SPC/Inshore Fish. Res./BP.44
10 March 1988

ORIGINAL : ENGLISH

SOUTH PACIFIC COMMISSION

WORKSHOP ON PACIFIC INSHORE FISHERY RESOURCES
(Noumea, New Caledonia, 14 - 25 March 1988)

GUAM INSHORE FISHERIES SURVEY

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OFFSHORE FISHERIES SURVEY

BACKGROUND

Effective management of the island's offshore fishery resources requires accumulating data on fishing pressure, types of fishing methods used and annual harvest. In order to identify trends in fishing participation, effort, and catch, the Division of Aquatic and Wildlife Resources (DAWR) has been monitoring offshore fishing activities for the past ten years. Over this period of time, survey and analysis methodologies have changed in response to fluctuations in budget and staff. Recently, however, major advances have been made in both field survey techniques and in the area of computerized statistical analysis. Much of this progress has resulted from the combined efforts of DAWR and National Marine Fisheries Service (NMFS) personnel through the Western Pacific Fisheries Information Network (WPACFIN) program (see Study F-1, Job 3).

OBJECTIVES

1. To quantify fishing participation, effort, and catch which occurs outside the reef margin in boats.

2. To collect biological data from the specimens examined during interviews.

PROCEDURES

Interviews of returning offshore fishing parties are conducted on four days each month at the Agana Boat Basin. Two of these days are randomly selected weekdays and two were randomly selected weekend days or holidays. Each survey consisted of two periods, one from 0500 to 1100 hours and the other from 1600 to 2400 hours.

Returning fishers are asked standard questions regarding fishing methods, effort, catch, areas fished, etc. Questions are prioritized so that the most important information is obtained for otherwise incomplete interviews. Although attempts are made to intercept all returning boats, and to examine all catches, this is not always feasible.

During an interview each fish in the catch is measured when there is enough time to do so. Otherwise, efforts are directed at taking unbiased subsamples and all unmeasured fishes of each species are counted. Batch weights of all measured, unweighed fishes are calculated by species from known length-weight relationships. If additional data is needed to determine a valid length-weight relationship for a particular species, individuals of this species are weighed as well as measured. If adequate data is unavailable for calculating the weight of measured fish, available data on the most morphologically similar species is used.

Since interviews are obtained only at the Agana Boat Basin (ABB) during a limited time period, estimates of participation not accounted for in the interviews that occurs both at the Agana Boat Basin and elsewhere island-wide, must be factored into the expansion equations used by the Guam Offshore Expansion System (GOES). This is done by dividing the expanded values by the participation values P_1 and P_2. The methods outlined below are used to determine the participation values.

Estimates of the number of fishing boats returning to the boat basin outside of the survey period are made. This is done in order to calculate their contribution to the total offshore fishing activity that emanates from the boat basin on each survey day. This is also done separately for each fishing method encountered in order to eliminate any bias inherent in the sampling period. The following relationship is used in determining the P_1 values utilized by the GOES (see NOAA SWFC Admin. report H-83-21C):

$$P_1 = \frac{P(n/m)}{a}$$

where: a = estimated 24 hr. participation for a given day at the Agana Boat Basin.

p = no. of boats in which the fishing methods employed are known.

n = interview count for a given method.

m = no. of boats known to participate in a given method.

In addition, estimates of the number of active fishing boats not utilizing the boat basin on a given survey day are made. This is based on the numbers of empty trailers, berths, moorings, etc. counted at Merizo, Apra Harbor and other launch sites during inshore fishing participation surveys (see Study F-1, Job 2).

All data collected is entered into computerized files and expanded utilizing a program based on modifications of the algorithms outlined in the National Marine Fisheries Service Administrative Report H-83-21C (see Study F-1, Job 3). Since it is possible to obtain only an instantaneous estimate of offshore participation at launch points other than the Agana Boat Basin, a 24-hour island-wide participation estimate is made utilizing the hypothetical relationship:

$$I_p = \frac{A_t}{A_i} \times I_i + A_p$$

Where I_p = estimated island-wide 24-hr. participation for a given day.

I_i = instantaneous island-wide counts for that day.

A_t = estimated mean 24 hr. participation at Agana Boat Basin.

A_i = mean daily instantaneous participation counts at the Agana Boat Basin.

A_p = estimated 24 hr. participation for a given day at the Agana Boat Basin.

The portion (P_2) of the 24-hour island-wide participation estimate of boats that fished out of the Agana Boat Basin can be obtained by the following equation:

$$P_2 = \frac{A_p}{T_p}$$

This is done separately on data obtained during weekday and weekend/holiday survey days.

An expansion is done for each month and for the year as a whole by applying the raw data to the Guam Offshore Expansion System (GOES; See Study F-1, Job 3). The output of each monthly expansion includes standard errors (SE) and 90% confidence limits (CL) for participation, effort and harvest estimates. The sums of these estimates for all months are used to derive supplemental annual estimates, although calculations of SE and 90% CL for the year are not possible by this method. In contrast, annual estimates, including SE and 90% CL are computed by the GOES for a sample size of 48 days.

Results of the Guam International Fishing Derby (GIFD) are included in the monthly (usually July) and annual estimates. This is done by the GOES tournament utility which adds GIFD data directly to a 28 day August expansion and 362 day annual expansion. We consider this legitimate since the trolling effect during the GIFD is abnormally high and represents nearly all of the island-wide fishing effort for that three day period.

Since different calculations result in different rounding errors, slightly different annual estimates are produced by the two methods. For each of the fishing methods that were analyzed, various catch rates were calculated and these included kilograms (Kg) harvested per boat-trip (B-T), boat-hour (B-H), and person-hour (P-H) of effort.

Since the GOES can not expand for days in which there was participation for a given method but no interviews were obtained for that method, it under-estimates methods which are rarely encountered during the sample period. For this reason the following correction factor is used to estimate the degree of undersampling reflected in the GOES annual estimates.

$$F = \frac{(f_{wd} \times \text{no. of WD days}) + (f_{we} \times \text{no. of WE days})}{365}$$

where F = correction factor by which the GOES harvest is multiplied.

$f = \frac{x}{y}$

x = the sum of boats known to participate in a given method for all days in which that method occurred.

y = the sum of boats known to participate in a given method during days in which an interview was obtained.

RECORDING DATA

1. Boat Log (see attached form)

   The boat log is a record of every boat leaving or entering the ABB during the survey hours. The variables listed are defined as follows:

Int. no. - Interview number represents the number of returning fishing boats that were interviewed. There should be a corresponding catch report for every boat counted in the Int. no. category.

Activity no. - Activity number stands for the number of fishing boats entering or leaving the ABB. A boat may be counted twice if it makes two separate trips. A completed boat trip requires a single departure and return to port. Any non-fishing boat will be recorded but not counted in the activity no. category.

Time - Departure and Return Times - These parameters are all actual departure and actual or expected return times of a specific boat. Expected return time should be identified by the prefix "exp". No two boats can have the same departure time. Upon departure the boat should be questioned as to expected return time. All records should have a departure time and an expected or actual return time.

Boat no. or Name - The bow number or boat name should be used to identify the boat.

Activity - This area is reserved for recording the region fished, type of fishing performed and the vehicle license no. (not the trailer no.).

Trailer - This should correspond with the trailer (either VT or T) indicated on the map.

2. ABB Trailer and Moored Boat MAP (See Attached Map)

This map provides a visual aid to record trailer locations and the usage of moored boats at the ABB. Marking locations of vehicles with trailer as VT and a count number (VT_4 or VT_{11}) allows any person working the second shift to determine what boats to expect to return. The vehicle license plates should also be listed. The letter T represent trailers by themselves and should include the trailer plate no. as well as a count no (T_1, T_2, T_3, etc.). Finally, any moored boats out of port should be circled. The original map should be updated once a month.

3. Catch Record (See Attached Form)

The catch record is simply an organized method of collecting effort, participation, and catch data for a specific fishing trip. The variables are defined as follow:

Date - Survey date, circle 1 for weekday and 2 for weekends.

Landing - Area in which survey is being conducted, generally (ABB).

Interview - Corresponding number from boat log

Interviewer - Your initials

Interview time - Time of interview

Method - Method of fishing

Gear - Number of gear used for a given method

Hrs. in use - Number of hours fished for a given method

Area fished - General area fished (use region map to determine no. of area fished)

No. fishermen - No. of fishermen on boat (include crew if a charter)

Boat # - Bow number or boat name

Bait - Type of bait used or indicate a lure

Species - List species name, get as many lengths as possible, get weights for bottomfish or unusual fish. Count or estimate no. of fish. Remember to record fish by method. Weights can be calculated later.

Disposition of Catch

% Kept - % of total harvest kept by fishermen.

% Sold to Co-op - % of the portion of harvest sold, that went to the Co-op (always 100% unless part of catch sold elsewhere).

% Sold Elsewhere - % of the portion of harvest sold, that was sold to somewhere other than the Co-op.

Summary Block at Bottom - Blocks for summary of catch data by method.

After survey day is completed all forms must be coded for entry into computer data base.

To supplement the offshore survey, the inshore participation survey records trailer activities at Merizo pier, Nimitz Beach, Agat, Seaplane Ramp and any other possible location. These areas as well as the ABB are recorded in an instantenous count while driving in a once around the island route.

Special Conditions

When can a survey be aborted?

Only under specific circumstances can a survey be aborted. If a surveyor is 99.9 % sure no further boat activity will occur during the survey period, the survey can be aborted. Generally extreme weather or extremely poor fishing success can generate such conditions. Situations of this type are generally rare and usually allow a group decision. Typhoons are generally the most common reason for adverse condition. Typhoon status should not determine the decision as to working, but more the condition at the time. Knowing that no fishing was done is equally important as recording fishing activities.

Problem Areas

1. Take as many lengths of bottomfish and reef fish as possible.

2. Be sure to contact all boats going out to get expected fishing method and return time.

3. Do not count mackerel fishermen that do not leave the boat basin channel, since this is an inshore method.

4. Remember that fishermen returning have generally put in a long hard day. They are entitled to be impatient. Be quick and thorough about your work while polite. Even then do not push fishermen who do not want to cooperate.

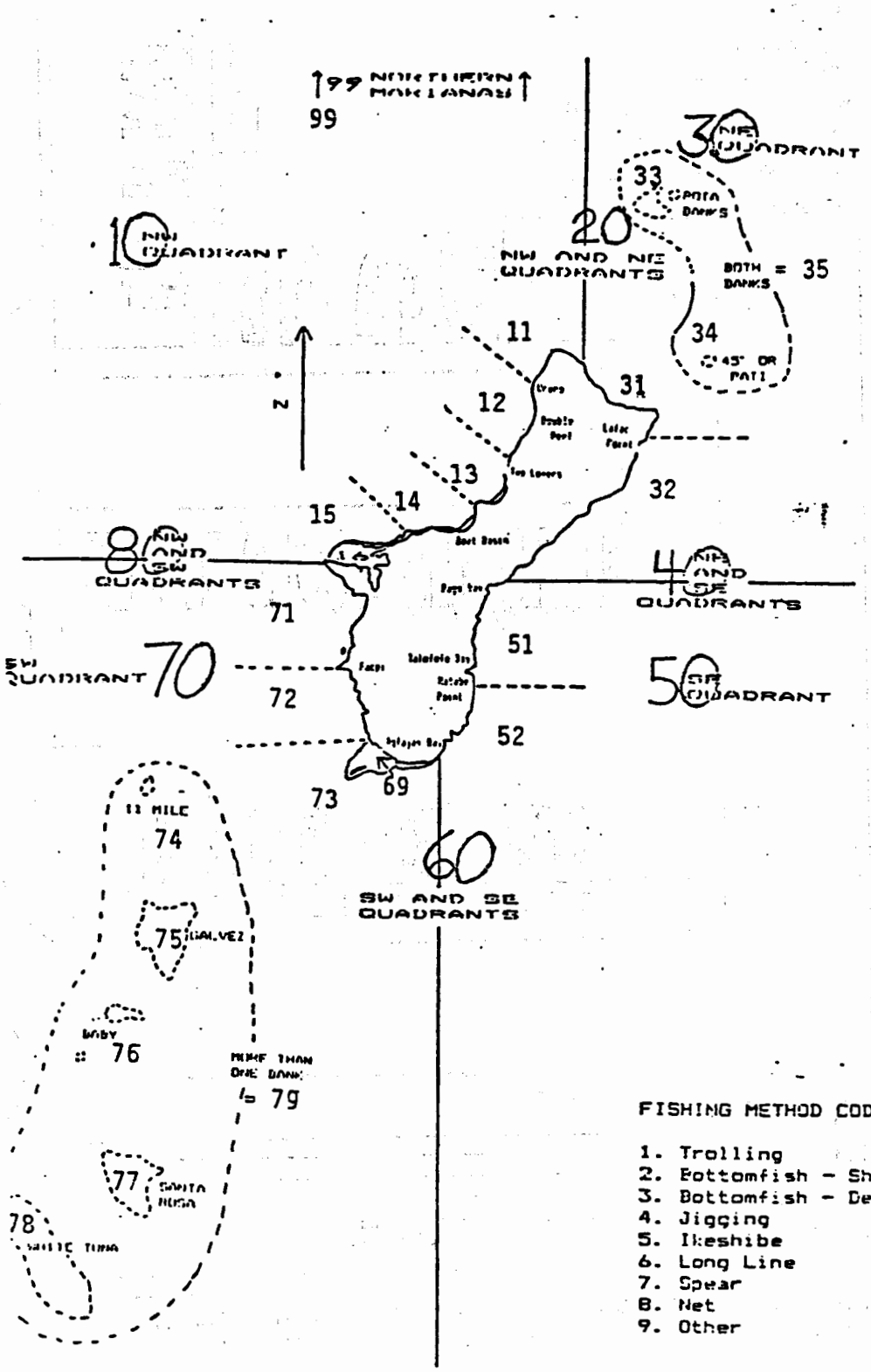
OFFSHORE CREEL CENSUS
BOAT LOG

Int. no.	activity no.	Time (Actual) Depart.	Time (Actual) Return	Boat No. or Name	ACTIVITY; Remarks (trailer or vehicle id.)	Exp. ret. time

ABB - 24 hrs. Activity

_____	Number of boats		
_____	Trol	_____	Atul
_____	Bot	_____	Longl.
_____	Spsc	_____	Spnet
_____	Spsn	_____	Other
_____	Sp. unspec.	___	Unknown

	Time	No. Boats
ABB inst. count:	_____	_____
Is. wide inst. ct.:	_____	_____


99
NORTHERN MARIANAS
30
NE QUADRANT
33
10
NW QUADRANT
20
NW AND NE QUADRANTS
BOTH BANKS = 35
11
34
12
31
13
32
15
14
80
NW AND SW QUADRANTS
40
NE AND SE QUADRANTS
71
51
70
SW QUADRANT
72
50
SE QUADRANT
52
73
69
60
SW AND SE QUADRANTS
11 MILE
74
75
GALVEZ
BABY
76
MORE THAN ONE BANK
79
77
SANTA ROSA
78
FISHING METHOD CODES
1. Trolling
2. Bottomfish - Shallow
3. Bottomfish - Deep
4. Jigging
5. Ikeshibe
6. Long Line
7. Spear
8. Net
9. Other

Offshore Fishing Participation Census
Agana Boat Basin

(edition date: 12/28/87)

Date _____ ME/F MD

Time _____

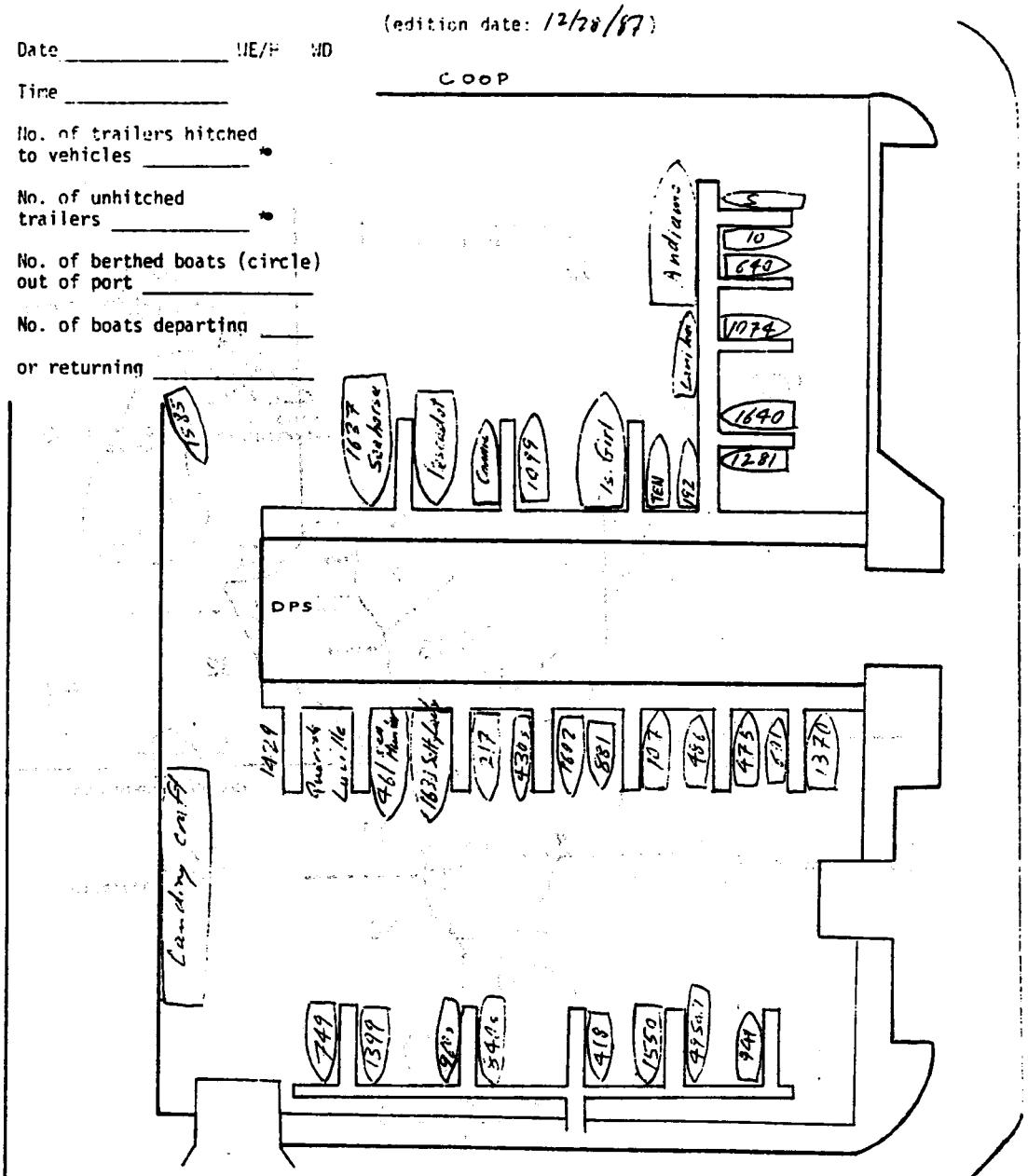
No. of trailers hitched to vehicles _____ *

No. of unhitched trailers _____ *

No. of berthed boats (circle) out of port _____

No. of boats departing ____

or returning _____



Apra Harbor seaplane ramp _____

Merizo Pier _____

Agat Bay _____

Nimitz _____

Other areas (specify location and no. of hitched and unhitched trailers only if boat is outside the reef and believed to be engaged in fishing): _____

*Please note location of all trailers on map above and indicate whether or not they are hitched to a vehicle. Usespace on back if necessary for all areas.

Date _____ 1 WD/2 WE

DIVISION OF AQUATIC & WILDLIFE RESOURCES
DEPARTMENT OF AGRICULTURE
GOVERNMENT OF GUAM

Interview #_____
Interviewer_____
Interview Time_____

Landing _____

OFFSHORE CREEL CENSUS

Method:	Gear Units	Hrs. in Use	Area Fished
1. Trolling			
2. Bottomfishing			
5. Spearing/snorkel			
6. Spearing/scuba			
Other			

No. fishermen_____
Weather_____
Cloud cover_____
Wind dir._____
Wind speed_____
Lunar day_____

FAD_____
Start time_____
Hrs. fished_____
No. passes_____

Species	No.	Wt.

Boat # _____ Bait _____

TYPE DATA: 1 3 1 2 3

SPECIES	Length	wt.	length	wt.	length	wt.	Number Act	Number Est	Weight Act	Weight Calc	Weight Est

Disposition of Catch

	METHOD	METHOD
% Kept		
% Sold to Co-op		
% Sold Elsewhere		

Type Date	1 AC	2 CALC	3 EST
Method _____			
TOTAL NO. FISH			
TOTAL WT. (kg)			
TOTAL NO. SPP.			
Method _____			
TOTAL NO. FISH			
TOTAL WT. (kg)			
TOTAL NO. SPP.			

COMMON OFFSHORE SPECIES CODES

TROLLING

Caranx melampygus	31406	Acanthocybium solandri	41601	Istiophorus platypterus	41901
Elagatus bipinnulatus	31409	Euthynnus affinis	41603	Makaira indica	41902
Coryphaena hippurus	31501	Katsuwonus pelamis	41606	M. nigricans	41903
Sphyraena barracuda	36001	Thunnus albacares	41607	Tetrapterus angustirost.	41904
Gempylus serpens	41404				

SPEAR

Carcharhinus amblyrhynchos	1102	Plectorhyncus picus	32704	Bolbometopon muricatum	36401
C. galapagensis	1104	P. obscurus	32705	Cetoscarus bicolor	36403
Gymnothorax javanicus	5626	Monotaxis grandoculis	32812	Hipposcarus longiceps	36404
Sargocentron spinifer	24306	Pempheris oualensis	33401	Scarus brevifilis	36406
S. tiere	24307	Kyphosus cinerascens	33901	S. psittacus	36413
Myripristis adustus	24313	K. vaigiensis	33902	S. schlegeli	36415
M. berndti	24315	Cheilinus undulatus	36214	S. sordidus	36416
Macolor niger	32313	Coris aygula	36219	Acanthurus lineatus	41206
Plectorhyncus orientalis	32702	Epibulus insidiator	36222	A. xanthopterus	41215
P. gibbosus	32703				
Myripristi	24599				
Sargocentron spp.	24397				
Holocentrinae	24398				

BOTTOMFISH

Pontinus macrocephalus	26404	Seriola rivoliana	31405	Pristipomoides seiboldi	32320
Cephalopholis spiloparaea	28906	Aphareus furcatus	32301	P. zonatus	32321
C. argus	28907	A. rutilans	32302	Gymnocranius lethrinoides	32802
C. sonnerati	28912	Aprion virescens	32303	Lethrinus elongatus	32806
C. urodeta	28914	Etelis carbunculus	32304	L. ramak	32808
Epinephelus morrhua	28916	E. coruscans	32305	L. rubrioperculatus	32809
E. septemfasciatus	28917	Lutjanus bohar	32307	Mulloides pflugeri	33202
E. fasciatus	28919	L. fulvus	32308	Parupeneus cyclostomus	33206
E. maculatus	28923	L. kasmira	32310	P. cinnabarinus	33208
Saloptia powelli	28940	Paracaesio sordidus	32314	P. atrocingulatus	33211
Variola louti	28941	P. xanthurus	32315	Cheilinus unifasciatus	36212
V. albimarginata	28944	Pristipomoides macrops	32316	Trichthys pavo	36260
Carangoides orthogrammus	31403	P. auricilla	32317	Naso vlamingi	41226
Caranx lugubris	31405	P. filamentosus	32318	Xanthichthys caeruleoli	41516
Seriola dumerili	31414	P. flavipinnis	32319	Sufflamen frenatus	44514
		Lutj gibbus	32309	Gymnosarda unicolor	41605

MIXED SPECIES CODES

Assorted bottomfish	49100	Deep snappers	49140	Assorted reef fish	49400
Shallow bottomfish	49110	Assorted trolling fish	49200	Aquarium fish	49500
Deep bottomfish	49120	Assorted longline fish	49300	Assorted Ikashibi fish	49600
Shallow snappers	49130				

LONGLINE/IKASHIBI

Thunnus alalunga	41608
Xiphias gladius	41701

ATULAI

Selar crumenophthalmus	31413

Offshore "METHOD" Codes

1 Trolling
2 Bottom Fishing
3 Atulai Handline
4 ~~Gill Net~~ MX SP (combination of 5 & 6)
5 Spearfishing with Snorkel
6 Spearfishing with Scuba
7 Longline
8 Ika Shibi
9 Other - any other method

Offshore "BAIT" Codes

1 Artificial Lure
2 Cut Fish
3 Whole Fish
4 Squid
5 Chum
6 Other
7 None

FADS

1 Ritidian
2 Haputo
3 Apra Harbor
4 Camel Rock
5 Facpi Pt.
6 Cocos

"TYPE DAY" Codes

1 Weekday
2 Weekend day or holiday

"TYPE NUMBER, LENGTH or WEIGHT" Codes

1 Actual data
2 Calculated data
3 Estimated data

"WEATHER" Codes

Fair = 1
Threat of squalls = 2
Intermittant Rain = 3
Storm/Heavy Rain = 4

"CLOUD COVER" Codes

0 - 30% = 1 Clear
30 - 60% = 2 Pt. Cloudy
60 - 90% = 3 Most Cloudy
90 - 100% = 4 Total overcast