

**JOB PROJECT REPORT  
RESEARCH PROJECT SEGMENT**

**STATE:** Territory of Guam

**PROJECT NO:** F-1R-5

**SUB-PROJECT NO.:** F-1

**STUDY NO.:** 1

**JOB NO.:** 1

**STUDY 1:** Fisheries Participation, Effort, and Harvest Surveys (2430)

**JOB 1:** Offshore Fisheries Survey

**PERIOD COVERED:** October 1, 1996 to September 30, 1997

**SUMMARY**

Monthly offshore fisheries surveys were conducted at the Agana Boat Basin, Agat Marina, and the Merizo Pier from October 1996 through September 1997. The FY97 island-wide offshore catch, from primarily small recreational-type vessels, is estimated to be 492.2 metric tons (Table 1). The bulk of the catch, 357.0 m.t., was landed by the trolling method, which consisted primarily of five pelagic species. Bottomfishing produced an estimated 48.1 m.t., primarily snappers, emperors, and groupers, while night-light jigging produced an estimated 6.0 m.t. Spearfishing, both SCUBA spear and snorkel spear, produced 49.5 m.t. of finfish and invertebrates. An additional 31.2 m.t. of finfish were landed by other methods such as gillnet, castnet, jigging, and spincasting.

TABLE 1: Composition of the Guam Offshore catch during FY97. Weights are in metric tons (m.t.).

<b>Offshore Fishing Method</b>	<b>FY97 Catch</b>
Trolling	357.4
Bottomfishing	52.1
Spearfishing	44.2
Atulai night-light jigging	5.4
Other Methods	31.2
<b>TOTAL FY97 OFFSHORE CATCH</b>	<b>490.3</b>

**BACKGROUND**

Effective management of the island's offshore fishery resources requires the collection and analysis of data on fishing effort, methods, and harvest. In order to identify trends in fishing participation, effort, and catch, the Department of Agriculture's Division of Aquatic and Wildlife

Resources (DAWR) has been monitoring offshore fishing activities for the past 20 years. Over this period of time, survey and analysis methodologies have changed in response to fluctuations in budget and staff, as well as changes in the fishery. During FY97, the National Marine Fisheries Service (NMFS) and DAWR have been developing a computerized database program to collect and analyze the offshore fisheries data. The data in the FY97 report should be considered as preliminary data, as the new expansion process used to obtain the FY97 data is in the early phase of being verified. The statistical basis for the expansion can be found in NOAA SWFC Admin. Reports H-83-21C and H-92-08.

## **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**

During FY97, interviews of returning offshore fishing parties were conducted on four days each month at the Agana Boat Basin (two weekends and two weekdays), two days each month at the Agat Marina (one weekend and one weekday), and two days each month at the Merizo Pier (one weekend and one weekday). Each of these days were randomly selected weekdays (WD) and weekend days (WE/H). Agana Boat Basin surveys consist of two periods, one from 0500 to 1200 hours and from 1600 to 2400. Agat Marina and Merizo Pier survey times differed slightly in the morning survey hours, 0530 to 1200 and 0600 to 1100 hours respectively. Island-wide participation was determined by means of a morning and evening survey, one weekday and one weekend a month, of all public boat launching areas in which all trailers attached to vehicles were counted, but no interviews were taken. This assumes that the percentage of boats operating out of the Agana Boat Basin, Agat Marina, and the Merizo Pier combined engaging in fishing, and the proportion of those fishing boats engaging in each offshore method is representative of the island as a whole.

Several major changes were made in the data expansion process during FY97. These changes include using quarterly rather than monthly expansions, using boat log data to calculate participation in the expansion process, expanding data from three ports rather just the Agana Boat Basin, and separating charter and non-charter fishing activity. Documentation of the entire process will be available in FY98 report.

## **RESULTS**

### **Trolling**

Five major pelagic species account for 95.6% of the total troll catch by weight (Table 2). Mahimahi (*Coryphaena hippurus*) made up 31.4% of the troll catch, followed by bonita (*Katsuwonus pelamis*; 28.9%), wahoo (*Acanthocybium solandri*; 13.0%), Pacific blue marlin (*Makaira mazara*; 11.7%), and yellowfin tuna (*Thunnus albacares*; 10.6%). Approximately 2% of the troll catch consists of requiem sharks (*Carcharhinidae*), rainbow runner (*Elagatis bipinnulatus*), barracuda (*Sphyraena barracuda*), kawa kawa (*Euthynnus affinis*), dogtooth tuna (*Gymnosarda unicolor*), species of *Lutjanidae* and *Lethrinidae*, and other incidental troll catch species. For approximately 2.1% of the troll catch, an estimated catch, rather than a species break down, was obtained due to time constraints imposed by the fishermen. For these interviews, effort and participation data was collected.

Overall troll catch decreased slightly, approximately 2%, compared with FY96, 357.4 m.t. down from 363.6 m.t. Landings decreased 11% for mahimahi (112.2 m.t. from 125.9 m.t.), decreased 10% for yellowfin tuna (37.8 m.t. from 42.1 m.t.), and decreased 2% for Pacific blue marlin (41.8 m.t. from 42.7 m.t.). Landings for bonita increased 6% (103.1 m.t. from 97 m.t.), increased 5% for wahoo (46.6 m.t. from 44.4 m.t.), and increased 39% for other troll species. Total kilograms of troll fish per boat trip increased 8%, 23.9 kg/boat trip compared with 22.2 kg/boat trip in FY96. Comparing troll participation with FY96, the number of trolling boat trips decreased 10%, 14,947 boat trips from 16,786 boat trips, and the number of people participating decreased 23%, 55,810 down from 72,425. With effort, the number of boat hours decreased 6%, 62,738 hours down from 66,638 boat hours.

TABLE 2: Composition of the Guam troll catch during FY97 by most common species. Weights are in kilograms (kg).

<b>Troll Species</b>	<b>Total Catch (kg)</b>	<b>% Total Catch</b>
<i>Coryphaena hippurus</i>	112,202	31.4
<i>Katsuwonus pelamis</i>	103,148	28.9
<i>Acanthocybium solandri</i>	46,570	13.0
<i>Makaira mazara</i>	41,761	11.7
<i>Thunnus albacares</i>	37,784	10.6
"assorted trolling"	7,460	2.1
<i>Carcharhinidae</i>	2,376	>1
<i>Elagatis bipinnulatus</i>	2,067	>1
<i>Sphyraena barracuda</i>	1,460	>1
<i>Euthynnus affinis</i>	1,250	>1
<i>Gymnosarda unicolor</i>	544	>1
<i>Aprion virescens</i>	408	>1
<i>Tetrapterus angustirostris</i>	155	>1
<i>Carangidae</i>	162	>1
other <i>Lutjanidae</i>	37	>1
Other	38	>1
<b>TOTAL</b>	<b>357,423</b>	

Charter trolling remains a significant portion of the trolling activity. Charter activity accounted for 24% of the troll catch (86.7 m.t.), 25% of boating hours, 15,784 hours, and 36% of all

trolling trips, 5,305 trips. The number of people participating in charter troll trips was 39,972, or 56% of all people participating in charter trolling trips.

## Bottomfishing

An estimated 52.1 m.t. of bottomfish was landed during FY97, a decrease of 22% from FY96. The bottomfish catch (Table 3) was dominated by three major families: *Lethrinidae* or emperors (28.9%), *Lutjanidae* or snappers (14.7%), and *Serranidae* or groupers (11.8%). The dominant bottomfish species were the yellowstripe emperor (*Lethrinus obsoletus*, 4.1 m.t.), the redgilled emperor (*L. rubrioperculatus*, 2.9 m.t.), the blackspot emperor (*L. harak*, 2.6 m.t.), the yellowlip emperor (*L. xanthochilus*, 2.2 m.t.), the black-tipped grouper (*Epinephelus fasciatus*, 1.8 m.t.), the yellowtail kalikali (*Pristipomoides auricilla*, 1.6 m.t.), the honeycomb grouper (*E. merra*, 1.5 m.t.), the jobfish or uku (*Aprion virescens*, 1.3 m.t.), and the lyretail grouper (*Variola louti*, 1.0). Other important families include trevallies (*Carangidae*, 2.7 m.t.), triggerfish (*Balistidae*, 2.1 m.t.), sharks (*Carcharhinidae*, 1.4 m.t.), and mullets (*Mullidae*, 1.1 m.t.). For approximately 25% of the bottomfish catch, an estimated bottomfish catch, rather than a species break down, was obtained due to time constraints imposed by the fishermen. For these interviews, effort and participation data was collected.

Comparing bottomfish participation with FY97, the number of boat trips bottomfishing did not change significantly, 7,139 in FY97 compared with 7,126 in FY96. However, the number of persons participating increased 108%, 39,660 compared with 19,108 in FY96. A significant number of these people, approximately 74% of these people, participated in charter bottomfish trips but may not have actually fished. Comparing bottomfish effort, the number of boat hours decreased 13%, 28,469 hours down from 32,844 hours in FY96. Comparing overall catch rate (kg/boat trip), overall catch rate decreased 24%, 7.31 kg/boat trip compared with 9.6 kg/boat trip in FY96. The catch rate for non-charter bottomfish trips, 8.7 kg/boat trip, was significantly higher than for bottomfish charter boats, 3.23 kg/boat trip.

TABLE 3: Composition of the Guam bottomfish catch during FY97 by Family\* and most common species. Estimated weights are in kilograms (kg).

FAMILY	Total Catch (kg)	% Total Catch
<i>Lethrinidae</i> *	13,925	28.9
<i>L. obsoletus</i>	4,080	29.3+
<i>L. rubrioperculatus</i>	2,943	21.1+
<i>L. harak</i>	2,651	19.0+
<i>L. xanthochilus</i>	2,160	15.5+
<i>L. olivaceous</i>	828	5.9+
<i>Lethrinidae</i> sp.	409	2.9+
<i>Gnathodentex aurolineatus</i>	378	2.7+
<i>Lutjanidae</i> *	7,062	14.7
<i>Pristipomoides auricilla</i>	1,588	22.5+
<i>Aprion virescens</i>	1,252	17.7+
<i>Etelis carbunculus</i>	699	9.9+
<i>P. zonatus</i>	679	9.6+

<i>L. monostigmus</i>	670	9.5+
<i>L. kasmira</i>	594	8.4+
<i>Serranidae*</i>	5,682	11.8
<i>Epinephelus fasciatus</i>	1,829	32.2+
<i>E. merra</i>	1,501	26.4+
<i>Variola louti</i>	1,043	18.4+
<i>E. hexagonatus</i>	328	5.8+
<i>Carangidae*</i>	2,720	5.7
<i>Balistidae*</i>	2,147	4.5

\*over 1000 kg.. +% in respective Family.

Deepwater species comprised only 9% of the total bottomfish catch. A significant drop in total deepwater bottomfish catch was observed 4.0 m.t. compared with 16 m.t. in FY96. Deepwater species encountered during FY97 consists of *Etelis*, *Pristipomoides*, and *Epinephelinae* species (Table 4). Dominant deepwater bottomfish were the yellowtail kalikali (*P. auricilla*, 1.6 m.t.), ehu (*E. carbunculus*, 699 kg), gindai (*P. zonatus*, 679 kg), and opakapaka (*P. flavipinnis*, 308 kg).

### Atulai Night-Light Jigging

Atulai night-light fishing was encountered year round during FY97. An estimated 5.4 m.t. of fish were landed, 45% less than the 9.9 m.t. harvested in FY96 (Table 5). A 45% decrease in the number of atulai night jigging trips was observed 401 trips down from 732 trips in FY96. There was no significant change in catch per boat trip, with 13.5 kg/boat trip observed in FY96 and 13.6 kg/boat trip observed in FY97. Approximately 95% of the catch consisted of atulai (*Selar crumenophthalmus*, 5.1 m.t.). The remaining 5% were incidental catches of trevallys (*Carangidae*, 109 kg.), snappers (*Lutjanidae*, 86 kg.), soldier fishes and squirrelfishes (*Holocentridae*, 79 kg.), and emperors (*Lethrinidae*, less than 50 kg.).

TABLE 4: Composition of the Guam deep bottomfish catch during FY97. Estimated weights are in kilograms (kg).

FAMILY	Total Catch (kg)	% Total Deep Bottomfish Catch
<i>Pristipomoides auricilla</i>	1,588	39.4
<i>Etelis carbunculus</i>	699	17.3
<i>P. zonatus</i>	679	16.8
<i>P. flavipinnis</i>	308	7.6
<i>Aphareus rutilans</i>	196	4.9
<i>P. filamentosus</i>	111	2.7
<i>Saloptia powelli</i>	51	1.3
<i>E. coruscans</i>	39	0.9
<i>P. argyrogrammicus</i>	11	0.3
Misc. deep bottomfish	350	8.7
Total deep Bottomfish	4,029	

TABLE 5: Composition of the Guam atulai (*Selar crumenophthalmus*) night jigging catch during FY 97. Estimated weights are in metric tons (m.t.).

SPECIES	Total Catch (m.t.)
<i>Selar crumenophthalmus</i>	5.6
<i>Carangidae</i>	0.1
<i>Lutjanidae</i>	>0.1
<i>Holocentridae</i>	>0.1
<i>Lethrinidae</i>	>0.1
<b>Total Catch (m.t.)</b>	<b>6.0</b>

## Spearfishing

An estimated 44.2 m.t. of speared fish, crustaceans, and mollusks were landed during FY97 (Table 6). The spearfish finfish catch (Table 7) was dominated by surgeonfishes (*Acanthuridae*, 19.8 m.t.) and parrotfishes (*Scaridae*, 6.7 m.t.), *Naso unicornis* was the most important spearfish specie taken, comprising 80% of the *Acanthuridae* catch and 33% of the total spearfish catch. *Trochus niloticus* ranked third in overall catch by weight, with 3.8 m.t. taken, 8% of the total spearfishing catch. Next in importance were the rudderfishes (*Kyphosidae*; 1.9 m.t.), emperors (*Lethrinidae*, 1.6 m.t.), groupers (*Serranidae*, 1.5 m.t.), goatfishes (*Mullidae*, 1.5 m.t.), rabbitfish (*Siganidae*, 1.3 m.t.), and snappers (*Lutjanidae*, 1.2 m.t.). With the spearfish invertebrate catch, 1.8 m.t. of octopus were taken, second to *Trochus niloticus*.

Spearfishing participation, effort, and catch decreased in FY97 compared with FY96. The number of spearfishing trips decreased 22%, 2,091 from 2,691 trips, the number of persons spearfishing decreased 7%, 8,216 persons from 8,800 persons in FY96, boat hours decreased 25%, 5,399 boat hours down from 7,221 boat hours, and spearfish catch decreased 26%, 44.2 m.t. compared with 59.3 m.t.

TABLE 6: Composition of the Guam spearfish catch during FY96 by Family\* and most common species. Estimated weights are in kilograms (kg).

FAMILY	Total Catch (kg)	% Total Catch**
<i>Acanthuridae</i>	19,841	40.1
<i>Naso unicornis</i>	16,498	33.3
<i>N. lituratus</i>	2,075	4.2
<i>N. caesius</i>	315	+
<i>Scaridae</i>	6,705	13.6
<i>Hipposcarus longiceps</i>	2010	4.1
<i>S. sordidus</i>	1190	2.4
<i>S. schlegeli</i>	957	1.9
<i>S. altipinnis</i>	788	1.6
<i>Scarus sp.</i>	350	+
<i>S. microrhinos</i>	346	+
<i>Trochus niloticus</i>	3,779	7.6

<i>Kyphosidae</i>	940	1.9
<i>K. cinerascens</i>	808	1.6
<i>K. vaigiensis</i>	132	+
<i>Octopus sp.</i>	872	1.8
<i>Lethrinidae</i>	812	1.6
<i>L. xanathochilus</i>	308	+
<i>L. harak</i>	145	+
<i>Serranidae</i>	736	1.5
<i>Plectropomus laevis</i>	173	+
<i>Variola louti</i>	132	+
<i>Epinephelus polyphkadion</i>	107	+
<i>Mullidae</i>	725	1.5
<i>Parupeneus bifasciatus</i>	148	+
<i>Siganidae</i>	658	1.3
<i>S. punctatus</i>	392	+
<i>S. argenteus</i>	215	+
<i>Lutjanidae</i>	592	1.2
<i>Macolor niger</i>	159	+
<i>L. gibbus</i>	146	+
<i>L. bohar</i>	108	+
<i>Labridae</i>	472	+
<i>Cheilinus undulatus</i>	312	+
<i>Carangidae</i>	384	+
<i>C. melampygus</i>	273	+
<i>Holocentridae</i>	259	+
<i>Panilurus penicillatus</i>	243	+
<i>Muraenidae</i>	241	+
<i>Gymnothorax javanicus</i>	241	+
<i>Orectolobidae</i>	230	+
<i>Nebrius concolor</i>	230	+
<i>Balistidae</i>	122	+
<i>Carpilius maculatus</i>	74	+
<i>Haemulinae</i>	63	+
<i>Ephippidae</i>	52	+

\*Families with estimated catches greater than 50 kg. \*\*% greater than 1%.

+less than 1% of total spearfish catch.

TABLE 7: Comparison of Participation and Catch (m.t.) between Snorkel spearfishing, scuba spearfishing, and mixed spearfishing.

Spear Method	Number of Trips	Catch (m.t.)	Catch per Trip (kg/boat trip)
Snorkel spear	1,437	21.2	14.8
Scuba spear	603	21.9	36.2
Mixed spear	51	1.1	22.0
<b>TOTAL</b>	2,091	44.2	

Snorkel spearfishing, SCUBA spearfishing, and mixed spearfishing, had significantly different participation and catch rates (Table 7). Comparing participation, snorkel spearfishing comprised 70% of both spearfishing trips and persons participating in spearfishing. Comparing effort, snorkel spearfishing accounted for 78% of total spearfishing hours. Comparing overall catch, snorkel spearfishing accounted for 49% of the total spearfishing catch, while SCUBA spear was

slightly less at 48%. SCUBA spearfishing had a significantly higher catch rate compared with snorkel spearfishing, 36.2 kg/boat trip compared with 14.8 kg/boat trip for snorkel spearfishing. Mixed spearfishing activity accounted for less than 5% of spearfishing trips, overall spearfish catch, persons participating, and hours spent spearfishing.

## **Other Methods**

Other less common fishing methods encountered during the offshore surveys accounted for 31.2 m.t. of finfish, 6% of the total offshore catch. This category experienced a thirteen-fold increase in finfish catch compared with FY96. This category was dominated by gillnetting, with castnetting, spincasting, and jigging.

Approximately 94% of the catch by these less encountered methods, 29.4 m.t., were taken by gillnetting. *Carangidae* accounted for 19.2 m.t., or 65% of the gillnet catch, followed by *Lethrinidae* (2.1 m.t.), *Scaridae* (1.1 m.t.), *Acanthuridae* (0.9 m.t.), and *Siganidae* (0.6 m.t.). Castnetting accounted for 3.4 m.t. of finfish, dominated by rudderfish (*Kyphosidae*, 1.4 m.t., 41% of the castnet catch), goatfish (*Mullidae*, 0.4 m.t.), and surgeonfishes (*Acanthuridae*, 0.3 m.t.). An additional 1.2 m.t. of finfish were taken by spincasting, with mahimahi (78%) dominating this category. The use of spincasting gear during trolling trips during mahimahi season has increased in popularity, especially with charter boats.

## **DISCUSSION**

The total offshore catch for FY97 was slightly less compared with FY96, less than 3%. All major offshore methods, trolling, bottomfishing, spearfishing, and atulai night light jigging, had decreases in total catch compared with FY96. Comparing catch rates (kilograms of fish caught per boat trip), a significant decrease, 24%, was observed only with bottomfishing, with no significant difference observed with trolling and atulai night light jigging. A decrease in the total catch for trolling, bottomfishing, spearfishing, and atulai night light jigging could be attributed, in part, to an increase in the number of bad weather days due to storms in FY97. The decrease in bottomfish catch rate could be reflective of an over-utilized resource, a trend observed in the last few years with bottomfishing.

Charter boat activity comprises a significant portion of the trolling activity. However, during the end of FY97, a significant decrease in the number of charter trolling trips a day was observed. This was due primarily to a slump in tourism. This trend will be observed closely during FY98, and its impact on trolling monitored.

A major deficiency with using this preliminary data for the FY97 offshore report was the lack of an consistent adequate measure of CPUE to compare catch rates between FY96 and FY97. The only CPUE value available for comparison was kilograms of fish caught per boat trip. This measure of CPUE is not useful since the length of a fishing trip varies significantly within a method, even more so between charter and non-charter fishing activities. Although this measure

of CPUE was reported in FY96, charter and non-charter activity were not separated out during FY96 making any comparison with FY97 impossible. Other measures of CPUE that were reported in FY96 such as “kg of catch per gear-hour” or “kg of catch per person-hour” were not available at the time this report was written.

## **RECOMMENDATIONS**

It is recommended that the new survey design and new computerized database being developed with the assistance of NMFS be completed and implemented during FY98. Data from FY92 to the FY97 should be inputted during FY98 into the new data model, and an expansion run on this time series. This should standardize as much as possible, the offshore data reporting to obtain a clearer and more accurate picture of the evolution of the offshore fisheries on Guam.

## **PROGRAM COSTS**

The estimated cost of the Offshore Fisheries Survey Project was \$159,000.

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