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THE ORGANIZATION OF TUNA STATISTICS IN NEW ZEALAND

by

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PREPARATION OF THIS DOCUMENT

This paper was prepared as part of the background documentation for the Ad Hoc Consultation on Global Tuna Statistics, held in Colombo, Sri Lanka, 6-7 December 1985. It has been reproduced as a Fisheries Circular in view of its general interest as to how a small country without a long history of tuna fishing tackles the problems of collecting and processing statistical data.

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ABSTRACT

The New Zealand catch of tuna is slightly under 5,000 tons and that of foreign vessels in New Zealand waters rather more than 7,000 tons.* Possibilities for some growth in catches exist: Catch and effort data required for the management of these fisheries is collected by requiring New Zealand fishermen to furnish monthly, daily records of catch and effort by fishing area, and foreign fishermen to submit more detailed records of set position, environmental conditions and gear characteristics. Southern longline logbooks are returned when vessels clear New Zealand waters at the end of the season, Northern longline logbooks are returned from the home ports of the vessels. In addition to these routine records, special scientific investigations are made. Handling of the forms and summaries is made by staff with experience or knowledge of fishing, as they are better able to spot errors in the data. The data when checked and stored are available in different degrees of detail to different categories of user, with the more sensitive and detailed information available to specialist users.

* Errata. tons should read tonnes

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I. Introduction

1. New Zealand waters support fisheries for three tuna species:- Skipjack (Katsuwonus pelamis), Southern bluefin (Thunnus maccoyii) and Albacore (t. alalunga). In addition, there is a significant by catch of Bigeye (T. obesus) and Yellowfin (T. albacares) with minor catches of Northern bluefin (T. thynnus) reported. These fisheries account for half of the catch in FAO Area 81 (Southwest Pacific), and further expansion of some of the tuna fisheries is envisaged. Table 1 shows the size of New Zelaand fisheries by species, compared with the Southwest Pacific, total Pacific and world.

2. There are three domestic and two foreign tuna fisheries defined by area, method and target species. Two foreign longline fisheries operate, one to the north and a second to the southeast and east of New Zealand. The northern fishery targets on albacore, while the southern fishery targets on southern bluefin and bigeye tunas. A purse-seine fishery for skipjack that is primarily domestic concentrates on northern coastal waters over summer.

3. A domestic handline and troll fishery for large southern bluefin tuna operates from the west coast of the South Island during winter. The west coast of the South Island also supports an expanding troll fishery for albacore in summer months.

4. The national body mostly concerned with these fisheries is the Ministry of Agriculture and Fisheries (MAF), which has two divisions responsible for monitoring and managing all fisheries resources. Other groups interested in the industry rely on MAF for information and research. The agencies involved with or requiring regular information on New Zealand tuna fisheries are listed in Table 2.

II. Statistical Requirements

5. Tuna catch and effort data are gathered as part of the overall monitoring role of MAF. Management of foreign tuna fisheries is by limiting the number of vessels permitted to fish, and regulating the areas in which they can operate. Domestic fisheries have a quota for southern bluefin.

6. There are three levels of data which are routinely required: 1) data attributable to individual vessels; 2) detailed catch and effort summaries; and 3) summaries of annual landings.

7. The first category of information is required by MAF scientists who collect data on individual fishermens' daily activity (e.g. catch, effort, size of fish, area of operation, etc.). Individual catch, effort and vessel data are also required by Fisheries Officers for the purpose of law enforcement. Specific overseas research agencies also receive these data but with individual identity suppressed to maintain confidentiality.

8. Summaries of catch and effort by month, year, region, species and fishing method are routinely requested by fisheries managers and economists. These data summaries are also supplied on request to international agencies involved with the regional tuna fisheries. (e.g. UNDP/IPTP).

9. Data are also tabulated from the detailed summaries. These are available in publications and popular articles and are generally adequate to fulfil the requirements of fishermen, administrators, local bodies, researchers, politicians and commercial groups.

III. System for Collecting Statistics

10. There are two systems for collecting fisheries statistics. A national system provides long term catch and effort data for monitoring purposes and specific data are collected to supplement scientific programmes.

11. The Fisheries Statistics Unit (FSU) is the national body responsible for the collection and processing of fisheries statistics within the New Zealand EEZ. It comprises a staff of fourteen, based at the Fisheries Research Centre, Wellington. All fishermen are required by law to furnish information to the FSU on catch and effort and failure to file returns can result in prosecution. There is some variation in the detail required between fisheries. Domestic forms require a daily measure of catch and effort appropriate to specific fishing methods, and identification of the fishing area as one of the 52 domestic statistical areas. Foreign longline returns require considerably more detail on set position, environmental conditions and gear characteristics in order to provide a record of fishing patterns and of changes in fishing methods in fisheries where it is impractical to use observers. Examples of fishing returns processed by the FSU are included as Figures 1 to 5, while Table 3 provides a summary of these returns and the data derived from them.

12. Information is returned from the tuna fisheries monthly in the case of domestic fisheries and prior to the start of the following season in the case of foreign longline fisheries. Southern longline fishery logbooks are returned when vessels clear New Zealand ports at the end of each season. The northern longline vessels generally do not enter port during the season and logbooks are returned from their home ports, which in many instances imposes up to a two-year delay in receiving data.

13. The second system of statistical collection is run by MAF fisheries scientists and includes research logbooks completed by fishermen, observer programmes, and aerial sightings logbooks. These diverse data sources are used to give additional details on length, weight, and sex composition of the catch, logbook accuracy as well as information on school size and distribution. Table 4 describes the collection of these and of supplemental data while Figures 6 to 8 are examples of log forms returned.

14. In addition to these two systems, to ensure timely monitoring of the northern foreign longline fleet during the season, MAF requires each foreign vessel to make radio contact to report its position each week. Positions are updated more often if a vessel moves more than sixty nautical miles during the week. Vessels also report their weekly catch by species and weight at each radio contact.

IV. Data Management

15. Fisheries statistics are stored on a Prime P750 super-mini-computer at the Fisheries Resarch Centre. Official statistics are available on line via a national computer network, to all authorized fisheries staff within MAF. There are more than 250 users in at least 25 centres throughout the country.

16. Data management of all fisheries statistics is run by the FSU. The unit receives returns throughout the year for all fishing in the New Zealand EEZ. Figures 8 and 9 illustrate the general organization of the data management system.

17. Domestic statistics are processed as follows:-

- Upon receipt, returns are sorted by fishing method, i.e., form type, then checked by staff familiar with specific fisheries for obvious errors prior to machine encoding on magnetic tape. Encoded data are processed through error checking programs and any errors are corrected. The checking program is rerun until no errors are reported. At this point, returns are copied to master files which are the machine encoded equivalent of fishermens' returns. Master files can be used, but not edited, by any programmer who is recognized by the MAF computer system. Non-programmers who wish to examine the data on the master file can access it with a special interactive viewing program. This option, however, does not allow users to make summaries for themselves. To produce data summaries, two types of programs are regularly run. The first accesses the master file to create several standard updated summaries of landings by region and catches by fishing area for main fish species in a calendar year. In addition, summaries of species caught in each region by month and year, and species caught by each method by month and year are produced. The second type of program is used interactively in a question and answer format enabling users to summarise fishing return data according to their own specifications in report format or as input for further analysis.

- Logbooks from the foreign flag vessels are processed in a separate system. They are checked and encoded in the same way as domestic returns, but the data is not available to the network, and master files are only accessible to specialist users.

- Data gathered by the MAF fisheries scientists are also stored on computer but are not available to the network. These data are generally used only by scientific staff.

- In addition to catch and effort data, the FSU maintains individual vessel registration information on computer. Boat registration files contain details of all vessels, such as lengths, tonnages, owners, captain, and other data required for registration. Some of these data are available on request and some are included in summaries and data reports (e.g. vessel length related to catch).

V. Statistics for Domestic Fisheries

18. Data for the period 1974 to 1982 consist of landings by species, fisheries management region, month and fishing method. Effort data, however, was not encoded. Data summaries are available, but direct access otherwise is limited to specialist users.

19. From 1983 onward, all information given by fishermen on returns has been encoded and stored on master files. All data are available to specialist users. For non-programmers a comprehensive computer summary is available which includes catch and effort data for each management area. Extract programs allow users to choose any combinations of effort, fishing method, region, month, year, species, as well as size and type of vessel. Standard summaries are updated weekly and include landings by method in each landing region and catch by method in each fishing area.

VI. Statistics for Foreign Flag Vessels

20. Computer summaries are available for all seasons since 1980 and limited data are available for 1978 and 1979. No data were collected from foreign vessels on their fishing activity prior to 1978 when New Zealand extended its jurisdiction to 200 miles. The summaries include tables of monthly catch by species and management area, as well as summaries of catch and effort data by 1 grid. Specialist users can access all alongline data in the master file for analysis.

VII. Statistical Publications

21. Information released from MAF is commonly produced in the form of internal reports, occasional publications and in articles in popular magazines. Published statistics also occur in reports of other bodies that request data, but most reports are prepared for New Zealand internal purposes. These publications are available on request.

VIII. Problem Areas with Fisheries Statistics

22. The problems which have arisen in the development of a tuna fisheries database in New Zealand are common to many fisheries and to nations with limited resources for monitoring and enforcement.

23. Most fisheries in New Zealand are based on small owner-operator vessels less than 25m LOA which fish many species by several methods. To ensure routine return of catch and effort data we have found it necessary to develop a series of method specific reporting forms to provide a daily record of activity. A small operator may have to complete a variety of forms and so forms are kept simple and easy to complete. A straightforward form requires some sacrifice of detail, but results in a more dependable database of catch and effort. In addition, FSU staff and individual researchers routinely liaise with fishermen to encourage the return of accurate data. Lack of resources and limited space on vessels has prevented us from being able to run comprehensive observer programmes for routine verification of data supplied by fishermen.

24. One of the problems inherent in our system of fishing returns is their availability to other government departments. Conversations with fishermen lead us to suspect that under and over reporting biases have varied in importance between years. The perception of many New Zealand fishermen has been that if returns can be obtained for tax purposes then it is in their interest to neglect reporting the portion of their catch that they are able to sell for cash. These biases are usually easy to estimate and remain relatively constant between years. The proposed imposition of quotas even in unrelated fisheries however, may encourage fishermen to over report if they perceive that a quota based on fishing history is likely to be imposed.

25. In foreign licenced fisheries, vessels may catch several species but the method is the same throughout the season. These vessels are usually large and well staffed, and are able to provide greater detail on the fishing operation. Instructions on filling out the log, written in the mother tongue of the crew, ensure that we receive data that is as accurate as possible. Where possible, the log itself is also written in the crew's mother tongue.

26. Although the current system is satisfactory, we endeavour to improve data collection through liaison with fishermen to convince them of the usefulness of the data and to identify sources of bias.

The production and distribution of data summaries to fishermen appears to have improved the attitude of fishermen towards MAF and the completion of fishing returns. Verification of statistics rely on analysis of data from observer programs which at present are limited.

IX. Summary

27. Experience within New Zealand suggests that the following factors are essential for successful data collection:

- Forms should be simple and straightforward. Complex forms lead to incomplete returns, and may cause inaccuracies as fishermen estimate catch and effort at the end of a reporting period rather than at the end of each fishing operation.

- Handling of forms and summaries should be made by staff with experience in or knowledge of fishing. This ensures better quality of data, as errors are more obvious to staff if they are familiar with its source. It also facilitates liaison with fishermen at sea and at landing points.

- A complete library of data handling programs is essential to allow both specialist and non-specialist users to make use of the data. A committment to program development ensures quality of data summaries and ease of access.

- Centralization of all returns and data handling has, in our experience, improved consistency in entry and use of data, and continuing contact with fishermen throughout the country compensates to some extent for the loss of local participation.

28. The double system by which catch and effort data is collected from all fishermen with more detailed data collected by scientists, allows accuracy and comprehensiveness for basic data, while at the same time affording detailed data where required.

Table 1

1983 Tuna catches in metric tonnes from the New Zealand EEZ compared with Southwest Pacific (FAO Area 81), total Pacific (FAO Areas 61, 67, 71, 77, 81 and 87) and world. Figures from Anon (1984a), Murray, et al (1984).

	New Zealand EEZ			Southwest Pacific	Total Pacific	World
	Domestic	Foreign Flag	Total			
Albacore	718	901	1619	9459	106317	200783
Bigeye	0	442	442	2038	108887	199699
Skipjack	3911	4222	8133	9160	563239	773719
Southern Bluefin	112	1618	1730	6348	6348	33569
Yellowfin	0	31	31	1793	339052	533629
Northern Bluefin	0	62	62	0	0	48977
TOTAL	4741	7276	12017	28798	1148266	1741399

Table 2

Agencies involved with or regularly requiring information on New Zealand tuna fisheries.

Fishing Ventures	Ministry of Agriculture and Fisheries	Other Interested Groups
Domestic	Fisheries Research Division	
- Purse seine (skipjack), incl. foreign flag vessels operating as Joint Ventures	- Scientists (Pelagic Research Group) - Fisheries Statistics Unit (FSU)	Fishing Industry Board Fishing Companies Exporters Other Government Departments
- Handline and troll for southern bluefin	Fisheries Management Division	Local Government (especially harbour boards)
- Troll for albacore	- Resource Managers - Fisheries Officers - Administration	Fishermen Local Fishermens' Associations
Foreign Licence	Economics Division	
- Northern longline for albacore (Korean and Japanese)		
- Southern longline for southern bluefin and bigeye (Japanese)		

Table 3

Official tuna statistics collected by the Fisheries Statistics Unit

SOURCE	FREQUENCY OF RETURN	DATA COLLECTED FOR EACH VESSEL
Domestic Vessels		Purse Seine Daily Log
Purse seine - Purse seine daily log (Fig.1) - Landed catch form (Fig.2)	Both returned at the end of each trip.	Date, location, activity. Data for each set including latitude and longitude, sea temperature, start and finish time, estimated catch by species (tonnes).
Purse seine joint venture - Purse seine daily log - Landed catch form	Returned at the end of each trip. Received when the vessel unloads, usually at the end of the season.	Landed Catch Dates of trip, weight in kilograms of each species landed, total weight of all fish landed.
Troll - Troll and Pole fishing return (Fig.3)	Returned monthly	Troll and Pole Fishing Return Month, port of landing, main method (Troll or Pole), no. of jigs. Data for each day including fishing area, hours fished, numbers of each tuna species and other species, landed whole weight in kilograms for each species.
Handline - Line Fishing return (Fig.4)	Returned monthly	Line Fishing Return Month, port of landing. Data for each day including area number, no. of hooks set or no. of handlines, landed whole weight in kilograms for each species.

Table 3. (continued)

SOURCE	FREQUENCY OF RETURN	DATA COLLECTED FOR EACH VESSEL
Foreign Licence Vessels		
Northern Longline - Log of each set (Fig.5) - Southern Longline - Log of each set (Fig.5)	Logbook returned after the end of the season Sent after return to home port. Logbook returned at the end of the fishing season when the vessel clears customs (no later than September of each year).	Data for Each Set Target species, time, latitude, longitude, sea surface temperature, wind, cloud, line length, no. of hooks, total no. of baskets, bait used, processed weight of each southern bluefin, total processed weight of other tuna and billfish by species, number of sharks caught.

Table 4

Supplemental collection of tuna statistics by fisheries scientists for research purposes.

SOURCE	FREQUENCY OF RETURN	DATA COLLECTED
Research logbooks on Japanese longline vessels (Fig.6) (calipers supplied to measure southern bluefin)	Logbooks returned at the end of each season.	Daily record of target species, latitude and longitude. Record for each fish: hook number, species, time, sea surface temperature, sex, length, weight.
Research logbooks on domestic southern bluefin freezer vessel.	Logbooks returned at end of the season.	Date, wind force, wind direction, sea surface temperature, latitude and longitude, fish number, name of vessel that caught the fish, fork length, processed weight, sex, grade.
Observer Programs		
- Limited program for foreign longline and domestic handline fishery	Data returned by observer at the end of each trip.	Biological samples, length frequencies, general observations.
- Systematic program for purse seine vessels, skipjack research program (not current)	Several forms returned by observer at the end of each trip.	Catch, effort, length, weight, girth, school sightings from vessels and ship-based aircraft.
Aerial sightings from spotter planes supporting the purse seine fishery (Fig.7)	Pilot returns forms at his convenience throughout the year.	No. of schools, species, estimated tonnes (min, max, total), time, sea surface temperature, sea conditions, location, time spent searching for fish.
Research cruises	Cruise reports, various publications - at the end of each cruise and as completed.	Troll and longline catch, effort, position, biological and hydrological data.
Reported position and catch from foreign longline fleets.	Summaries of radio reports to the Fisheries Control Centre, forwarded to the Pelagic Research Group weekly during the season.	Weekly position and catch (tonnes) by species.
Limited market sampling	At the end of each sampling trip.	Length and weight

FIGURE 1

10

DAILY PURSE SEINE LOG

Registered no.

Vessel name

Date

Day Month Year 1 9

Location

Tick if searching/fishing

1 a.m.

2 p.m.

If not searching/fishing tick reason

1 Travelling
2 Bad weather
3 Discharging/stores
4 Repairs/survey
5 Time off

Sets							Estimated catch (tonnes)								
Set no.	Location: Latitude Degrees	Latitude Minutes	Longitude Degrees	Longitude Minutes	Sea temp.	Start time	Finish time	Skipjack	Trevally	Blue mackerel	Jack mackerel	Kahawai	Other species		Wells	Remarks

Notes

SIGNATURE

FIGURE 2

15

LANDED CATCH FORM

Registered no. | Vessel name | Port of landing

Factory name | Code

First day fished (Day Month Year 19) | Last day fished (Day Month Year 19)

Species	Code	State	Weight (kg)	Species	Code	State	Weight (kg)
Barracouta	BAR			Snapper - ordinary	SNA		
Blue cod	BCO			Snapper - premium	SNP		
Blue nose (Bonita)	BNS			N.Z. sole	ESO		
Elephant fish	ELE			Lemon sole	LSO		
Sand flounder (Dabs)	SFL			Sole - mixed	SOL		
Y. belly flounder	YBF			Squid	SQU		
Flounder - mixed	FLO			Stargazer (Monkfish)	STA		
Gemfish (S. kingfish)	SKI			Tarakihi	TAR		
Gurnard	GUR			Trevally	TRE		
Hake (English)	HAK			Common warehou	WAR		
Hapuku	HAP			Silver warehou	SWA		
Hoki	HOK						
John dory	JDO			Albacore	ALB		
Kahawai	KAH			Skipjack	SKJ		
Kingfish (Yellowtail)	KIN			Sth bluefin tuna	STN		
Leatherjackets	LEA						
Ling	LIN						
Jack mackerel	JMA						
Blue mackerel	EMA						
Moki	MOK						
Octopus	OCT						
Orange roughy	ORH						
Oreo dory	OEO						
Lookdown dory	LDO						
Red cod	RCO						
Red cod	RCO						
Rig (Spot'd dogfish)	SPO						
School shark	SCH						
Ghost shark	GSH						
Skate	SKA						

Please code state as follows

Green	GRE	Trunked	TRU
Gutted	GUT	Headed, gutted and skinned	HGS
Headed and gutted	HGU	Filleted	FIL
Gilled and gutted	GGU	Trimmed fillets	TRF

Total weight landed (kg)

FIGURE 3

06

TROLL and POLE FISHING RETURN

Registered no.

Name of vessel

Month Year

Port of landing

Tick main method 1 Trolling 2 Poling

No. of jigs

Fishing information									Landed catch				
Day of mth	Tick each day fished	Area no. see map	No. of hours fished	Albacore numbers	Skipjack numbers	Southern bluefin numbers	Other species		Albacore kg	Skipjack kg	Southern bluefin kg	Other species	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
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16													
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22													
23													
24													
25													
26													
27													
28													
29													
30													
31													

SIGNATURE

05

LINE FISHING RETURN

Registered no.

Name of vessel

Port of landing

Tick main method

1 Bottom longline
2 Drop or dhan line
3 Handline
4 Other_____
Specify

Month | Year

Fishing information				Landed catch (weight in kg and state, e.g. gutted, for days catch landed)										Name of fishing grounds
											Other species			
Day of month	Area no. see map	no. of hooks set	No. of hand-lines OR	Snapper	Hapuku	Rig	School shark	Ling	Blue cod	Gurnard				
				SNA	HAP	SPO	SCH	LIN	BCO	GUR				
				State	State	State	State	State	State	State	State	State	State	

SIGNATURE

Foreign Long Liner Log Form

START NEW SHEET EACH SET

TARGET SPECIES	2		CODE

POSITION AT START OF SET

LATITUDE			LONGITUDE		
DEG	MIN		DEG	MIN	E/W
		S			

SETTING LINE

	DATE			TIME NZST	SEA SURFACE TEMP (°C)		DATE			TIME NZST	CLOUD	
	DAY	MONTH	YEAR				DAY	MONTH	YEAR		COVER	TYPE
START OF SET						FINISH OF SET					8	

HAULING LINE

	DATE			TIME NZST	WIND FORCE		DATE			TIME NZST	WIND FORCE
	DAY	MONTH	YEAR				DAY	MONTH	YEAR		
START OF HAULING						FINISH OF HAULING					

GEAR

TOTAL LENGTH OF LINE(KM)	TOTAL No. OF HOOKS	TOTAL No. OF BASKETS

BAIT USED SPECIFY NUMBER OF HOOKS

1	SQUID		2	LURE		3	MACKEREL		4	SAURY		9	OTHER	

TOTAL NUMBER OF SOUTHERN BLUEFIN

CATCH

	STN	PROCESSED WEIGHT OF EACH SOUTHERN BLUEFIN (KG)															
40																	
40																	
40																	
40																	
40																	
40																	
40																	
40																	
40																	

	CODE	SPECIES	TOTAL PROC'D WEIGHT (KG)	No. OF FISH	CODE	SPECIES	TOTAL PROC'D WEIGHT (KG)	No. OF FISH
41	NTU	NORTHERN BLUEFIN			ALB	ALBACORE		
41	BIG	BIGEYE			YFN	YELLOWFIN		
41	BTU	BUTTERFLY TUNA			SWO	BROADBILL SWORDFISH		
41	STM	STRIPED MARLIN			BEM	BLUE MARLIN		
41	BKM	BLACK MARLIN			OFH	OILFISH		
41	SSF	SHORTBILL SPEARFISH			MAK	MAKO SHARK		
41	SAI	SAILFISH			SUN	SUNFISH		
41	MOO	MOONFISH			STU	SLENDER TUNA		
41								

	CODE	SPECIES	NUMBER OF FISH	CODE	SPECIES	NUMBER OF FISH
42	BWS	BLUE SHARK		THR	THRESHER SHARK	
42	BWH	BRONZE WHALER SHARK		SHA	OTHER SHARK	
42	RBM	RAYS BEAM				

FIGURE 6

Research Log Form for Japanese Long Liners

投縄の度に一枚使用のこと

目標魚種コード TARGET SPECIES	SPECIES CODE

日付 日	月	年

DATE

投縄時の位置 緯度 度	分		経度 度	分	
		S	POSITION		

雲 夜明 雲量	夜明 種類	薄暮 雲量	薄暮 種類
8		8	

CLOUD COVER AND TYPE

釣針番号 RUN	魚体番号 HOOK NUMBER	魚種 SPECIES NAME	コード CODE	ニュートラル揚げ時間 TIME	表層水温 SEA TEMP. °C	性別 SEX	体長 LENGTH CM	加工重量 WEIGHT KG	摘要 COMMENTS

FIGURE 7 Pelagic Fish Aerial Sightings Form

Date _____ Pilot _____

Customer _____ Aircraft _____

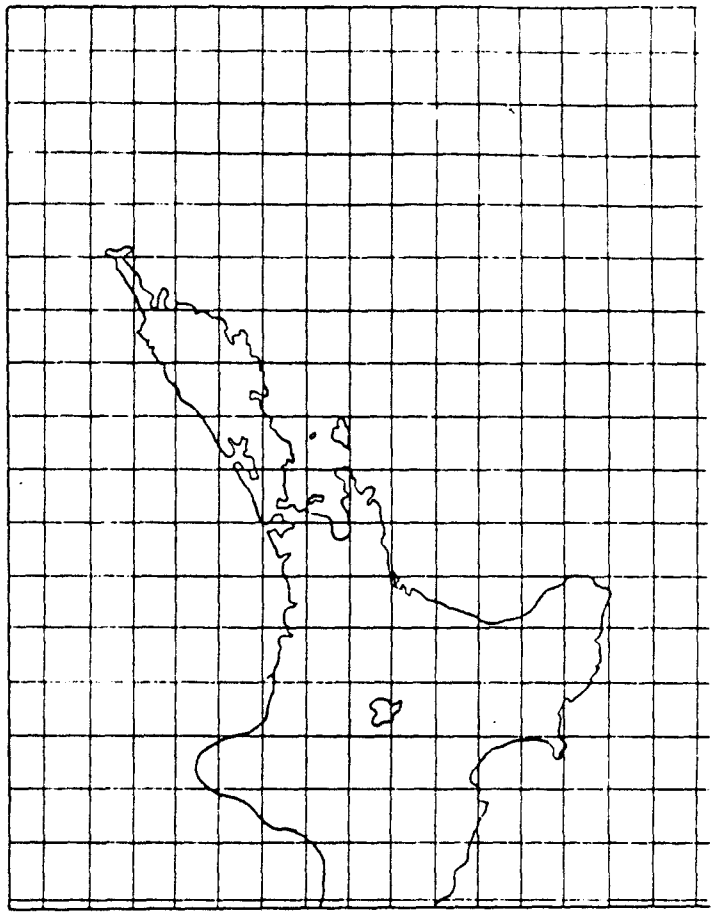
MARINE SURVEY FLIGHTS

FLIGHT TIME

Takeoff			Land			Airtime
Airport		Time	Airport		Time	
					Total time flown	

(F/T)$ (O/N)$ (TOT)$

PILOTS USE ONLY



No. of Schools	Species		Tonnes Min.	Tonnes Max.	Tonnes Est. total	Time	Sea temp.		Sea cond.	Location

FIGURE 8

Data flow in the Fisheries Statistics Unit
Data Management System - adapted from R. Coombs (1984)

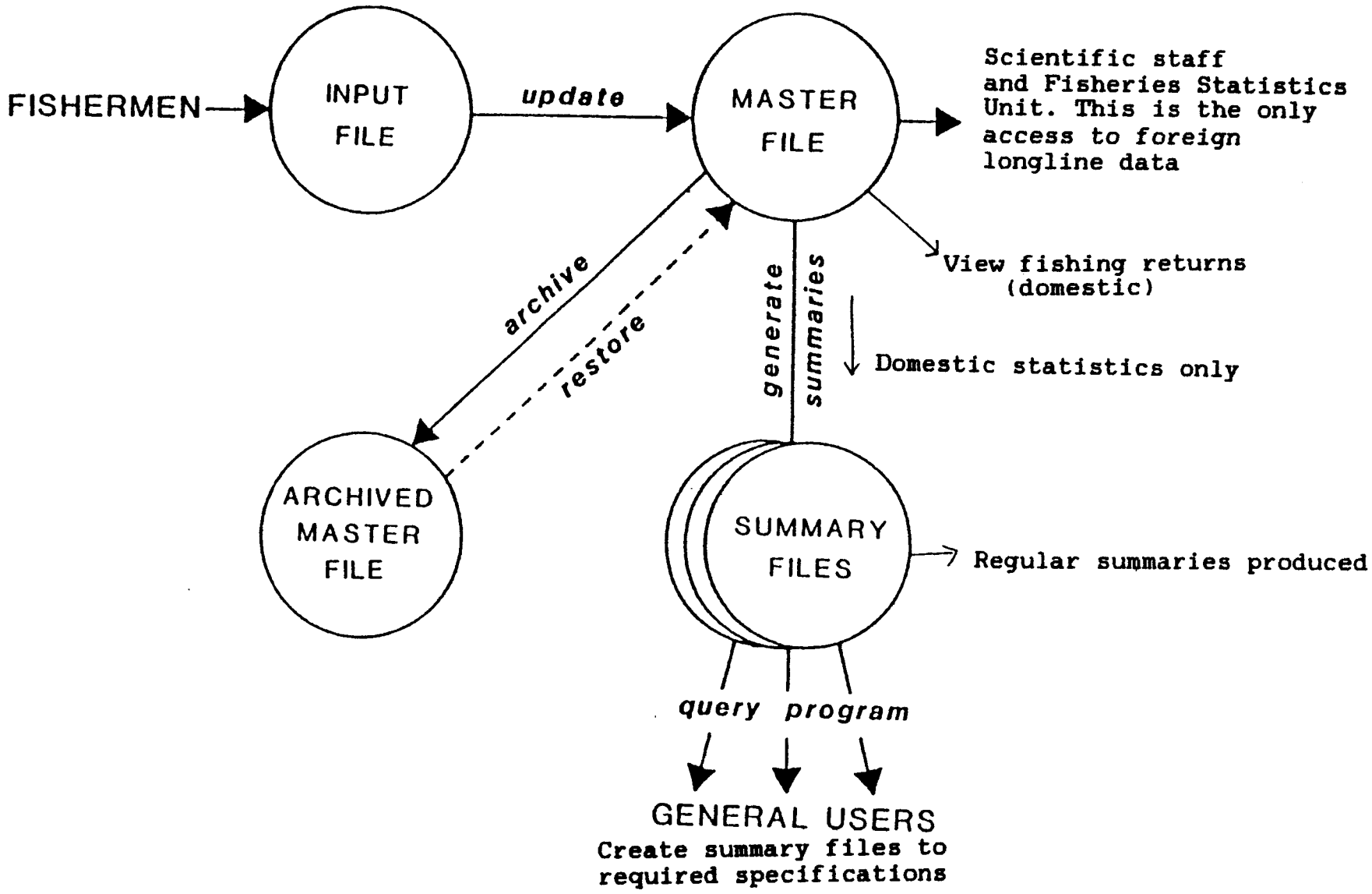
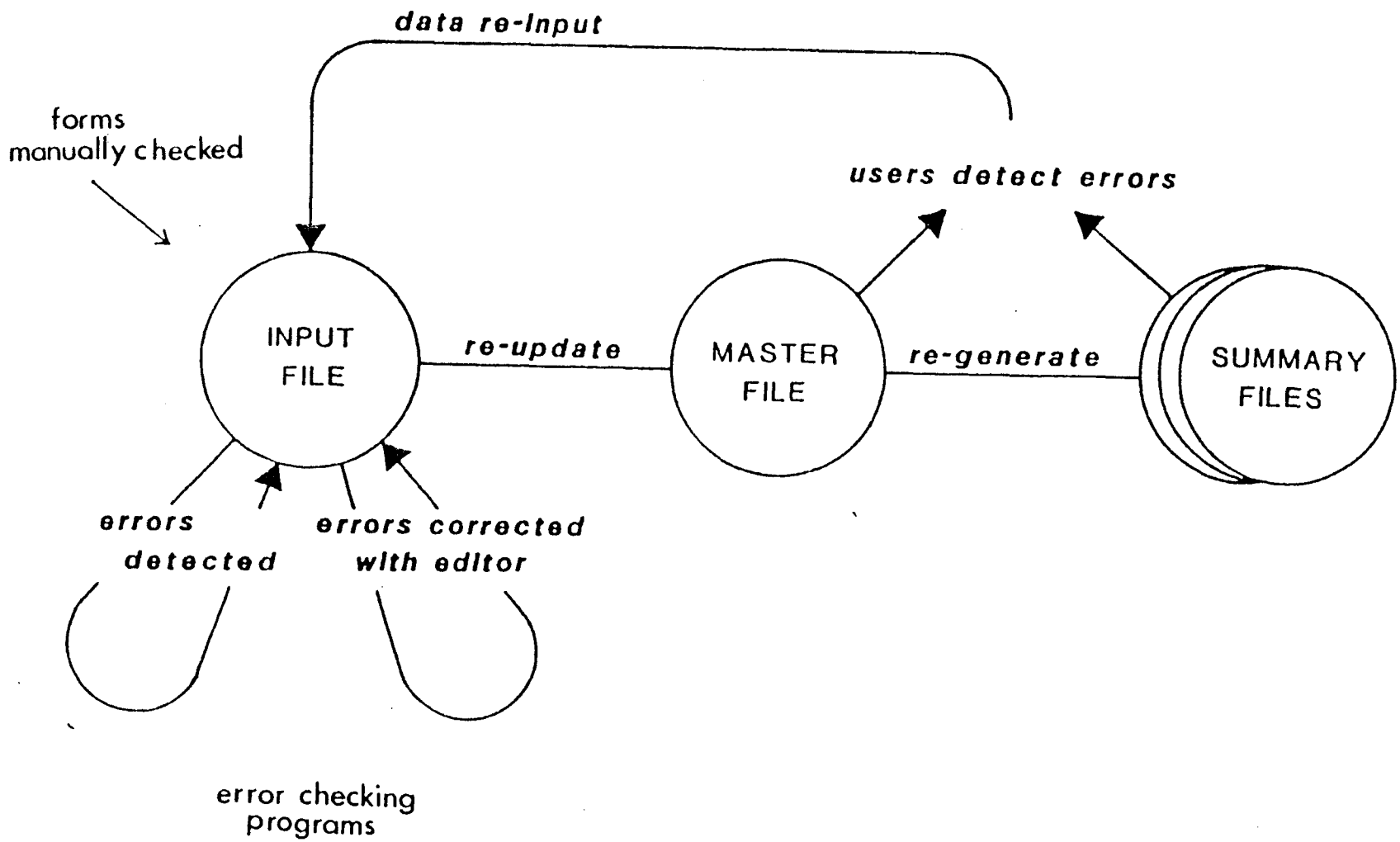


FIGURE 9

Data flow, error detection and correction in the Fisheries Statistics Unit Data Management System Adapted from R. Coombs (1984)



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