them if it wishes to succeed. The second type of limitations are very difficult to bypass or overcome. Tradition and culture are still very much alive in rural areas, they are the product of the relationships that society has developed with its ecological environment, and they completely shape this society. No fisheries development project will be able to place itself outside of this context, or be able to afford to ignore it. Thus, any innovation proposed by the development planners will only have a chance of becoming truly adopted if it can fit in with the personal and community aspirations of the "society in need of

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22 The reader who might wish to pursue the subject of the various forms of status of the fishing grounds in Vanuatu will be well advised to consult the thesis of B. Vienne (1984) concerning the Banks Islands, particularly chapter 4 : "La Maitrise de la Nature".

23 Thus, in Vanuatu, after ten years of Village Development Fisheries Programme, the annual catch of fish has never exceeded the 200 tonne mark. Traditional fishing, meanwhile, supplies between 1500 and 2000 tonnes per year (David, 1991).

development". As Johannes (1990) rightly points out, these aspirations usually do not include the increase of the fishing output, the search for maximum balanced catch, or optimum production in economic terms. Yet these are the primary goals usually assigned to any fisheries development policy. So it is essential to reshape the contents of fisheries development planning in order that it be better adapted to this social-economic-cultural context, and, at long last, have a chance of success. The only model currently available is that of traditional fishing, and thus the success of any fisheries development project will depend on using it as a guiding light. This, of course, doesn't mean limiting fisheries development to ancestral techniques or equipment, but rather respecting the philosophy through which traditional fishing has adapted to the limitations imposed by the physical environment, and the spirit in which it has made itself a part of the social and cultural context of island village society.

There is of course another possible approach, which is that of urging the island populations toward a complete divorce from the traditional ways and customs. As territory, culture and racial identity are inseparably linked in traditional society, this requires the "breaking" of the logic which ties these three fundamental elements together. Migration toward the urban centres is the best way to achieve this. A long-term separation from the land of origin, and the daily contacts with other ethnic groups lead to a gradual break down of the sense of identity with the territory. As this identification is the keystone of the triad "culture-territory-racial identity", its loss leads to the loss of the original culture. This traditional culture, powerfully associated with the territory, gives way to the culture of the new habitat - the city -, a culture that is replete with such western values as efficiency, profit motive, and intensification of productivity, all for the sake of a type of development that is reduced to its single dimension of economic growth.

We ourselves refuse to be a part of this kind of logic of cultural destruction, and would much rather see the forging of links between tradition and modernism. We reject an approach that would only retain of modernism its most brutal aspects, the ones that prevail when the only criterion is the constant upgrading of economic indexes.

3.2. The contribution of traditional fishing in resource management

Of all the possible aspects of traditional fishing which can inspire development planners, this is the one which shows most promise according to the planners. It was the subject of a major part of the debates during the workshop on the social and economic aspects of fisheries organized by the South Pacific Commission during the 1991 Regional Technical Meeting on Fisheries. Ruddle brought together the various elements with great clarity during the International Conference on the Economy of Fisheries Management in the Pacific Islands, held in Hobbart in 1989 under the sponsorship of A.C.I.A.R. . The interest in this subject has a lot to do with the difficulties that the various national Fisheries Departments experience in trying to implement and enforce regulations regarding the preservation and management of stocks when faced with territories as vast as the island groups of the Pacific. They see this form of decentralized resource management at village level as far more effective, backed as it is by traditional chiefly authority and the participation of the fishermen. They see it as an attractive solution to the problems they face at the national level. As far as we are concerned, we only partially share this enthusiasm. To work, village level resource management depends on a very important requirement : the continued respect for the traditional system of authority. This is still usually the case, as long as fishing is limited to the traditional activity for self-subsistence, or to a small-scale commercial pursuit with only the village, and perhaps the neighboring villages, for a market. On the other hand, once the resource has to supply demand at the national and possibly international scale, there is no guarantee that "custom" authority will be powerful enough to enforce respect of the necessary temporary fishing taboos, or even that this authority will have any desire to impose such bans. Once fishing is capable of providing a substantial income to the majority of families, it becomes difficult, in times of tight money, to deny this "manna" to the village community, even if means putting the fish stock in jeopardy. This situation occurs often in the case of trochus shell and of beche-de-mer. With world-wide supply of these products beginning to dry up, and demand remaining high, the prices paid to the producer are usually very attractive. The traditional economic system isn't geared to resist to such pressures. So it isn't unusual for fishermen to succumb to the lure of quick and easy money, and for concern for the survival of the resource to assume a secondary role.

In this type of situation, it is essential that the State be able to control fishing activities. With the decline of traditional authority, too often helpless against the high stakes involved, the State is the only institution who can counteract the logic of the profit motive generated by international demand, by enforcing a regulation of supply at the national level. For this purpose, neither the quota system, nor a system of licensing, are satisfactory. As is so often the case, the simplest solution is the best. It is based on acceptance at the national level of a minimum size for specimens caught, in some cases a maximum size. The Customs Department can then monitor compliance to the size regulations at the point of export; any undersize product is immediately destroyed, and a heavy fine levied against the exporter. In this way, demand will always be for legal sizes, thus allowing the stock the possibility of replenishing itself. In cases where the product undergoes a manufacturing process prior to exporting, such as for trocca shell, monitoring for legal sizes will be done at the place of fabrication. A company that refuses to co-operate in this monitoring would see its export licence cancelled by the government.

The management of the resource has to be flexible and adaptable. Products aimed at the international market must come under nation-wide regulations. On the other hand, products aimed exclusively at the local consumer market can be placed under traditional control at the village scale, provided the regulations can be made to apply to every village. As we can see, there is still a long way to go before a resource management model inspired by traditional methods can be put into practice at national level. To limit the contribution of these traditional methods to fisheries development planning strictly to the problems of controlling access to the resource would be a mistake. Traditional fishing has much more to offer us in this field.

3.3. The contribution of traditional fishing to the commercial use of the environment

We think that it is in this sector that traditional fishing has the most to contribute to the development of artisanal fishing. This development, as it has been planned so far, labours under three major handicaps :
a) It is too innovative, and too lacking in flexibility. Every aspect of what is proposed to the fishermen about the new developments is new to them : the resource (deep-bottom species), the type of habitat fished (the deeper portions of the outer reef wall), the boats (single-hulled or twin-hulled motorized craft), the tackle (reel-mounted deep-bottom lines), and such aspects as fishing technique, gear maintenance, book-keeping... The potential of such a model for integration within island society is very low. For this reason, a program of strict monitoring and assistance to the fishermen has had to be organized. Every fishermen's association is regularly visited and checked by an agent of the Fisheries Department, who lives on the island. This agent is in daily radio contact with the headquarters of the Department in Port Vila. Within this system, the only role played by the fishermen consists in the strict application of the directives given by the Fisheries agent. The success of the project, and the eventual spreading of development of the fishing industry throughout Vanuatu, is expected to depend on this faithful adherence to the agent's directives. The economic success of the participating fishermen is then supposed to inspire others to take up commercial fishing, leading to the development of more fishing projects in those islands and districts which are still innocent of intensive fishing. This system of technical support worked correctly for only two years. Designed to help manage 25 fishermen's associations, it soon found itself having to deal with five times the number. The greater part of these associations were then mostly left to their own devices, and, with a few rare exceptions, the experiment ended up in failure.

b) It is too specialized. The whole of the development effort is targeted on a small number of species, on a single type of tackle, a single territory, a single method of product conservation. This is one of the classical approaches to development, with specialization being equated to increase in production, and economy through increase of scale.

c) It is too costly, both in terms of working time and of cash outlay. In 1984, a motor catamaran, complete with twin outboards and all fishing gear, was worth 900 000 Vatus (roughly US$ 9000). The cost of an ice-making plant was US$ 10000, and US$ 15000 for a small cold storage facility. Most usually, the E.E.C., through the European Development Fund, covered 51% of the expense in the form of outright gifts, while the Vanuatu Development Bank supplied 42% in the form of three-year loans at 4% interest. The goal that had been set for the fishermen's associations was an average of 150 fishing days per year, a day representing an 8 to 12 hour trip, with 4 to 5 hours of

active fishing. This large investment in work and time was deemed necessary to guarantee the fishermen a reasonably comfortable income, while fulfilling the expectations of the E.E.C., who wanted to see its gifts used to best advantage, and of the Vanuatu Development Bank, who hoped for repayment of the sums borrowed. This calculation fails to take into account that fishing is hard work indeed, particularly when it is practiced from small boats in the kind of well formed sea that is usually found between the islands of Vanuatu. It was long before the fishermen, finding the working conditions too hard and time consuming in comparison with the returns, started to turn their attention back to agricultural pursuits, or, if they continued going to sea, to the transport of goods and passengers, a type of activity generating less income than fishing, but considerably less demanding in time and effort. We see here an excellent example of the principle that we mentioned earlier and according to which the tendency will be toward optimizing return for given effort, rather trying to improve the productivity of the environment.

We will not insist any further on the problems encountered by the development of artisanal fishing in Vanuatu. The subject has been exhaustively discussed elsewhere (David, 1990a, 1991). We have shown that the rigidity, the excessive cost and the over-specialization of the proposed model have been largely responsible for the failures that have been experienced. Given the social and cultural context of the island societies, and the limitations imposed by the environment, the planners should instead turn their attention to concepts of adaptability, of diversity, of inexpensiveness, and of flexibility. These concepts are already at work in traditional fishing, and constitute, as we have seen, its fundamental philosophy.

There is an urgent need for these principles to find their way into the policies that govern the development of artisanal fishing in coastal waters, whether in Vanuatu or in any other nation of the island Pacific that faces similar limitations, both physical and human. This means that development planners must accept the idea of pluralistic development allowing the existence of a high performance sector, engaged in a regular activity, made up of a small number of expensive projects using sophisticated equipment, aimed at the international export and the tourist markets, while encouraging in parallel the existence of a more informal sector, made up of a multitude of small operators, engaged in a more sporadic type of fishing, using much simpler and inexpensive equipment both in terms of craft[24], tackle, or conservation methods. In Vanuatu, the simple expedient of introducing such unsophisticated and inexpensive conservation methods as fish smoking and salting[25]would make an increase of production possible. This would offer to those who fish only for their own family the possibility of taking advantage of occasional abundances of certain species, particularly the small pelagic species, which at present they are unable to stockpile for lack of the means of preserving them. In this way they would be able, if they wished, to put away surplus production, and possibly acquire the notion of marketing. Smoking and salting of fish, by offering the possibility of marketing their catch to a greater number of fishermen of modest means, are one of the keys of the development of fisheries, and of the distribution of fish products to the interior of the islands where the road network is often embryonic if not completely absent. Smoked or salted products will keep well for several days, even several weeks, at ambient temperature, and are easier to transport than the fresh article.

In most topical countries where fish is smoked or salted as an artisanal activity, the work of preparing and marketing the product is done by women. This is done at home as a "cottage" industry, where it forms a part of the women's daily household chores. In rural Vanuatu, where women are generally excluded from participating in income-producing activities, to adopt such a model would give them an opportunity to acquire a degree of economic freedom from their husbands, and to gain a certain economic stature within the family structure. They might bring to the development of the fishing industry an enthusiasm and a form of pragmatism they have developed over centuries of having to master the difficulties of subsistence agriculture in Vanuatu.

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[24]The use of sailing canoes, with a small auxiliary engine to help them in going to windward, is certainly the least expensive way to develop fishing in the shallower portions of the outer reef wall, in depths of between 10 m and 100 m, particularly on the leeward side of the islands, where there is shelter from prevailing winds and ocean swells.

[25] Readers who might be interested in the application of these techniques to Vanuatu should consult Van Pel (1958) and issue n° 50 of the S.P.C.'s information niewsletter on fisheries (David, 1990b).

Conclusion

The development of artisanal fisheries is currently in the throes of a crisis throughout the island Pacific. The models followed over the last fifteen years or so by the various Fisheries Departments of the region are being increasingly questioned, particularly by the funding organizations who are wondering whether similar levels of production couldn't be achieved at less expense, or, similarly, whether the same cash outlays couldn't be made to yield better results. What is being reassessed here is the whole concept of development based on specialization and on intensification of production. This type of development is too innovative, too alien to the culture - and its understanding of time and space - of the village society to which the fishermen belong, and the mere injection of massive capital is unlikely to be enough to make it catch on at grass-roots level. The island Pacific is still too heterogeneous, in ecological, economic, geographical, social, and cultural terms for models which have served well in Europe or North America to be useable as-is. Two main lessons can be learned from the failure of the artisanal fisheries development policies in Vanuatu :

- If neither the physical nor the human contexts can adapt to the development model, then it is up to this model to adjust to the physical and human realities of the islands;
- It is impossible to build anything without using what is already there as a solid foundation.

In this particular field, traditional fishing can provide an excellent source of inspiration. It prominently features adaptability, diversity, and flexibility in methods, techniques and strategies; it offers an economy - both in terms of money and of labour - of equipment and energy; it makes use of the diversity of possible target species and of biotopes suitable for fishing. These are general principle that can help guide the development of artisanal fishing in coastal waters.

Yet, the inspiration shouldn't be limited to traditional fishing methods of the Pacific alone. One would like to hope that the type of "North-South" co-operation that is typical of artisanal fishing development in Vanuatu could one day be replaced by a "South-South" co-operation between the nations of the island Pacific and the other countries of the inter-tropical zone. There is no doubt that Fanti or Senegalese fishing skippers have a wealth of experience that they could share with their Ni-vanuatu counterparts. There is no doubt that the women of Vridi, on the Ebrié lagune of Ivory Coast, famed for their smoked fish, have much that they could teach to the women of Vanuatu and the other island nations of the Pacific.

References

Anell, B. - 1955 - Contribution to the history of fishing in the southern seas. *Studia Ethnographica Upsaliensa, IX.* University of Upsala, 249 p.

Barrau, J. - 1956 - L'agriculture vivrière indigène aux Nouvelles Hébrides. *Journal de la Société des OCéanistes. XII,* n°12 : 181-215.

Bonnemaison, J. - 1981 - Voyage autour du territoire. *L'espace Géographique, n°4* : 249-262.

Bonnemaison J. - 1986 - Tanna, les hommes lieux. Les fondements d'une identité : Territoire, histoire et société dans l'archipel du Vanuatu (Mélanésie). *Travaux et Documents de l'ORSTOM,* 201, T. 2, 680 p.

Campbell, H., Menz, K. and G. Waugh - 1989 - Economics Fishery Management in the Pacific Islands Region. *ACIAR Proceedings n° 26,* 169 p.

Codrington, A.M. - 1891 - *The Melanesians, studies in their anthropology and folklore.* Oxford University Press, 419 p.

David, G. - 1985 - Pêche de subsistance et milieu naturel : les mangroves de Vanuatu et leur intérêt halieutique. *Mission ORSTOM de Port-Vila, Notes et Documents d'océanographie,* n°13, 67 p.

David, G. - 1990a - The strategy of reef resources exploitation in the Pacific Islands: the case of Vanuatu. *Proceedings of the 1990 International Society for Reef Studies Congress, Noumea, UFP-ISRS* : 61-74

David, G. - 1990b - Prospects as the role of women in the valorisation of village fisheries products in Vanautu. S.P.C. Information Fisheries Niews Letter, ,n°50 : 23-28.

David, G. - 1991 - *Pêche villageoise et alimentation au Vanuatu, excploration d'un système.* Université de Bretagne Occidentale, Thèse de Géographie de laMer, 1050 p.

Done, T.J. and K.E. Navin - 1990 - *Vanuatu marine resources Survey.* Australian Institute of Marine Science, Townsville, 272 p.

Doucere, Mgr - 1922 - Les populations indigènes des Nouvelles Hébrides. *Revue d'ethnographie et des traditions populaires. Paris, T. III* : 215-240.

Garanger, J. - 1972 - Archéologie des Nouvelles Hébrides, contribution à la connaïssance des îles du centre. *Publication de la Société des Océanistes - ORSTOM,* n°30, 156 p.

Grandperrin, R., Gillet, R., de Riviers, X. and M. Theriault - 1982- Appâts vivants à Vanuatu.*Mission ORSTOM de Port-Vila, Notes et Documents d'océanographie,* n°2, 22p.

Johannes, R.E. - 1989 - Managing small-scale fisheries in Oceania : unusual constraints and opportunities. In Campbell, H., Menz, K. and G. Waugh (eds.), Economics Fishery Management in the Pacific Islands Region. *ACIAR Proceedings n° 26,* : 85-93.

Laurec, A and J.C. Leguen - 1981 -Dynamique des populations marines exploitées. Concepts et modèles, T.1. *Centre National pour l'Exploitaiton des Océans, Rapports Scentifiques et Techniques,n°45,* 118 p.

Polnac, R. B. and J.G. Sutinen - 1979 - Economic, social and cultural aspects of stock assessment for tropical small-scale fisheries. *University of Kingston, Rhode Island, ICMRD work. paper,* N°5, 23 p.

Ruddle, K. - 1989 - Traditional sole property rights and modern inshore fisheries management in the Pacific basin. In Campbell, H., Menz, K. and G. Waugh (eds.), Economics Fishery Management in the Pacific Islands Region. *ACIAR Proceedings n° 26,* : 68-76.

Sahlings, M. - 1976 - Age de pierre, âge d'abondance : l'économie des sociétés primitives. Bibliothèque des Sciences humaines. NRF, Gallimard, 409 p.

Smith, I.R. - 1979 - A research framework for traditional fisheries. International center for Living Aquatic Resource Management,*ICLARM Studies and Reviews,* n°22, 40 p.

Van Pel, H. - 1958 - *A survey of fisheries in the New Hebrides with preliminary recommendations for their development.* South Pacific Commission, 27 P.

Vienne, B. - 1984 - Gens de Motlav. Idéologie et pratique sociale en Mélanésie. *Publication de la Sociétédes Océanistes n°42,* 434 p.

Williams, D.Mc. B. - 1990- Shallow water reef fishes. In Done, T.J. and K.E. Navin (eds)*Vanuatu marine resources Survey.* Australian Institute of Marine Science, Townsville : 66-76.