Qualitative baseline information on finfish resources associated with coral reefs of the Lae Artisanal Fishery, Papua New Guinea

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Introduction

The Lae Artisanal Fishery (LAF) is one of the two well-developed artisanal fisheries in Papua New Guinea (PNG) exploiting largely marine fish resources associated with coral reefs. The other is the Port Moresby Artisanal Fishery. LAF has developed as a bilateral fisheries project between the governments of Papua New Guinea and Germany under the Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) program. With the appropriate project name as the Moma Coastal Fisheries Development Project (MCFDP), it has grown from a small trial fisheries project to a very important artisanal fishery for the city of Lae and the hinterland domestic markets of Papua New Guinea.

Reef fishing is the term used to describe the overall activities of the Lae artisanal fishery. This is largely due to the concentration of fishing activities in and around coral reef areas of the Huon Gulf, Huon Peninsula, West New Britain and Manus. Although a large proportion of species exploited is finfishes, other marine animals including crustaceans, molluscs and sedentary species (e.g. sea cucumbers) are targeted. The Huon Gulf and the seas surrounding the Huon Peninsula provide considerable fish production for this small-scale fishery (Anas, unpublished data). Finfish landing data accumulated since 1990 indicated increased production over years. For example, between 1990 and 1992 Hermes (1993) reported an annual catch of about 100 tonnes which increased to about 130 tonnes per year between 1993 and 1996 (Anas & Federizon, unpublished). A maximum landing figure was recorded in 1994 of 138.154 tonnes (MCFDP database).

Like many small-scale fisheries in PNG, very little or no scientific data is available on the resource, its environment and the overall fishery activity. Usually little information on the resource is generalized that it does not give any details of the resource to species level and coupled with the difficult task if not impossible, of analyzing and processing tropical multi-species and multi-gears fisheries, stock assessment and management actions are in-complete. In LAF, attempts are progressing to assess the fish stocks and as a component activity, a survey of the fisheries catches was done at the LAF fish-landing hall in November 1997. The comprehensive data collected during this survey is now been used to complement the existing historical MCFDP data for assessment of the stocks. The qualitative part of this comprehensive (survey) data is presented here to show a simple but informative description of the LAF. This is hoped to stress the importance of baseline studies to obtain such vital information.

Materials and Methods

The survey area

The Huon coast defined here include an area of water body bordering the northern coastline of mainland Papua New Guinea and the off-shore islands of Siassi and Tami at the geographical location of 6°-8° S and 147°-148° E. The northern part of this area forms a peninsula and the southern part is a large gulf, referred to as the Huon Peninsula and Huon Gulf respectively. Holding an estimated water body of about 14500km2, this area has extensive fringing and patch reefs where the fish resources are harvested. Figure 1 shows the map of the study area.

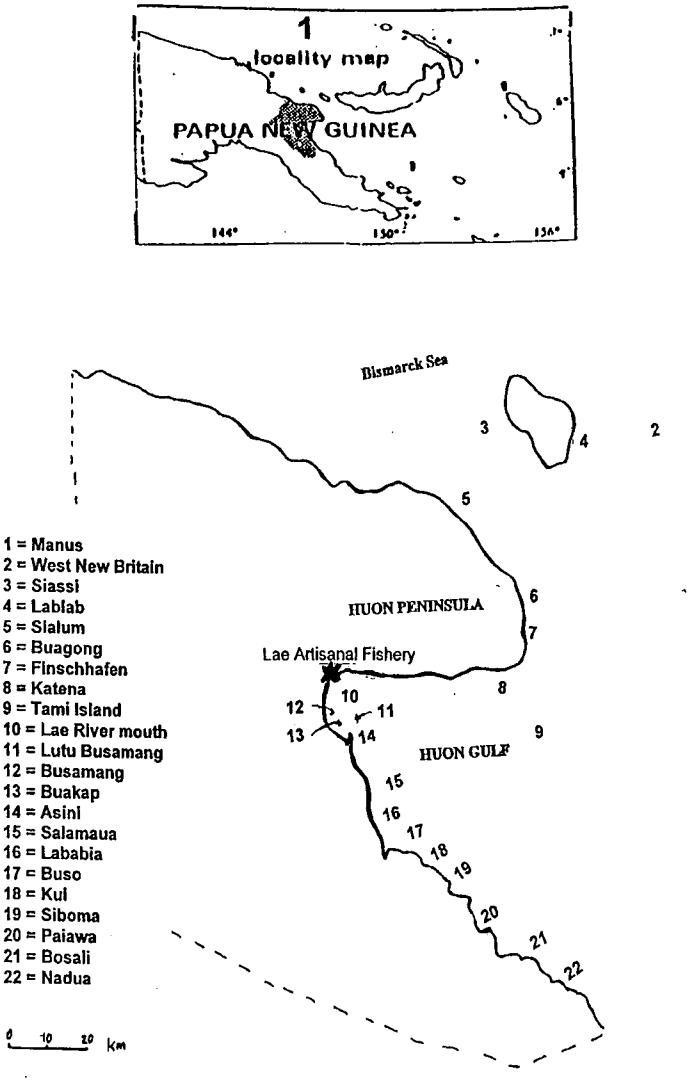

Figure 1
Study area showing the fishing grounds where the landings for LAF is derived from.

Survey activities at the Lae artisanal fishery landing hall

Fish catch data were collected at the MCFDP fish landing hall between November 3 and November 28 1997. Data collections were done from artisanal fishers fishing several grounds along the continental shelf of the Bismarck Sea around the Huon Gulf and along the Huon Peninsula coastline. Survey was conducted during daylight hours from 0800 hours to 1600 hours daily from Monday to Saturday. During this period a total of 75 landings were observed.

In the fishlanding hall catches were sorted into boxes of separate species. Weights and tallies of species were recorded in prepared survey data sheets. By means of verbal communication with the owners of the landings I was able to get accurate information on the originality of the catches (which is referred to as fishing grounds), the types of fishing gears used, the methods of fishing applied, the time of the day actual fishing was done and the duration of the actual fishing activity (I defined actual fishing as the time between setting and howling of the gear).

The following examinations were carried out within the period of surveying each landing. Total length measurements of individuals were carried out on several of the most abundant species. Lengths were measured to the nearest millimeter with each fish lying on its right side on a fish measuring board with the mouth closed. Corresponding weights were obtained to the nearest two decimal points of a kilogram using an electronic balance.

Analysis of the data

Data analysis was done on MS excel. Data on fishing gears, fishing grounds and catches were sorted accordingly which produced qualitative information on the artisanal fishery. Sorting of the fish names produced the comprehensive species list of the Huon coast. Due to the multi-species and multi-gear status of the fishery, gear-conflict analysis of the species and gears data gave information on species vulnerability to the different combination of fishing gears and/ or fishing methods.

Results

Comprehensive species list of finfishes for the Lae Artisanal Fishery

One hundred thirty fish were identified as individuals from 26 family groups. Table 1 shows the comprehensive species list arranged in alphabetical order of the families. In the order of the number of species they have, the largest families are Lutjanidae (18 species); Serranidae (17 species); Carangidae (16 species); Lethrinidae (13 species); Scombridae (8 species); Nemipteridae (8 species); Acanthuridae (7 species) and Scaridae (7 species). This means out of the thirty family groupings only eight account for more than 70 % of the total number of species.

Species code	Family	Genus	Species	Common name(s)
1	ACANTHURIDAE	*Acanthurus*	*lineatus*	blue-lined surgeonfish
2		*Acanthurus*	*nigrofuscus*	dusky surgeonfish
3		*Acanthurus*	*olivaceus*	orangeband surgeonfish
4		*Acanthurus*	*pyroferus*	mimic surgeonfish
5		*Ctenochaetus*	*binotatus*	twospot bristlletooth
6		*Naso*	*annulatus*	ringtailed unicornfish
7		*Naso*	*lituratus*	stripeface unicornfish
8	BELONIDAE	*Tylosurus*	*crocodilus*	longtom
9	CARANGIDAE	*Alectes*	*ciliaris*	pennant fish
10		*Carangoides*	*bajad*	orange-spotted trevally
11		*Carangoides*	*ferdau*	blue trevally
12		*Carangoides*	*fulvoguttatus*	gold-spotted trevally
13		*Caranx*	*ignobilis*	giant trevally
14		*Caranx*	*lugubris*	black trevally
15		*Caranx*	*melampygus*	bluefin trevally
16		*Caranx*	*plagiotaenia*	barcheek trevally
17	CARANGIDAE	*Caranx*	*sexfasciatus*	bigeye trevally
18		*Caranx*	*tille*	tille trevally
19		*Decapterus*	*macarellus*	mackerel, malambur
20		*Elagatis*	*bipinnulata*	rainbow fish
21		*Gnathanodon*	*speciosus*	golden trevally
22		*Scomberoides*	*lysan*	queen fish
23		*Selar*	*boops*	mackerel, malambur
24		*Selaroides*	*leptolepsis*	mackerel, malambur
25	CHANIDAE	*Chanos*	*chanos*	milkfish
26	DASYATIDAE	*Taeniura*	*lymma*	stingray
27	EPHIPPIDAE	*Platax*	*pinnatus*	batfish
28	HAEMULIDAE	*Diagramma*	*pictum*	painted sweetlip
29		*Plectorhinchus*	*lineatus*	diagonal-banded sweetlip
30		*Plectorhinchus*	*orientalis*	orizontal-banded sweetlip
31	HEMIRAMPHIDAE	*Hyporhamphus*	*dussumieri*	garfish
32	HEMIRAMPHIDAE	*Zenarchopterus*	*dunckeri*	garfish
33	HOLOCENTRIDAE	*Sargocentron*	*rubrum*	red squirrelfish
34		*Sargocentron*	*spiniferum*	spiny squirrelfish
35		*Sargocentron*	*tiere*	bluestripe squirrelfish
36	KYPHOSIDAE	*Kyphosus*	*sp.*	sharpnose drummer
37		*Kyphosus*	*vaigiensis*	blunthead drummer
38	LABRIDAE	*Cheilinus*	*trilobatus*	tripletail maori wrasse
39		*Halichoeres*	*melasmapomus*	ocellated wrasse
40		*Novaculichthys*	*taeniurus*	carpet wrasse
41		*Cheilinus*	*celebicus*	celebes maori wrasse
42	LETHRINIDAE	*Lethrinus*	*Atkinsoni*	yellowtailed emperor
43		*Lethrinus*	*crysostamus*	sweetlip emperor
44		*Lethrinus*	*erythracanthus*	yellowspotted emperor
45		*Lethrinus*	*erythropterus*	longfin emperor
46		*Lethrinus*	*harak*	thumbprint emperor
47		*Lethrinus*	*lentjan*	purple-headed emperor
48		*Lethrinus*	*miniata*	emperor
49		*Lethrinus*	*nebulosus*	spangled emperor
50		*Lethrinus*	*obsoletus*	orange-striped emperor
51		*Lethrinus*	*olivaceus*	long-nosed emperor
52		*Lethrinus*	*sp.*	emperor
53		*Lethrinus*	*xanthochilus*	yellowlip emperor
54		*Monotaxis*	*grandoculis*	bigeye emperor, bream
55	LUTJANIDAE	*Aphareus*	*rutilans*	rusty jobfish
56		*Aprion*	*virescens*	green jobfish
57		*Etelis*	*coruscans*	longtail deepsea snapper
58		*Etelis*	*marshi*	short-tail deepsea snapper
59		*Lutjanus*	*bohar*	red bass, snapper
60		*Lutjanus*	*boutton*	mollucan seaperch
61		*Lutjanus*	*fulviflamma*	blackspot seaperch
62		*Lutjanus*	*fulvus*	seaperch
63		*Lutjanus*	*gibbus*	paddle tail
64		*Lutjanus*	*lutjanus*	bigeye seaperch
65		*Lutjanus*	*malabaricus*	scarlet seaperch
66	LUTJANIDAE	*Lutjanus*	*rivulatus*	maori seaperch

67		*Lutjanus*	*russelli*	moses perch
68		*Lutjanus*	*sebae*	red emperor
69		*Lutjanus*	*semicinctus*	blackbanded seaperch
70		*Lutjanus*	*timorensis*	timor seaperch
71		*Lutjanus*	*vitta*	striped seaperch
72		*Pristipomoides*	*multidens*	seaperch
73	MONOCANTHIDAE	*Aluterus*	*scriptus*	leatherjacket
74	MUGILIDAE	*Crenimugil*	*crenilabris*	mullet
75	MULLIDAE	*Parupeneus*	*barberinoides*	goatfish
76		*Parupeneus*	*bifasciatus*	goatfish
77		*Parupeneus*	*cyclostomus*	goatfish
78		*Parupeneus*	*indicus*	goatfish
79		*Parupeneus*	*multifasciatus*	goatfish
80	NEMIPTERIDAE	*Nemipterus*	*furcosus*	bream
81		*Pentapodus*	*sp.*	reef bream
82		*Pentapodus*	*trivittatus*	threadfin bream
83		*Scolopsis*	*ciliatus*	monocle-bream
84		*Scolopsis*	*margaritifer*	monocle-bream
85		*Scolopsis*	*monogramma*	monocle-bream
86		*Scolopsis*	*temporalis*	rainbow monocle bream
87		*Scolopsis*	*xenochrous*	olivespotted monoclebream
88	PLOTOSIDAE	Plotosus	*lineatus*	striped catfish
89	POLYNAMIDAE	*Polydactylus*	*plebius*	threadfin
90	PRIACANTHIDAE	*Heteropriacanthus*	*cruentatus*	duskyfin bigeye
91	PRIACANTHIDAE	*Priacanthus*	*hamrur*	lunar-tailed bigeye
92	SCARIDAE	*Calotomus*	*carolinus*	stareye parrotfish
93		*Leptoscarus*	*vaigiensis*	blue-spotted parrotfish
94		*Scarus*	*bleekeri*	bleeker's parrotfish
95		*Scarus*	*frenatus*	briddled parrotfish
96		*Scarus*	*globiceps*	violet-lined parrotfish
97		*Scarus*	*microrhinos*	steephead parrotfish
98		*Scarus*	*rubroviolaceus*	ember parrotfish
99	SCOMBRIDAE	*Acanthocibium*	*solandri*	wahoo
100		*Auxis*	*thazard*	bullet /frigate mackerel
101		*Euthunnus*	*affinis*	mackerel tuna
102		*Gymnosarda*	*unicolor*	dogtooth tuna
103		*Katsuwonus*	*pelamis*	skipjack tuna
104		*Rastrelliger*	*kanagurta*	long-jawed mackerel
105		*Scomberomorus*	*commerson*	spanish mackerel
106		*Thunnus*	*albacares*	yellowfin tuna
107	SERRANIDAE	*Cephalopholis*	*argus*	peacock rockcod
108		*Cephalopholis*	*miniata*	coral cod
109		*Cephalopholis*	*sexmaculata*	six-banded rockcod
110		*Cephalopholis*	*sonnerati*	tomato rockcod
111		*Epinephelus*	*areolatus*	rockcod
112		*Epinephelus*	*hexagonatus*	hexagon rockcod
113		*Epinephelus*	*maculatus*	trout cod
114		*Epinephelus*	*merra*	honeycomb cod
115	SERRANIDAE	*Epinephelus*	*ongus*	speckled-fin rockcod
116		*Epinephelus*	*polyphekadion*	camouflage rockcod
117		*Epinephelus*	*spilotoceps*	spotty cod
118		*Epinephelus*	*tauvina*	reef cod
119		*Plectropomus*	*leopardus*	coral trout
120		*Plectropomus*	*maculatus*	barred-cheeck coral trout
121		*Pseudanthias*	*bicolor*	bicolor anthias
122		*Pseudanthias*	*tuka*	purple anthias
123		*Variola*	*louti*	coronation trout
124	SIGANIDAE	*Siganus*	*argenteus*	silver spinefeet
125		*Siganus*	*lineatus*	golden-lined spinefeet
126		*Siganus*	*punctatus*	gold-spotted spinefoot
127		*Siganus*	*spinus*	rabbitfish
128	SPHYRAENIDAE	*Sphyraena*	*barracuda*	giant barracuda
129		*Sphyraena*	*qenie*	military seapike
130	TERAPONTIDAE	*Terpon*	*jarbua*	crescent grunter

Table 1.
Species list of finfishes of the Lae Artisanal Fishery based the November 1997 survey.

Catch profile

In all, 6650.62 kilograms of gutted fish from 75 fishmarket landings were recorded during the survey. The Spanish Mackerel, *Scomberomorus commerson*; Crocodilian Longtom, *Tylosurus crocodilus*; Giant barracuda, *Sphyraena barracuda*; Skipjack tuna, *Katsuwonus pelamis*; Tille trevaly, *Caranx tille*; Red emporer, *Lutjanus sebae*; and Rusty Jobfish, *Aphareus rutilans* are the most common species. They make up more than 40 % (2893.39kg) of the total gutted weight. Working with the family level, the top three families are scombridae (tunas and mackerels), carangidae (trevallies) and lutjanidae (snappers, seaperches, jobfishes etc.). The latter two families are among the three groups that contained the highest number of species while the earlier group is an intermediate in terms of species number. Table 2 shows the total catches of the most important families and the corresponding total number of species composition. This information is further processed to the percentage catch (weight) composition in percentage as shown in the pie chart (Figure 2).

Family	Total catch in kilograms	Number of species
SCOMBRIDAE	2311.15	8
CARANGIDAE	1289	16
LUTJANIDAE	1202.35	18
SPHYRAENIDAE	480.55	2
BELONIDAE	349	1
LETHRINIDAE	295.49	13
SERRANIDAE	268.65	17
MUGILIDAE	93.67	1
NEMIPTERIDAE	82.6	8
SIGANIDAE	77.59	4
ACANTHURIDAE	59	7
HEMIRAMPHIDAE	40.4	2
Others(14 families)	101.17	33
TOTAL	6650.62	130

Table 2.
Catch in weight and species composition (number) of the most important families.

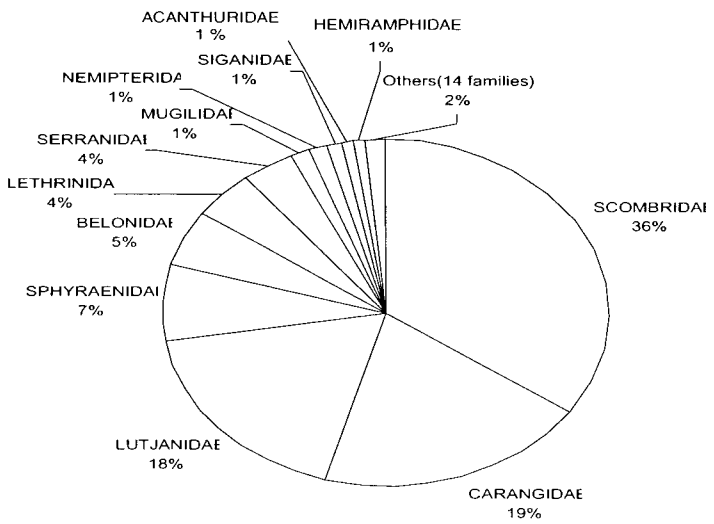

Figure 2.
Percentage by weight of the major famillies landed by the Lae Artisanal Fishery, Nov. 1997.

Twenty fishing grounds were identified as the major contributors to the landings of finfish at the Lae artisanal fishery. The number of fishers exploiting the resources between fishing grounds is not constant, some areas have more fishers than others, however it is not clear if the number of fishers (effort) is influential to the total catches from a certain fishing ground. Table 3 contains the listing of the fishing grounds, their total catches in November 1997. The two in bold are outside of the Huon Coast and their species contributions are not included in table 1. These fishing grounds can also be located in the study area map (figure 1).

Fishing ground	Total catch (kgs)	Fishing ground	Total catch (kgs)
West New Britain	2167	Tami Island	148.2
Lutu-Busamang	1089.75	Buakap	137.83
Manus	603.48	Finschhafen	77.4
Salamaua	452.59	Lablab	71.2
Kui	346.55	Lababia	68.8
Siassi Island	290.4	Sialum	68
Katena	248.2	Lae River Mouth	66.4
Paiawa	192.8	Nadua	47.6
Busamang	169.42	Asini	44.2
Bosali	158.4	Buagong	37.2
Siboma	158.4	Buso	6.8

Table 3
The fishing grounds from which the landings at the Lae artisanal fishery derived.

Gear/method	code	Gear/method	code
Bottom longline	BLL	Beach seine net	BN
Handline	HL	Gill net	GN
Troll line	TR	Spear	SP

Table 4
The fishing gears and methods employed to exploit the fishes.

Species vulnerability to gears

Gear conflict analysis results showed that there are possible 15 different gear combinations in which fish species are vulnerable to. Species are vulnerable to combinations ranging from single gears to four gears combined. This is shown in Table 5 below.

Gear combination	Number Vulnerable to	Gear combination	Number Vulnerable to
HL	74 species	GN + SP	1 species
GN	22 species	GN + HL	9 species
BLL	2 species	GN + HL + TR	4 species
TR	1 species	GN + HL + SP	1 species
BN	1 species	BLL + HL + TR	2 species
HL + TR	8 species	BLL+GN+HL+TR	1 species
HL + SP	1 species	BN+GN+HL+TR	1 species
GN + TR	2 species	**TOTAL**	**130 species**

Table 5.
Species vulnerability to fishing gears.

Discussion

Fishing in PNG is a very old activity and like terrestrial hunting, it has been a very important activity that sustains the daily protein intake of the coastal households. To date fishing has become a major cash source for many subsistent and artisanal fishers within the fishing communities of the country. With the initiative of the government to develop the local fisheries sector, many subsistent fishers have turned to artisanal and or full-time commercial exploiters of the abundant marine resources. This trend of subsistent fishers shifting to artisanal will continue to as fishers realize the importance of this resource sector in terms of commercial gains. The most obvious result will be that activities in the marine environment, for this presentation, the coral reef areas will increase. The rates of exploitation of the resources will also increase with increasing fishing effort by the number of fishers and the time spent fishing as the demand for cash rises and demand for fish supplies by the fishmarkets follow the same trend. With all these factors in mine, we should not be too ignorant with the fact that the resources we are exploiting with a fast rate over a short period, is not eternal. The concepts of sustainable development and exploitation of our marine resources still remain vital to reduce the risks of other fisheries concepts of overfishing and resource depletion. To start of, certain important questions such as: What is caught?; Where are they caught from?; How are they caught?; etc. must be answered. If we know how much of our resources are available in the fishing area it becomes useful to come up with the best answers to these questions and excellent management measures may be derived. Baseline information is vital for the development and management of a fisheries resource, for example such information becomes the control for monitoring data obtained during the development stages of the fisheries resource and or when another neighboring industry such as mining or forestry is seen to have effects to the fisheries resource and its environment.

Because reef fisheries targets multiple of resources and uses multiple gears it becomes relatively difficult to manage. It is also becoming clear that there are other alternative sustainable uses of the fish resources associated with coral reefs without actually removing the resource from the environment but has the same commercial potential, e.g. marine protected areas, tourism, etc. Development of these adventures must also require baseline information. It is not desirable that PNG will follow the mistakes of many Asian countries that have virtually destroyed their marine environment to almost 90 %. The Lae artisanal fishery and the MCFDP have taken the lead to develop a database for the catches of the resources that sustain the fishery, which the other artisanal fisheries in PNG should exercise. However it is recommended that from time to time research scientists, fisheries biologists of institutions such as the University of Papua New Guinea must through collaborative work conduct surveys and research work that will complement the existing historical data for effective stock assessment and management.

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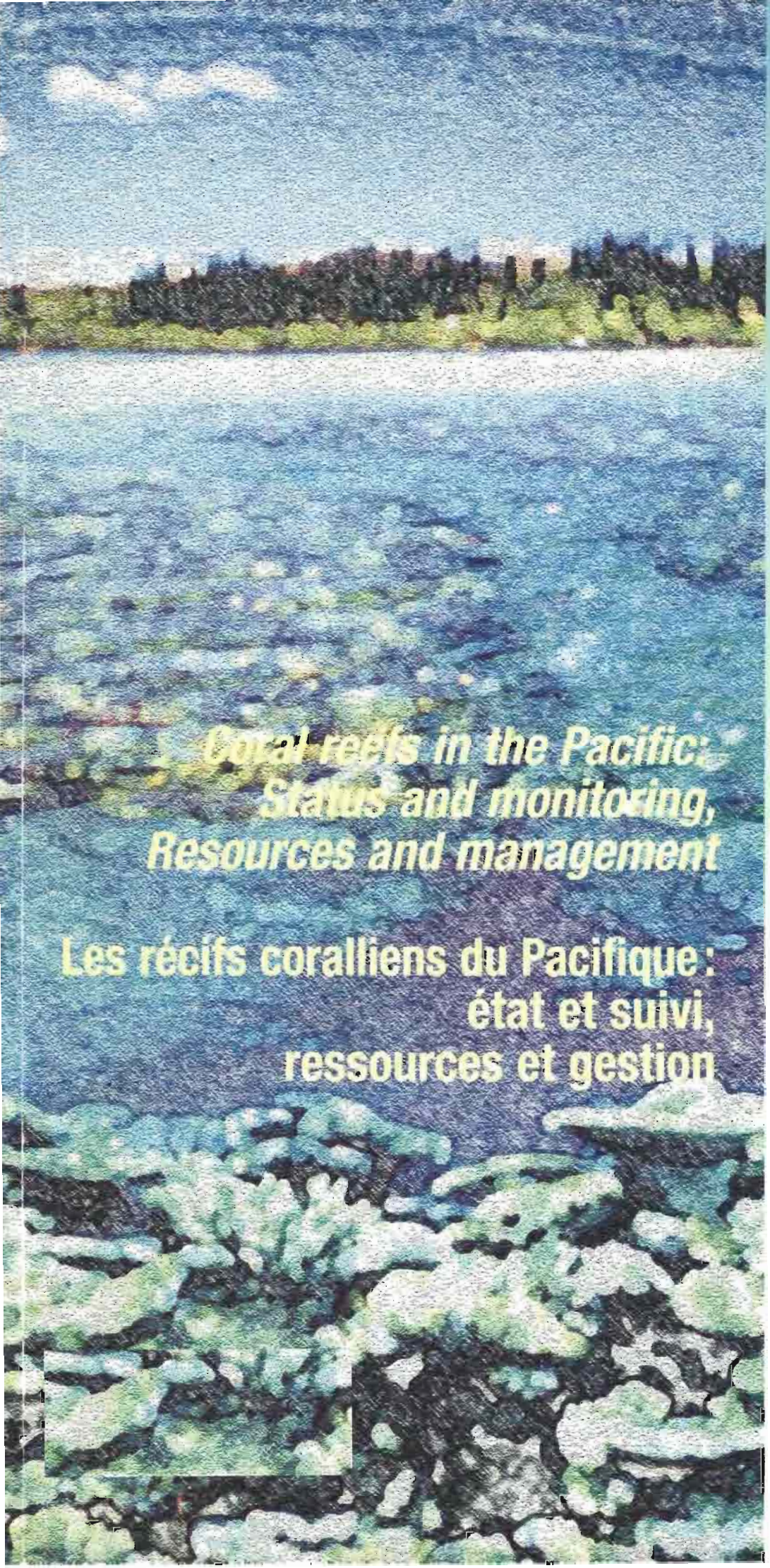

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