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FISHERIES-ORIENTED OVERVIEW OF TUNA DATA FROM NEW CALEDONIA'S ECONOMIC ZONE (1956 to 1994)

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[1] The ZoNéCo programme is a collaborative effort involving the French Government, the Territory of New Caledonia, the Provinces, IFREMER (French Institute of Research for Ocean Development); ORSTOM (French Institute for Research and Development in Cooperation), SHOM (Maritime Hydrography and Oceanography Service) and the French University of the South Pacific.

ABSTRACT

This report presents the historical background for tuna fishing in New Caledonia and gives an overview of relevant available data. These data come from many different sources (fisheries agencies in foreign countries involved in the offshore fishing, the South Pacific Commission, ORSTOM [French Institute of Research for Development in Cooperation], the Territorial Merchant Marine and Maritime Fisheries Service [STMMPM], Provincial Fisheries Services, etc.). Some data were incomplete and low quality, so could not be assessed or used directly by commercial tuna fishermen. After all the data had been computerised, they were compiled and sent to ORSTOM and to the ZoNéCo programme's Local Management and Development Unit (*Structure de gestion et de Valorisation Locale* : SGVL) for analysis. This analysis gave an impression of New Caledonia's tuna production in a regional context and described its development since 1962. Fisheries data collected after the implementation of the economic zone (EZ), particularly those corresponding to the period 1983-1994, were analysed in detail in order to highlight interannual, seasonal and geographic fluctuations in catches and yields for principal species. This analysis illustrated the existence of favourable zones and seasons by attempting to relate them to fluctuations in hydrological characteristics (salinity and thermal structures).

INTRODUCTION

New Caledonia's economic zone (EZ), has an surface area of about 1.4 million sq. km. In response to a decision by the Delegate of the French Government in New Caledonia, a large-scale programme called ZoNéCo was implemented in 1991. The programme's goal is to to explore and assess the marine mineral and fisheries resources within New Caledonia's EZ. As part of this resource assessment, an overview of fisheries data was requested initially concerning pelagic species (tuna and related species), then concerning deep-sea fishing on the outer reef slopes and seamounts (jobfish, alfonsino, crustaceans and other related bottom-dwelling species).

1- AVAILABLE DATA

Table 1 gives a summary of all existing data on tuna fishing in New Caledonia from 1957 to 1994 by activity and type of survey.

Agencies involved

For the past several years, a great deal of data has been collected within New Caledonia's EZ on tuna and related species (mahi mahi [dolphinfish], swordfish, marlin, etc.). These data are difficult to use in their raw state as they come in many disparate forms (logsheets, reports, different types of computer files, etc.).

- ORSTOM has collected all data related to scientific surveys using longline and trolling techniques, the aerial radiometry and tuna survey programme and commercial pole-and-line fishing cruises by the New Caledonian fleet.

- The Territorial Merchant Marine and Maritime Affairs Service has the data on exploratory trolling or shallow longline (targeting swordfish) fishing surveys which it has carried out as well as almost all data related to industrial longline fishing by New Caledonian and Japanese fleets since 1983.

- The SPC (South Pacific Commission) has historical data on the Japanese fleet before 1973, as well as on the Korean and Taiwanese fleets. These data were shared with the ZoNéCo programme with the permission of the fisheries agencies of the countries involved.

- New Caledonia's Provincial Fisheries Services shared data on artisanal tuna fishing in their respective provinces.

Difficulties encountered in preparing this report

Boundaries of New Caledonia's EZ

New Caledonia's EZ was implemented through Resolution no. 78-142 dated 3 February 1978 issued by Order no. 433 dated 1 March 1978. Given its common maritime boundaries with Australia, Fiji, Vanuatu and the Solomon Islands, agreements were then signed with each of these neighbouring countries, except for Vanuatu. For the purpose of the ZoNéCo programme, the EZ considered was as shown in Figure 1.

Confidentiality

One of the major problems encountered was collecting all the data, due to a "confidentiality syndrome". For this reason, results taken from logsheets do not reflect the actual fishing effort by New Caledonian and foreign longliners in New Caledonia's EZ.

This syndrome, which exists throughout the south-west Pacific, also hampers the formulation of a global view of fisheries development and fluctuations among New Caledonia's neighbours, information which would have allowed better understanding of these fisheries' importance in a regional context.

Disparate nature of the data

It was difficult to form any overall interpretation of the data collected, due to their disparate natures. Historical data were grouped monthly or annually, by 1° or 5° statistical squares (Figures 2a and 2b) while more recent data were generally recorded on a daily basis giving precise geographic positions. Some data only provided overall tonnage while others gave details by species.

2- HISTORICAL BACKGROUND OF TUNA FISHING IN NEW CALEDONIA'S EZ

Scientific and exploratory surveys

The first data available stemmed from 17 scientific surveys carried out by ORSTOM between 1957 and 1974. Between 1979 and 1982, this agency conducted a large-scale aerial radiometry and tuna survey programme (e.g. 1295 hours of flying, 250 schools of surface tuna located and mapping of a significant temperature front south of the main island). Beginning in 1985, several troll fishing surveys were carried out by the STMMPM, with the highest yields obtained north of New Caledonia and near Ouvea. Between 1992 and 1993, the STMMPM also carried out exploratory fishing surveys for swordfish with very encouraging yields (75 kg of marketable fish for every 100 hooks).

Commercial fishing

Longline fishing

The Japanese were the forerunners of industrial longline fishing in New Caledonian waters; their first available data date from 1962. The Taiwanese and Koreans only began fishing in this area at a much later date. Their first available data date respectively from 1967 and 1975. After implementation of the New Caledonia's EZ in 1979, only the Japanese signed an access agreement. New Caledonians began offshore fishing at the beginning of 1980. Since that time, several local longline fishing companies have been created; in 1994, just three companies remained, Calédonie Toho, Megu Calédonie and Navimon, whose boats fish solely in New Caledonian waters.

Table 2 gives an estimate of longline fishing efforts and catches for both foreign and domestic fleets between 1962 and 1994. From 1962 to 1983, annual fishing effort for longliners, both foreign and domestic, varied from 4 to 15 million hooks and catches fluctuated between 2600 and 11,000 mt per annum. These are only estimates, as results covered an area greater than the EZ, formed by all the 5° statistical squares surrounding it. From 1983 to 1994, annual effort did not surpass 6 million hooks and annual catches were 3400 mt; however, in this instance results only covered the EZ proper.

Pole-and-line fishing

Pole-and-line fishing data are quite sketchy and mainly involved Japanese pole-and-line vessels since 1974. Not much of this type of fishing—which is very dependant on live-bait supplies—has taken place in New Caledonia as bait resources are subject to high seasonal fluctuations from December to June. These fluctuations became evident after the first bait survey carried in New Caledonia waters in 1972 by the JAMARC (Japan Marine Fisheries Resources Center). Between 1974 and 1980, Japanese pole-and-line boats did, however, obtain high yields for skipjack during the short summer period. Between 1981 and 1983, the local fishing company Transpêche tried using this fishing technique but results were only mediocre. Unusual climatic conditions (El Niño) and the drop in world skipjack prices contributed in large part to this failure.

Seine fishing

Almost no data exist on seine fishing. The only fishing surveys in New Caledonia's EZ were conducted by four American purse seiners between 1980 and 1981. Daily yields averaged 12.6 mt, but with a set failure rate of more than 80%.

Artisanal pole-and-line (skipjack) and troll fishing

The tonnage taken by domestic artisanal fisheries, either through pole-and-line (Tahitian skipjack boats using the pearlshell lure technique) and troll fishing accounted for only a small portion of tuna catches. Pole-and-line fishing mainly targeted skipjack while troll catches were mainly composed of Spanish mackerel and yellowfin tuna. Artisanal pole-and-line fishing in New Caledonia is today limited to the efforts of one skipjack boat as compared to French Polynesia where there is fleet of more than 200 skipjack boats. However, a small artisanal fleet has been based in the Northern Province since the beginning of the 1990 and carries out trolling with an annual average tonnage of 30 mt.

3- LONGLINE FISHING IN NEW CALEDONIA

How it is situated regionally

New Caledonian longline tuna catches, foreign and domestic combined, are relatively modest compared to the level of catches elsewhere in the South Pacific. Figure 3 illustrates the ecologically "intermediate" position of New Caledonia, which is dominated by albacore in contrast to the situation found above 15° South or below 3° South. New Caledonia is, in fact, located between the tropical zone, where tuna catches are high and stable throughout the year and are dominated by yellowfin tuna along with some bigeye tuna, and a more temperate zone to the south where the dominate species for catches between May and October is the southern bluefin tuna.

Analysis of the results by New Caledonian and Japanese longliners between 1983 and 1994

Longline fishing, which accounts for most tuna fishing in New Caledonia, was analysed in detail using the standardised logsheets available since the last French-Japanese access agreement (August 1983). This analytical approach highlighted interannual and seasonal fluctuations in fishing effort, catches and yields per species as well as favourable catch areas by species. These data were mapped using a geographic information system (ARC/INFO software). This software was installed at the Territorial Service of Administrative Methods and Computing (*Service territorial des méthodes administratives et de l'informatique* : SMAI) by the SVGL, and has allowed fisheries data to be superimposed on bathymetric and environmental data integrated in the data bases.

Fishing effort

A detailed analysis of fishing effort by New Caledonian and Japanese fleets between 1983 and 1994 provided the following results:

- Average annual effort was 1.63 million hooks, with the maximum effort level occurring between 1989 and 1990. The drop in fishing effort observed between 1992 and 1994 was linked to the fact that no French-Japanese access agreement was signed during that time period.

- More than 40 Japanese longliners fished in the EZ for a total of 3576 fishing days, while the 11 local longliners had a total of 3942 fishing days.

- On average Japanese longliner cruises lasted longer than those for local ships (20% of the Japanese cruises lasted more than 50 days, compared to only 2% for New Caledonian ships). The domestic fleet is largely composed of small vessels (15 m) which generally carried out cruises of less than one week due to their limited autonomy.

- The longlines used on board New Caledonian boats on average had less hooks (2329 hooks) then those on Japanese longliners (2905 hooks).

- Figure 4 illustrates the movement of Japanese fleet from west to east (south of the main island) at the beginning of the year then from east to west (Chesterfield area) during the third quarter.

- As Figures 5a to 5d show New Caledonian longliners fished in the south-east and off the west coast of New Caledonia during the first quarter, then fished in the east and north-east of the Chesterfield Islands between May and August, following which they spread out between the Chesterfield Islands and New Caledonia for the rest of the year.

Catches

Figure 6 shows interannual catch fluctuations (all species combined) for Japanese and New Caledonian longliners. It also confirms that the data recorded on logsheets only represents a small percentage of the real catch (estimated catches).

Analysis of catches gave the following results:

Overall catches

Since 1987, the estimated annual tonnage for New Caledonian longliners has exceeded 1000 mt, most of which has been exported to Japan, despite some sales on the local market (10% of catches in 1994). Annual catches for Japanese boats have roughly followed the same fluctuations as those for New Caledonian longliners.

Species composition

For average annual catches :

- the percentage of tuna has gradually increased while the percentage of billfish has decreased (Figure 7).

- Albacore remained the predominant species in catches (78% in 1994) with yellowfin tuna remaining the second species (Figure 8)

- The predominant billfish species was the striped marlin, whose catch percentage varied between 25% and 60% depending on the year (Figure 9).

As for the seasonal fluctuations:

- Yellowfin tuna were particularly abundant in February and March (65% of the weight of tuna catches) while bigeye tuna did not show a significant peak in catches in any month (Figure 10).

- Striped marlin accounted for the largest percentage of billfish between August and December (Figure 11).

Average weight

- Only the average weight of yellowfin tuna increased significantly between 1993 and 1994 (from 28 to 37 kg).

- The average weight of striped marlin and swordfish was higher in October and November than in March.

- The geographic distribution of average weights for albacore showed an increasing gradient from south to north. North of 21° S, average weights surpassed 20 kg while south of 24°S, they varied between 10 and 18 kg (Figure 12).
- The largest yellowfin tunas were mainly caught in one of three areas corresponding to basins or trenches (with depths greater than 3000 m): south of 25°S, in the north-east of the EZ along the boundaries with Vanuatu's EZ zone, and south of Matthew and Hunter Islands (Figure 13).

CPUE

The yield analysis gave the following results:

- The CPUEs by number and weight correspond respectively to 2.76 fish and 74.34 kg/100 hooks. CPUEs generally increased over the period considered.

- Average monthly yields for albacore (Figure 14a), showed two significant peaks, i.e. in July and December (50 and 45 kg/100 hooks). Monthly variations in the CPUE by weight were very noticeable in yellowfin tuna: 45kg/100 hooks in April as compared to 12 kg/100 hooks in October (Figure 14b). Although the average monthly yields for bigeye tuna reached their maximum levels in May and June, they otherwise varied very little over the rest of the year (Figure 14c).

- The best yields for albacore were found in the north-west of the EZ (Figure 15a). However, yellowfin tuna seemed to be most abundant in the south-east of the main island (Figure 15b).

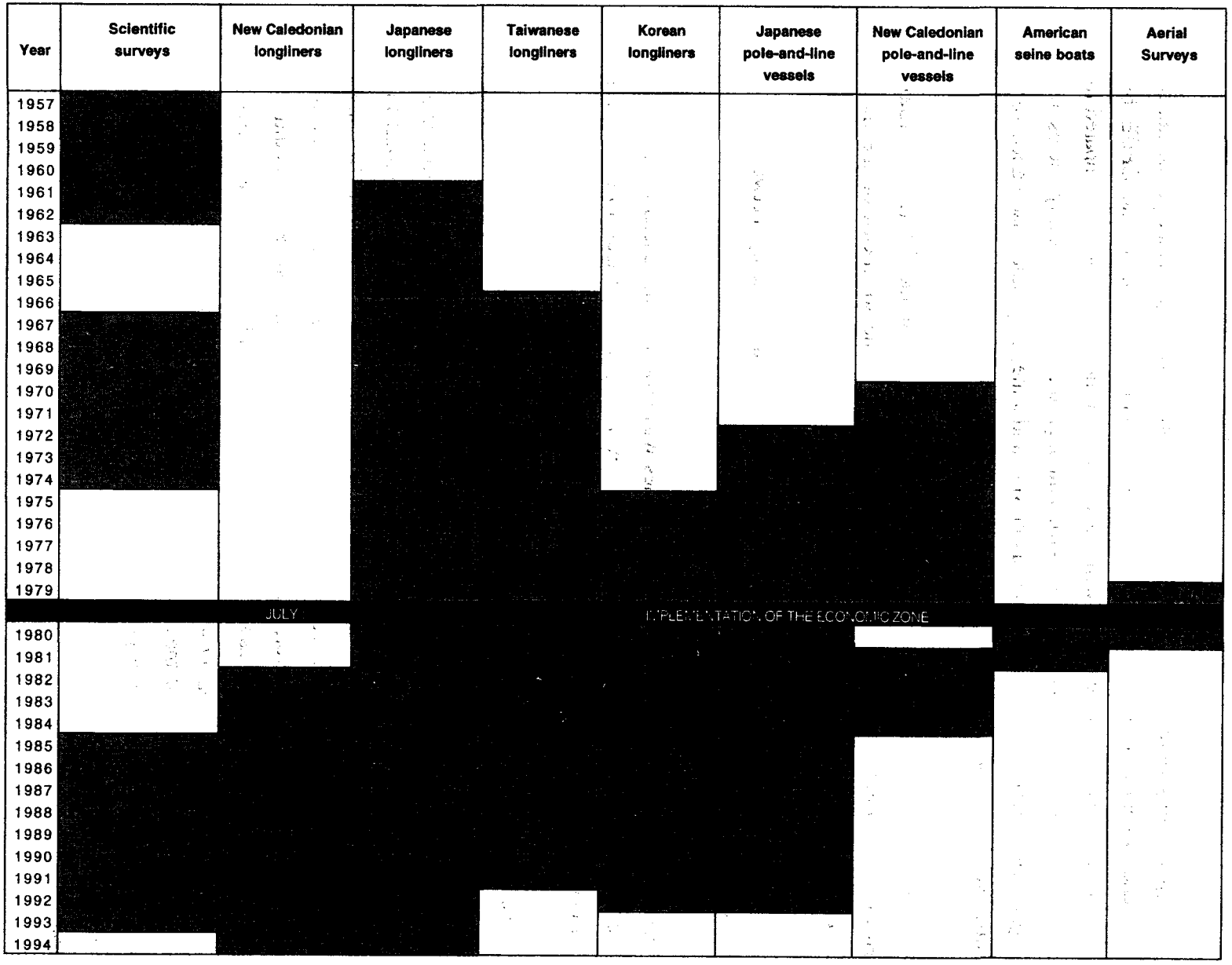
- The highest CPUEs by weight for bigeye tuna were found mainly between New Caledonia's east coast and the Loyalty Islands.

- The geographic distribution of CPUEs by species was probably influenced by the EZ's hydroclimatic conditions. At the local level, however it appears difficult to establish a correlation between yields per species and environmental variables.

CONCLUSION

This fisheries-oriented overview has made all historical data related to tuna fishing activities up to 1994 accessible to commercial fishermen. However, this "inventory" (statistical approach) is not an end in itself. It should, in fact, be followed by regular monitoring of fisheries (dynamic approach), especially based on the collection of complete and reliable fishery statistics, both for foreign and domestic fleets. Moreover, knowledge of the specific environmental conditions favourable to the aggregation of various species provides a valuable aid to fishing which vessels owners have eagerly been awaiting so as to be able formulate deployment strategies for their fleets and equipment. As study of these conditions implies a global approach, it would be advisable to develop a tuna research programme based on regional cooperation between the many different scientific agencies (SPC, ORSTOM, etc), fisheries services and private companies.

Table 1: Summary of existing data on tuna fishing in New Caledonia



(1) STMMPM: Territorial Merchant Marine and Maritime Fsheries Service

Table 2: Summary of catches (all species combined), and fishing effort of longliners, both foreign and domestic, fishing around New Caledonia

Year	New Caledonian Longliners			Japanese Longliners			Taiwanese Longliners			Korean Longliners			TOTAL		
	Zone	Effort	Catches	Zone	Effort	Catches	Zone	Effort	Catches	Zone	Effort ***	Catches ***		Effort	Catches
62				A	11.39	11117							A	11.39	11,117
63				A	8.99	6150							A	8.99	6150
64				A	6.07	4246							A	6.07	4246
65				A	4.88	3831							A	4.88	3831
66				A	8.78	6656							A	8.78	6656
67				A	5.25	4355	A	0.72	637				A	5.97	4992
68				A	4.02	2481	A	1.42	1207				A	5.44	3688
69				A	2.71	1599	A	1.29	994				A	4.00	2593
70				A	5.07	3517	A	4.19	4453				A	9.26	7970
71				A	4.99	2881	A	4.45	3833				A	9.44	6715
72				A	2.89	1749	A	5.72	5803				A	8.60	7552
73				A	3.38	1881	A	10.01	8025				A	13.39	9906
74				A	5.10	1987	A	5.54	2771				A	10.64	4758
75				A	2.10	945	A	5.10	3125	A	0.20	80	A	>7.40	>4149
76				A	2.78	1445	A	5.75	4586	A	0.16	44	A	>8.70	>6074
77				A	0.74	304	A	6.84	4801	A	0.31	110	A	>7.90	>5214
78				A	1.57	722	A	5.33	4426	A	0.10	50	A	>6.99	>5199
79				A	3.59	1574	A	5.95	3549	A	0.52	268	A	>10.07	>5390
80				A	3.27	1483	A	11.5	7223	A	0.38	214	A	>15.15	>8920
81				A	4.90	1937 *	A	5.15	2289				A	10.05	4226
82				A	7.70	2930 *	A	3.00	1408				A	10.70	4338
83	A	0.09	60**	A	3.90	1610 *	A	2.53	1846	A	0.09	64	A	>6.61	>3580
	EZ	0.09	60**	EZ	0.23	122**							EZ	0.32-2.94	182-2092
84	EZ	0.30	195**	EZ	0.42	229 **	A	2.99	1113	A	1.00	435	EZ	0.72-4.71	424-1972
85	EZ	0.56	398**	EZ	0.95	558 **	A	1.68	726	A	0.45	213	EZ	1.51-3.64	956-1895
86	EZ	0.61	509**	EZ	0.92	586 **	A	0.46	190	A	0.29	245	EZ	1.02-2.29	1095-1530
87	EZ	1.25	1139**	EZ	0.56	412 **	A	0.23	203				EZ	1.81-2.04	1551-1754
88	EZ	0.63	805**	EZ	0.70	720 **	A	1.77	954	A	0.26	83	EZ	1.33-3.37	1525-2562
89	EZ	1.02	834**	EZ	1.96	1412 **	A	2.71	1013	A	0.48	172	EZ	2.98-6.17	2246-3431
90	EZ	1.61	1152**	EZ	2.02	1293 **	A	1.52	567				EZ	3.63-5.15	2445-3011
91	EZ	0.94	633**	EZ	1.10	643 **	A	2.65	1139				EZ	2.04-4.69	1276-2415
92	EZ	0.78	506**	EZ	0.34	246 **							EZ	>1.12	>752
93	EZ	0.98	892**										EZ	>0.98	>892
94	EZ	0.41	303**	EZ	1.17	908 **							EZ	>1.58	>1211

* Value calculated catch figures provided by the Japanese Fishery Agency and the average weight per species

** Underestimated values from a few logsheets provided to the SMMPM

*** Underestimated values due to unknown coverage rate

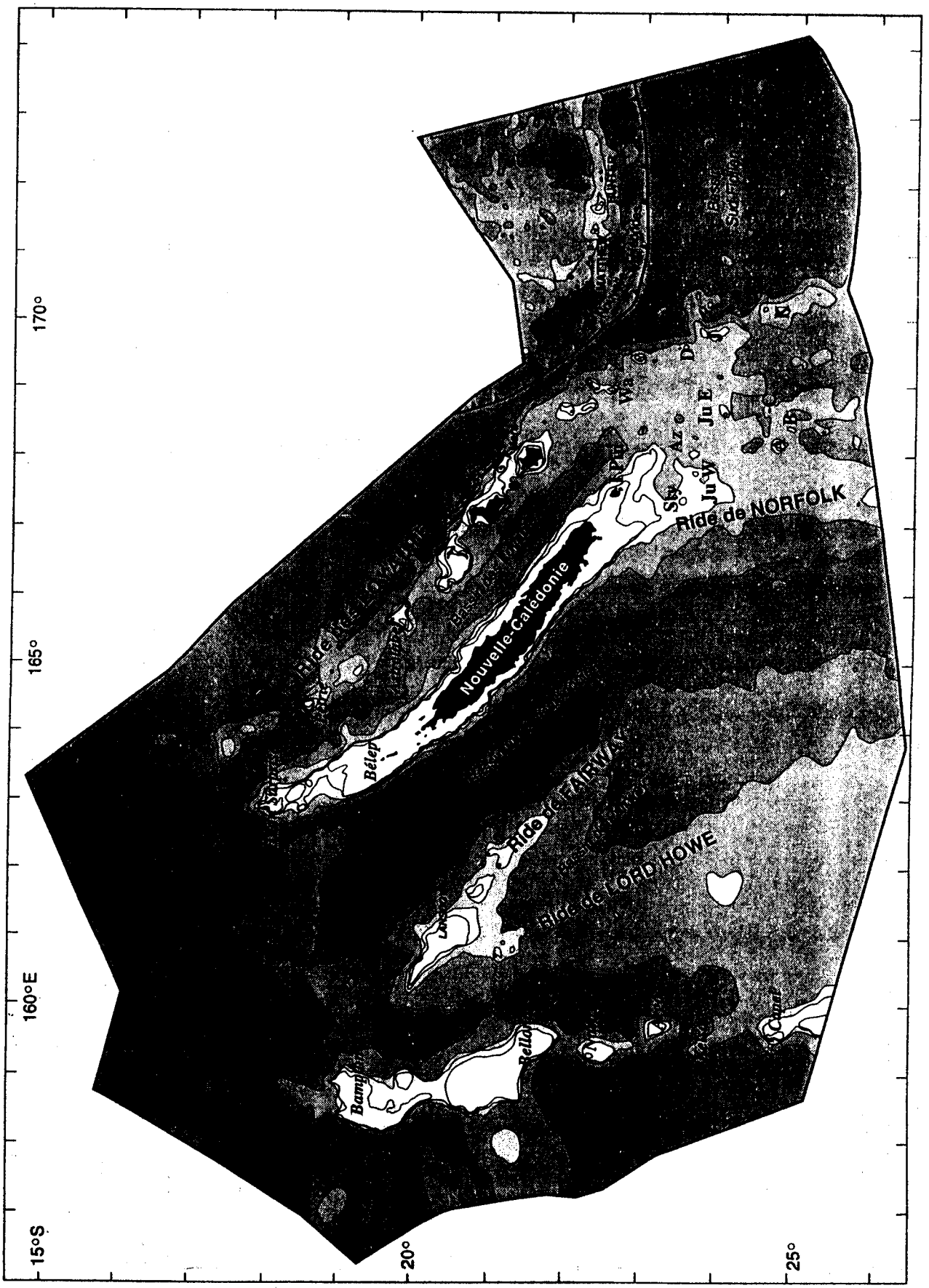


Figure 1: Map of the geomorphological structures of the New Caledonian EZ

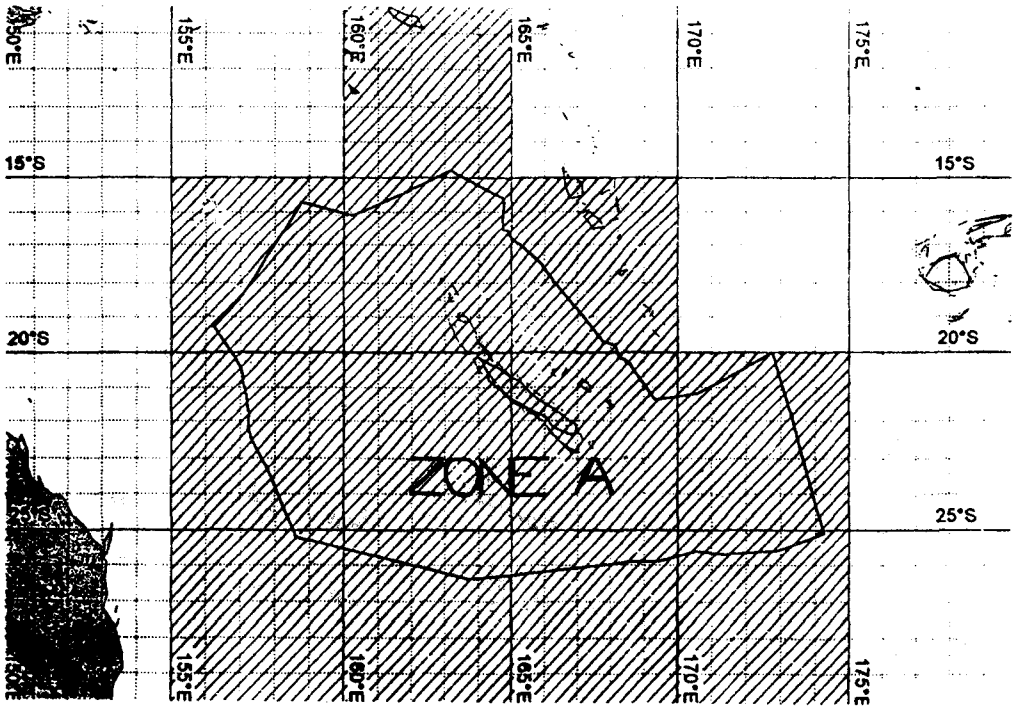


Figure 2a: Zone A (shaded area) formed with 5° statistical squares covering New Caledonia's EZ

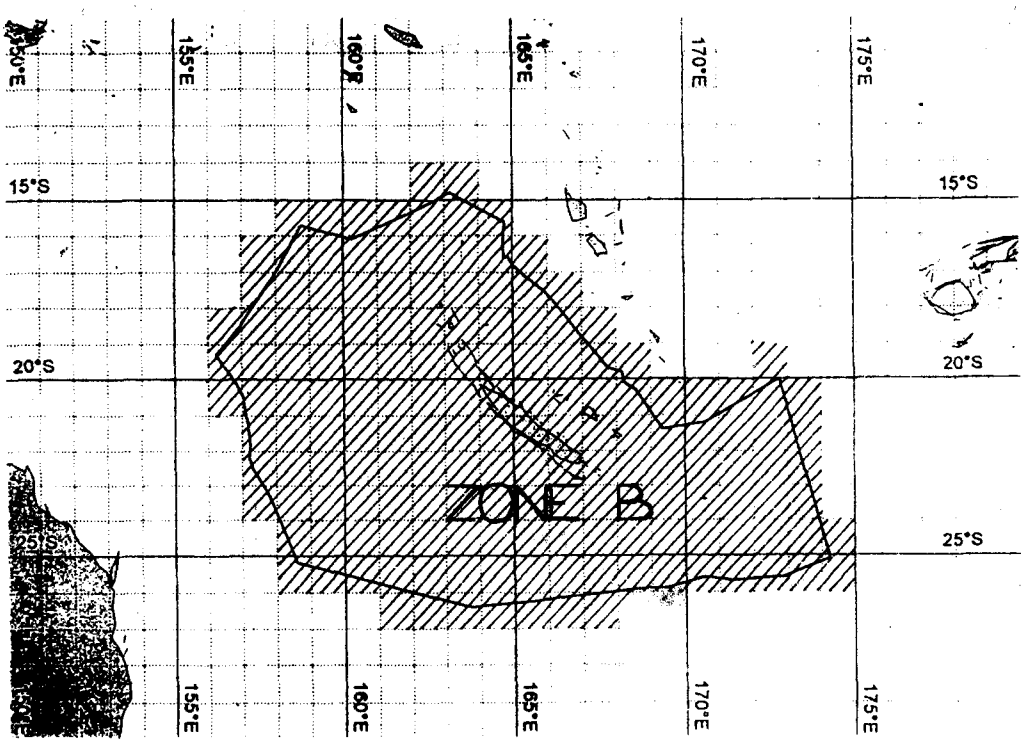


Figure 2b: Zone B (shaded area) formed with 1° statistical squares covering New Caledonia's EZ

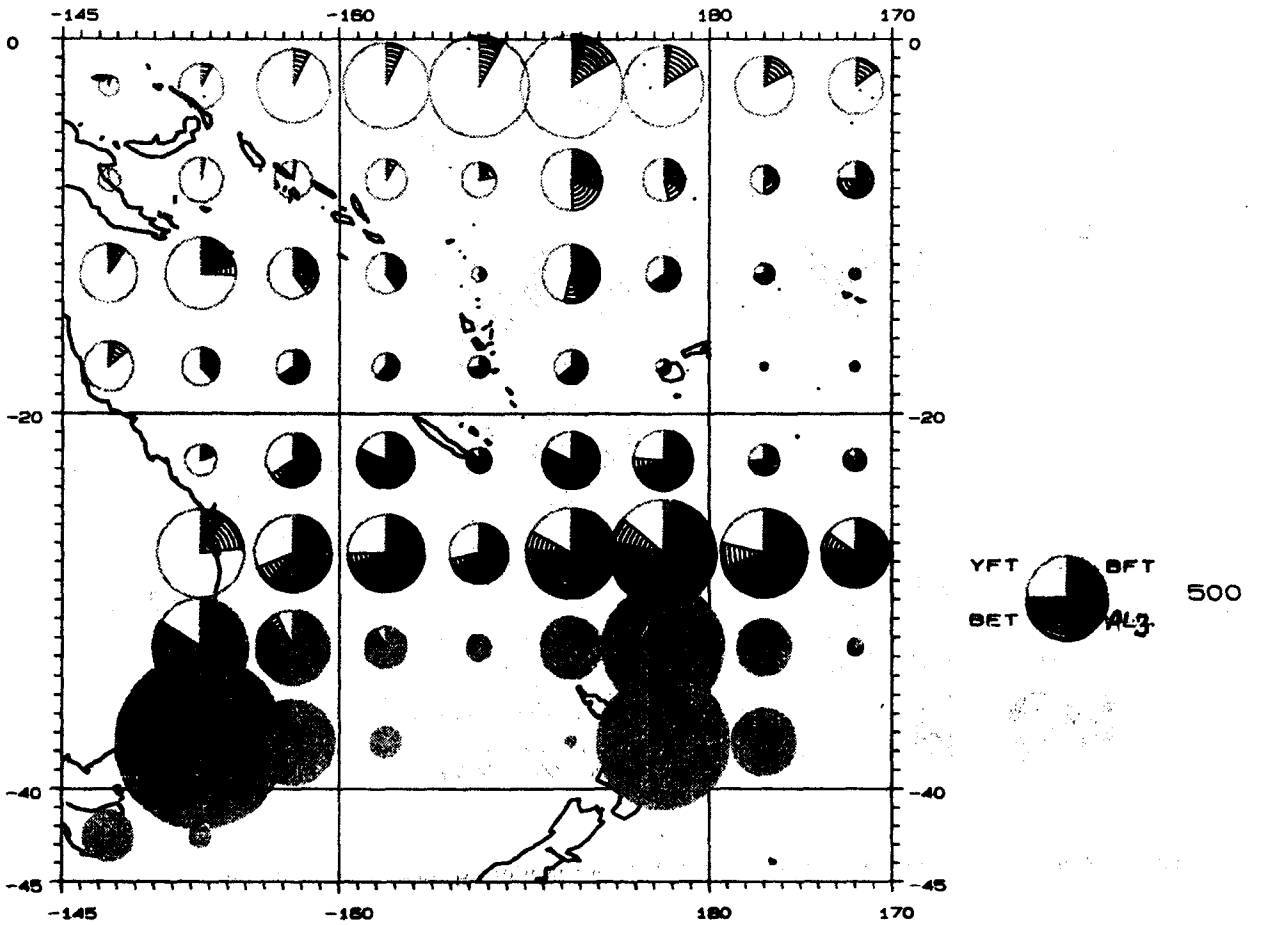


Figure 3: Geographic distribution of longline catches by species for the third quarters of the years 1956–1968, foreign and domestic fleets combined (Fonteneau, pers.com.).

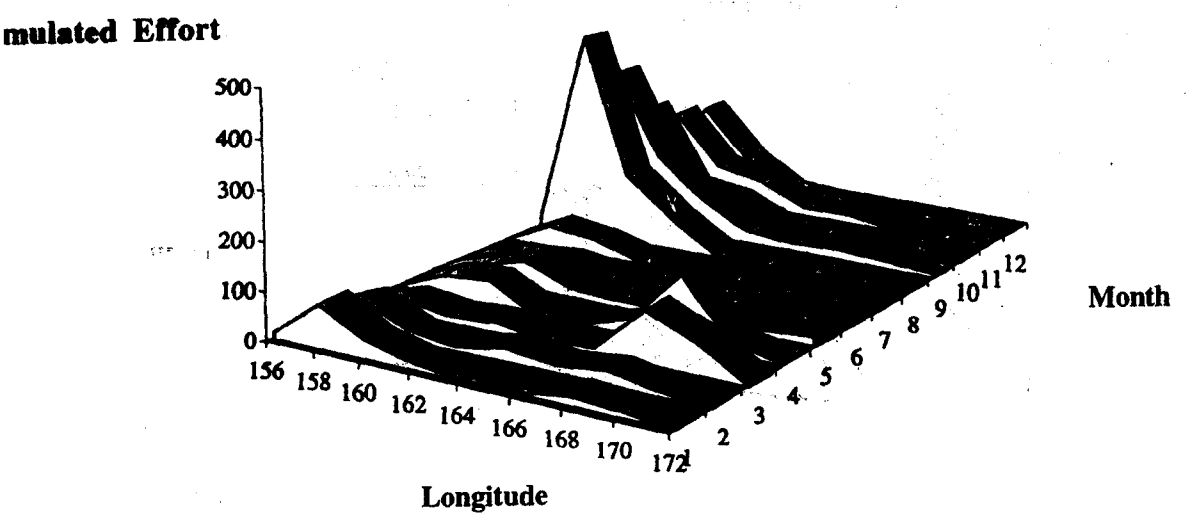
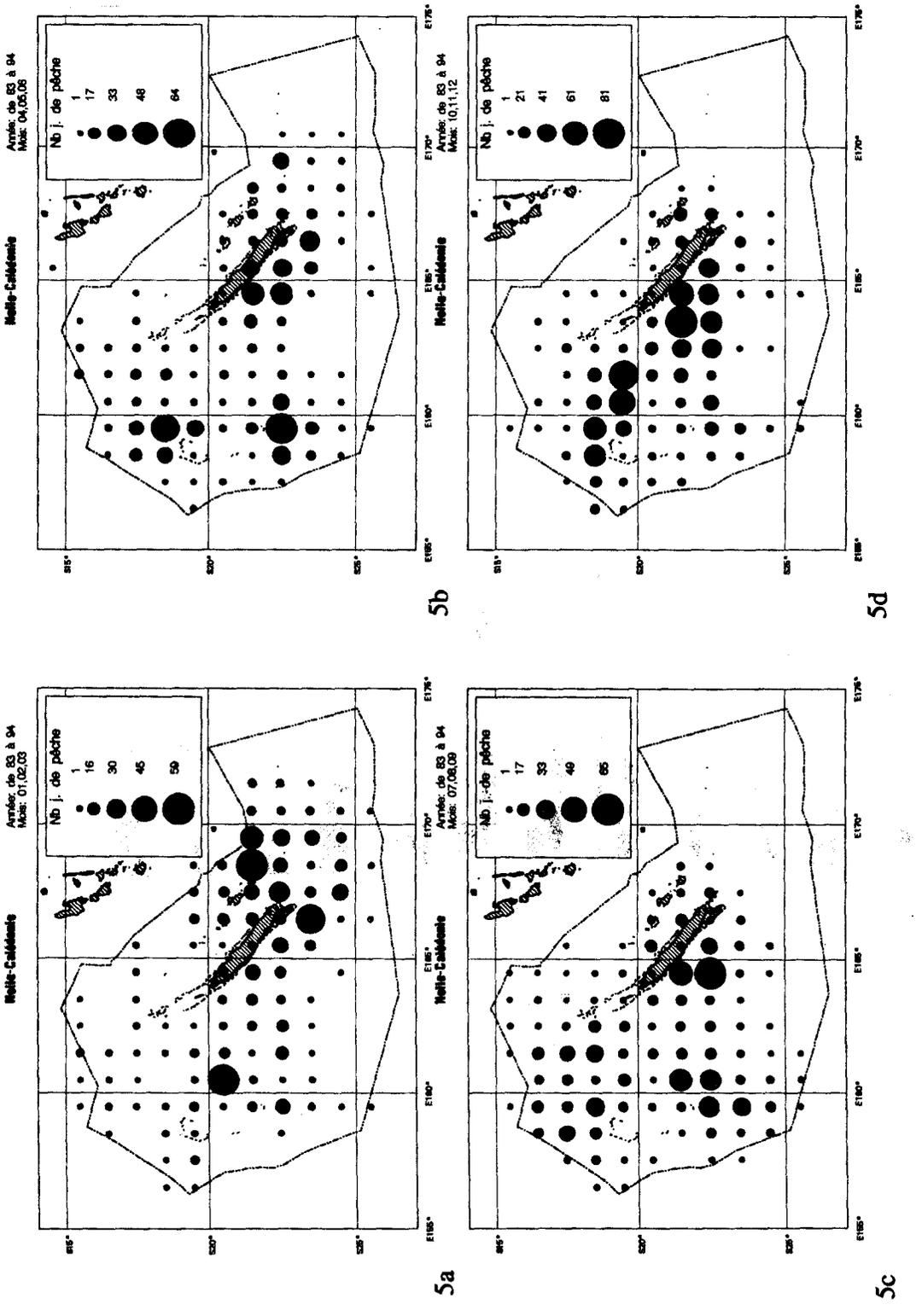


Figure 4: Distribution of cumulated monthly fishing effort by Japanese longliners during the period 1983–1994 by 2° wide longitudinal bands.



Figures 5a–5d: Geographic distribution of quarterly fishing effort for New Caledonian longliners (effort in cumulated number of fishing days from 1983 to 1994).

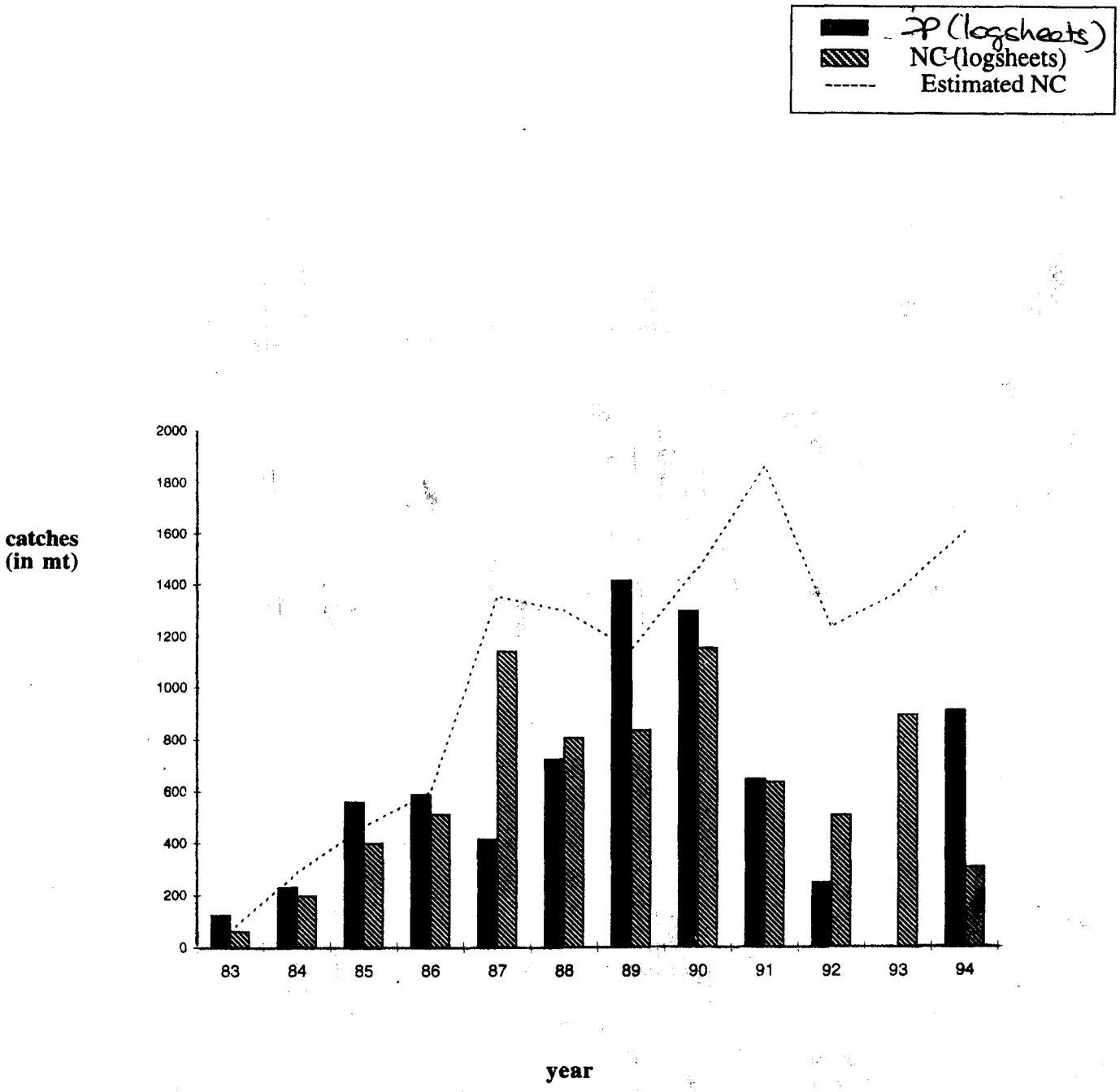
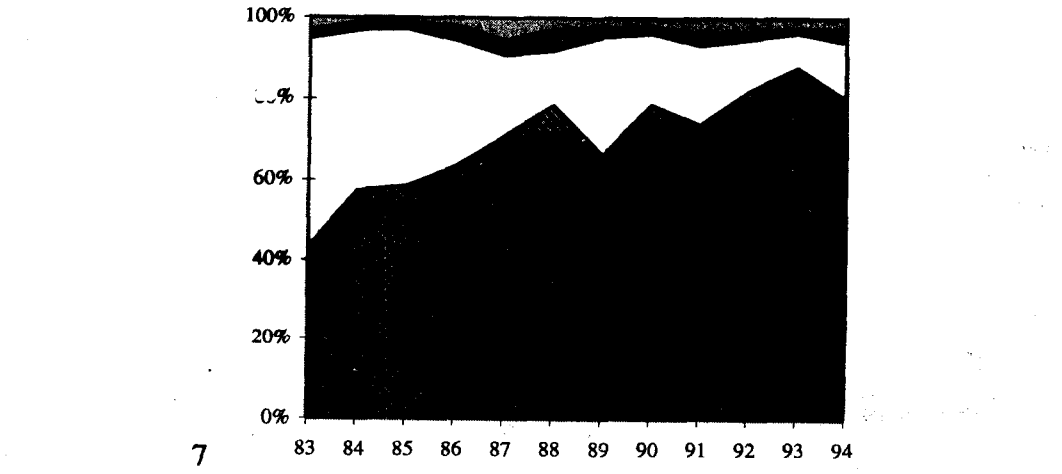
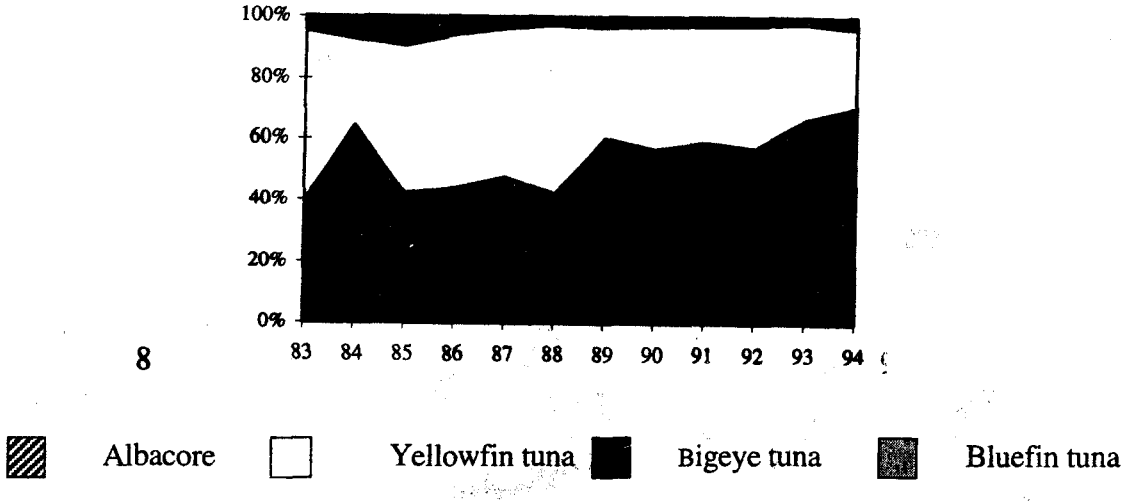
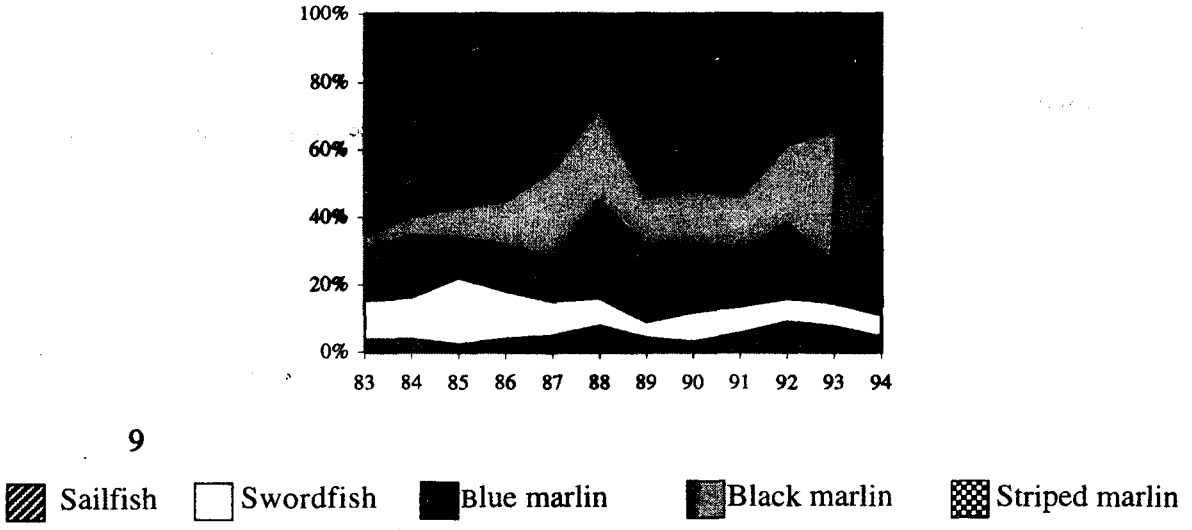


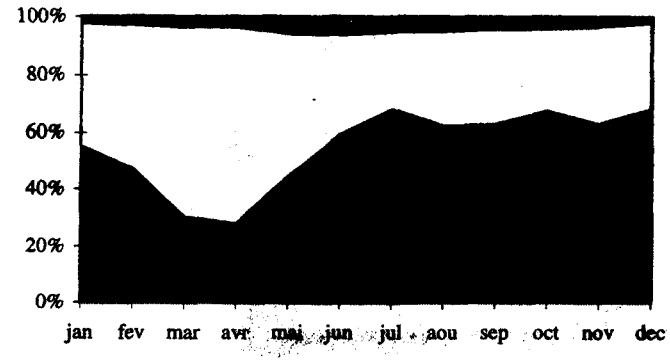
Figure 6: Evolution of annual catches by New Caledonian and Japanese longliners in New Caledonia's EZ between 1983 and 1994.







Figures 7–9: Evolution of the species composition of catches by weight for longliners fishing in New Caledonia's EZ



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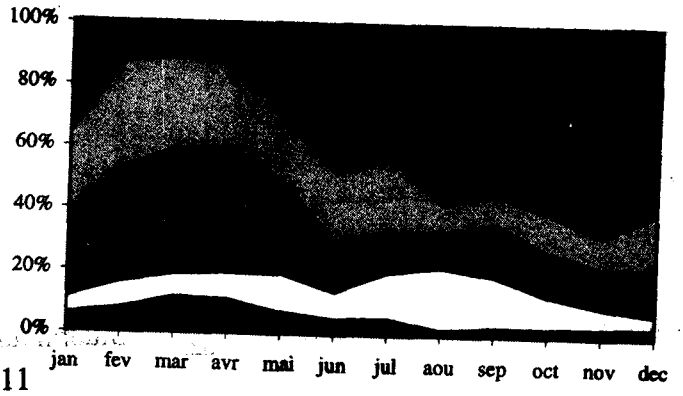

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Figures 10 and 11: Evolution of the species compositon of tuna (10) and billfish catches (11) by weight for longliners fishing in New Caledonia's EZ.

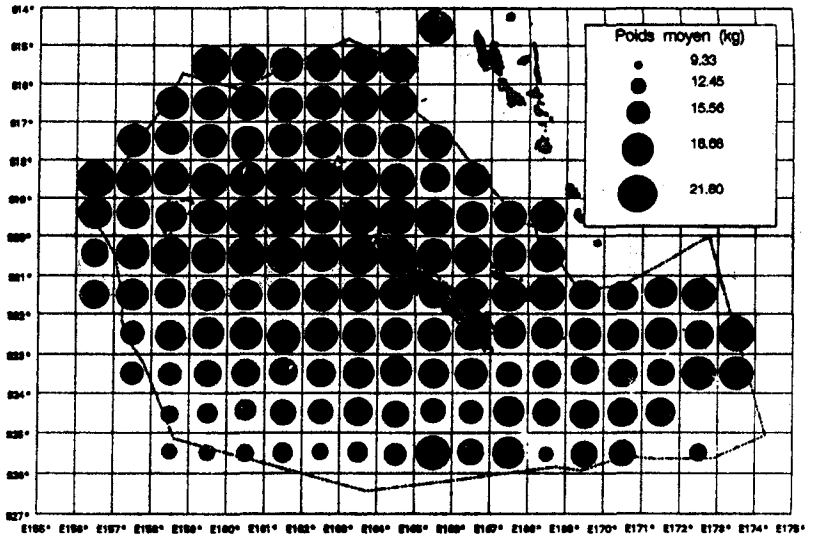


Figure 12: Geographic distribution of the average weights of albacore caught in New Caledonia's EZ

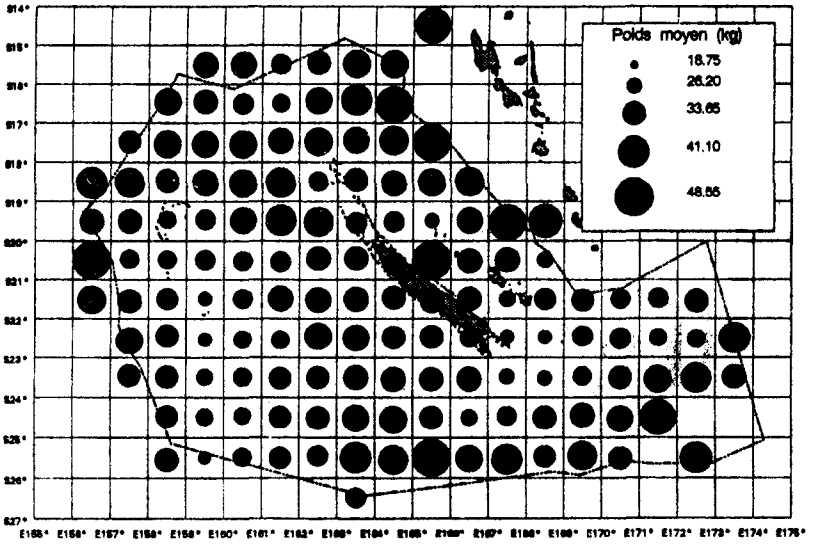
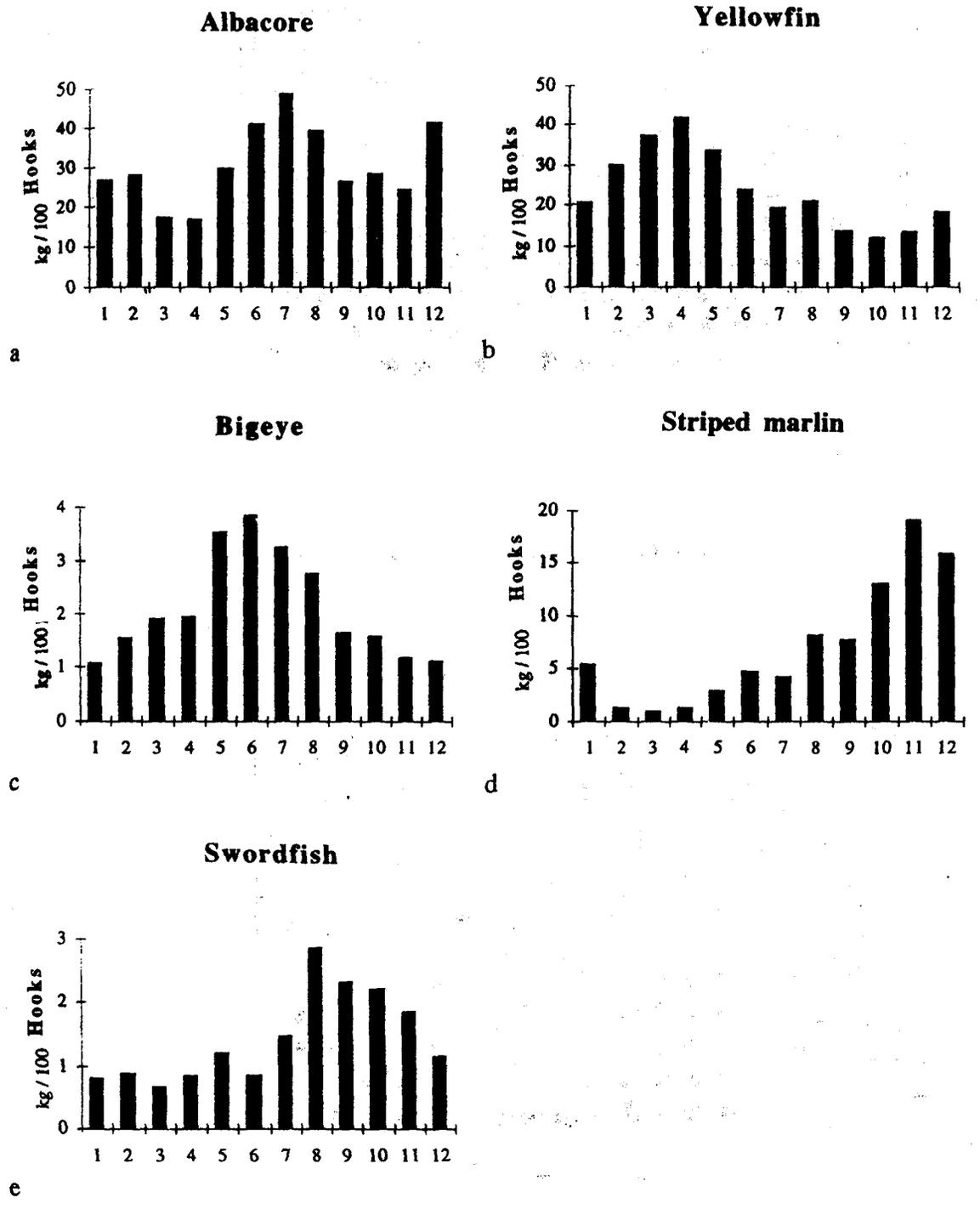
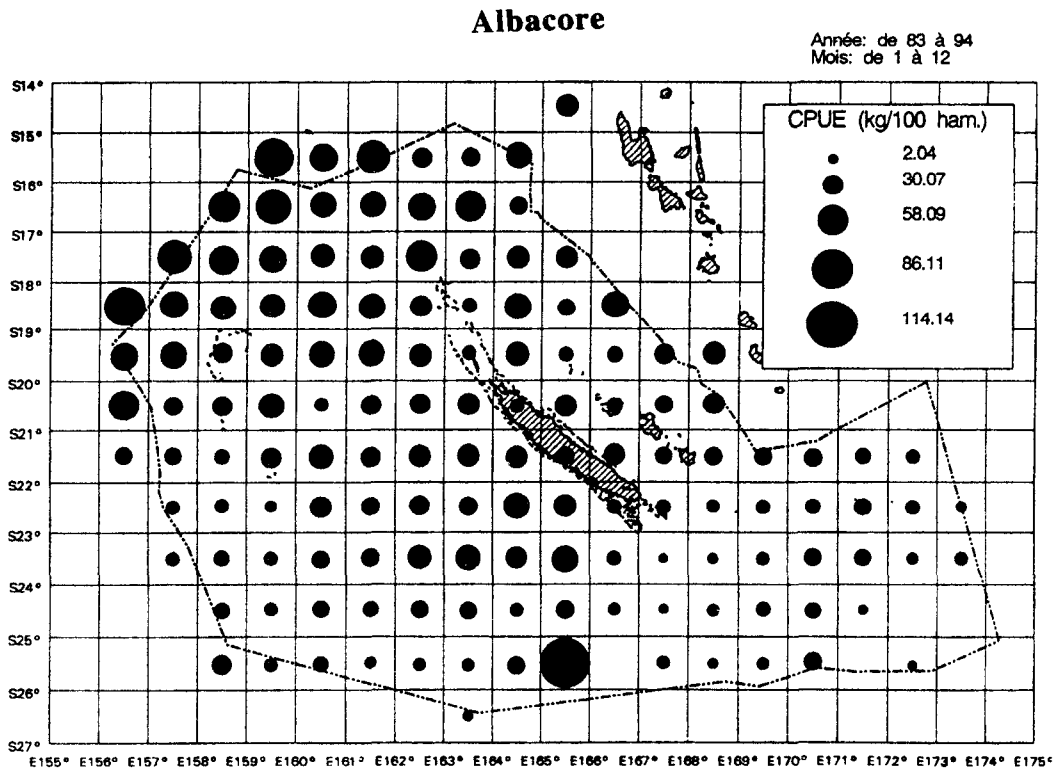
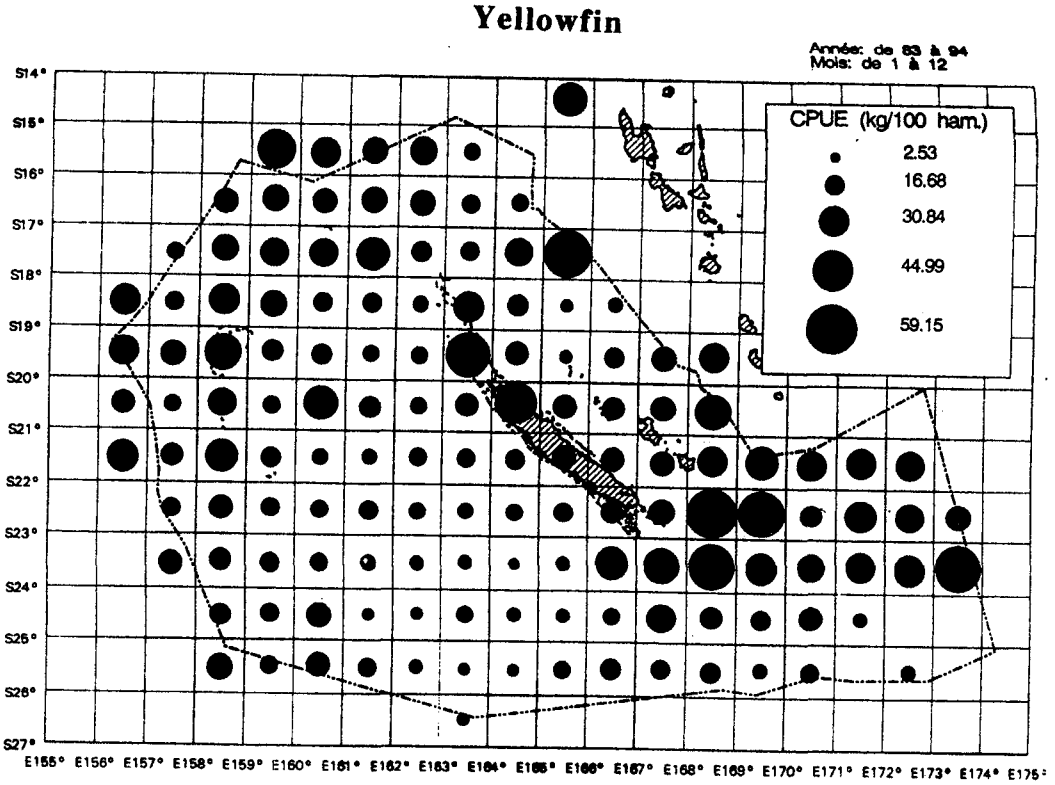


Figure 13: Geographic distribution of the average weights of yellowfin tuna caught in New Caledonia's EZ.



Figures 14a–14e: Monthly CPUEs by species, for longliners fishing in New Caledonia's EZ.





Figures 15a and 15b: Geographic distribution of the CPUEs by weight of albacore (a) and yellowfin tuna caught in New Caledonia's EZ.