

**JOB PROJECT REPORT
RESEARCH PROJECT SEGMENT**

STATE: Territory of Guam

PROJECT NO: F-1R-6
SUB-PROJECT NO.: F-1
STUDY: 1
JOB NO.: 1

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

JOB 1: Offshore Fisheries Survey

PERIOD COVERED: October 1, 1997 to September 30, 1998

SUMMARY

Monthly offshore fisheries surveys were conducted at the Agana Boat Basin, Agat Marina, and the Merizo Pier from October 1997 through September 1998. The FY98 islandwide offshore catch (Table 1), from primarily small recreational-type vessels, is estimated to be 529.3 metric tons (m.t.). The bulk of the catch, 377.7 m.t., was landed by the trolling method, which consisted primarily of five pelagic species. Bottomfishing produced an estimated 40.3 m.t., primarily snappers, emperors, and groupers, while night-light jigging produced an estimated 31.3 m.t. Spearfishing, both SCUBA spear and snorkel spear, produced 55.5 m.t. of finfish and invertebrates. An additional 24.4 m.t. of finfish were landed by other methods such as gillnet, castnet, jigging, spincasting, aquarium fish collecting, and other rarely encountered methods.

TABLE 1: Composition of the Guam Offshore catch during FY98. Weights are in metric tons (m.t.).

Offshore Fishing Method	FY98 Catch
Trolling	377.7
Bottomfishing	40.3
Spearfishing	55.5
Atulai night-light jigging	31.3
Other Methods	24.4
Total FY97 Offshore Catch	529.3

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 21 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. Since FY97, the National Marine Fisheries Service (NMFS) and DAWR have been developing and completing a computerized database program to collect and analyze the offshore fisheries data. The expansion program's algorithms are currently being reviewed and verified, and should be completed during FY99. The data in the FY98 report should still be considered

preliminary data. During FY98, historical offshore data since 1989 was entered into the new database system. 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.
3. To continue and complete the review and verification of the Guam Offshore Expansion System.

PROCEDURES

During FY98, 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 within weekdays (WD) and weekend/holiday days (WE/H) fields. Agana Boat Basin surveys consist of two periods, from 0500 to 1200 hours and 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. Islandwide participation was determined by means of a morning and evening survey, two weekdays and two weekends a month, of all public boat launching areas and accessible makeshift launching sites where all trailers attached to vehicles were counted, but no interviews were taken. The expansion program assumes that a percentage of boats operating out of the Agana Boat Basin, Agat Marina, and the Merizo Pier that are fishing is proportional to the types of fishing occurring on the island as a whole.

Important changes were made in the data expansion process since FY97. These changes include using quarterly rather than monthly expansions in order to account for seasonal fisheries, using the boat log data to calculate participation in the expansion process, expanding data from the three surveyed ports rather than just the Agana Boat Basin, and separating charter and non-charter fishing activity.

RESULTS

Trolling

Five major pelagic species account for 96% of the total troll catch by weight (Table 2). Mahimahi (*Coryphaena hippurus*) made up 29% of the troll catch, followed by bonita (*Katsuwonus pelamis*; 23%), wahoo (*Acanthocybium solandri*; 20%), yellowfin tuna (*Thunnus albacares*; 18%), and Pacific blue marlin (*Makaira mazara*; 6%). Approximately 2% of the remaining troll catch consists of requiem sharks (*Carcharhinidae*), rainbow runner (*Elagatis bipinnulatus*), barracuda (*Sphyraena barracuda*), kawakawa (*Euthynnus affinis*), and other incidental troll catch species. An additional 2% of the troll catch consists of an estimated troll catch. For this part of the troll catch, a species breakdown and measurement of the catch could not be taken due to time constraints imposed by the fishermen. All complete trolling interviews consist of catch, effort and participation information.

TABLE 2: Composition of the Guam troll catch during FY98 by most common species. Weights are in kilograms.

Troll Species	Total Catch	% Total Catch
<i>Coryphaena hippurus</i>	108,773	28.8
<i>Katsuwonus pelamis</i>	86,723	23.0
<i>Acanthocybium solandri</i>	73,908	19.6
<i>Thunnus albacares</i>	69,852	18.5
<i>Makaira mazara</i>	21,263	5.6
“assorted trolling”	6,589	>2
<i>Carcharhinidae</i>	3,478	>1
<i>Sphyrna barracuda</i>	2,793	>1
<i>Euthynnus affinis</i>	1,863	>0.5
<i>Elagatis bipinnulatus</i>	1,015	>0.5
<i>Gymnosarda unicolor</i>	528	>0.5
<i>Tetrapterus angustirostris</i>	405	>0.5
<i>Carangidae</i> species	214	>0.5
Other species	84	>0.5
Total	377,739	100

Trolling participation for all troll trips decreased compared with FY97. The number of trolling boat trips decreased slightly, 7%, 13,836 boat trips from 14,947 boat trips, and the number of people participating in the fishery decreased 17%, 46,296 people compared with 55,810. Each weekday had an average of 9.5 trolling trips per day, while weekends and holidays had an average of 22.6 trips per day, with an overall average of 16.0 trips per day. Approximately 47% of all offshore trips, 13,836 trolling trips out of 29,547 total offshore trips, were trolling trips. Of the trolling trips, 74% were non-charter trips, with each trip averaging 4.0 hours with 4.2 fishermen per trip. Approximately 55% of all troll trips originated from the Agana Boat Basin.

Comparing effort with FY97, the number of hours spent fishing decreased 8%, 57,716 boat hours down from 62,738 boat hours. There were also 231,845 gear-hours and 179,279 person-hours of trolling effort during FY98.

Troll catch increased 6% from FY97, 377.7 m.t. up from 357.4 m.t. Landings decreased 3% for mahimahi (108.8 m.t. from 112.2 m.t.), decreased 16% for bonita (86.7 m.t. from 103.1 m.t.), and decreased 49% for Pacific blue marlin (21.3 m.t. from 41.8 m.t.). Landings for wahoo increased 59% (73.9 m.t. from 46.6 m.t.) and increased 85% for yellowfin tuna (69.9 m.t. from 37.8 m.t.).

Total kilograms of troll fish per hour fished increased 15%, 6.54 kg/hr compared with 5.70 kg/hr in FY97. Comparing between charter and non-charter boats, charter boats had average CPUE's of 4.91 kg/hr and 1.06 kg/gr-hr, while non-charter boats had average CPUE's of 6.95 kg/hr and 1.80 kg/gr-hr. The catch rate for charter boats could have been underestimated by their targeting of marlin during the summer months.

Charter boats account for a significant portion of the overall trolling activity. Although they make up approximately 5% of the trolling fleet, charter boats account for 15% of the catch, 20% of troll fishing hours, 26% of all trolling trips, and 44% of all people participating in trolling. Charter boats caught 11% of wahoo, 42% of Pacific blue marlin, 20% of mahimahi, 5% of yellowfin tuna, and 14% of bonita catch. However, compared with FY97, charter participation, catch, and effort decreased significantly. Charter trips decreased 32%,

troll catch from charter boats decreased 35%, hours fished decreased 28%, and people participating in charter fishing decreased 49%. This was due to a significant drop in Asian tourists during FY98. On the other hand, participation, effort, and catch for primarily recreational fishermen differed. Compared with FY97, the number of primarily recreational troll trips increased 6%, catch increased 19%, hours fished decreased slightly, 1%, with people participating increased 63%.

Bottomfishing

An estimated 40.3 m.t. of bottomfish were landed during FY98, a decrease of 23% from FY97. The bottomfish catch (Table 3) was dominated by four major families: *Lutjanidae* or snappers (20%), *Lethrinidae* or emperors (18%), *Serranidae* or groupers (16%), and *Carangidae* or trevallys and jacks (9%).

TABLE 3: Composition of the Guam bottomfish catch during FY98 by Family* and most common species. Estimated weights are in kilograms (kg).

Family	Total Catch	% Total Catch
<i>Lutjanidae</i> *	7,965	19.7
<i>A. virescens</i>	1,722	21.6+
<i>P. auricilla</i>	1,425	17.9+
<i>L. kasmira</i>	1,266	15.9+
<i>P. flavipinnis</i>	969	12.2+
<i>P. zonatus</i>	609	7.7+
<i>L. bohar</i>	362	4.5+
<i>E. carbunculus</i>	379	4.8+
<i>P. argyrogrammicus</i>	252	3.2+
<i>Lethrinidae</i> *	7,258	18.0
<i>L. rubrioperculatus</i>	2,067	28.5+
<i>M. grandoculus</i>	1,368	18.9+
<i>L. obsoletus</i>	1,119	15.4+
<i>L. olivaceus</i>	359	5.0+
<i>Serranidae</i> *	6,408	15.9
<i>E. fasciatus</i>	3,523	55.0+
<i>E. merra</i>	1,484	23.2+
<i>V. louti</i>	577	9.0+
<i>C. sonneratti</i>	418	6.5+
<i>Carangidae</i> *	3,800	9.4
<i>C. lugubris</i>	1,410	37.1+
<i>C. orthogrammus</i>	1,075	28.3+
<i>C. melampygus</i>	519	13.7+
<i>Balistidae</i> *	2,147	4.8
<i>Holocentridae</i> *	1,746	4.3
<i>Carcharinidae</i> *	1,400	3.5
<i>Mullidae</i> *	1,204	3.0
<i>Hemigaliedae</i> *	1,101	2.7
Other bottomfish species	1,488	3.7
“Assorted bottomfish”***	6,070	15.0
Total	40,341	100.0

*over 1000 kg. +% in respective Family **unable to obtain species breakdown

The dominant bottomfish species caught during FY98 were the black-tipped grouper (*Epinephelus fasciatus*, 3.5 m.t.), the redgilled emperor (*Lethrinus rubrioperculatus*, 2.1 m.t.), the jobfish or uku (*Aprion virescens*, 1.7 m.t.), the honeycomb grouper (*Epinephelus merra*, 1.5 m.t.), the yellowtail kalikali (*Pristipomoides auricilla*, 1.4 m.t.), the black jack (*Caranx lugubris*, 1.4 m.t.), the bigeye emperor (*Monotaxis grandoculus*, 1.4 m.t.), the bluelined snapper (*Lethrinus kasmira*, 1.3 m.t.), the yellowstripe emperor (*Lethrinus obsoletus*, 1.1 m.t.), the yellow-spotted trevally (*Carangoides orthogrammus*, 1.1 m.t.), and opakapaka (*Pristipomoides flavipinnis*, 1.0 m.t.). Compared with FY97, the most significant decreases were seen with the blacksaddle grouper (*E. howlandi*, 4.1 m.t. in FY97 to none observed during FY98), the red-gilled emperor, (decreasing 30%, 2.1 m.t. compared with 2.9 m.t.), the blackspot emperor (*L. harak*, decreasing 74%, 0.68 m.t. compared with 2.7 m.t.), the yellowstripe emperor (*L. obsoletus*, decreasing 73%, 1.1 m.t. compared with 4.1 m.t.), and the lyretail grouper (*Variola louti*, decreasing 42%, 0.58 m.t. compared with 1.0 m.t.). Species with significant increases compared with FY97 were observed with uku, (increasing 38% from 1.3 m.t.), the blue-lined snapper (*L. kasmira*, increasing 217% from 0.6 m.t.), and the black-tipped grouper (*E. fasciatus*, increasing 93% from 1.8 m.t.).

Other important bottomfish include triggerfishes (*Balistidae*, 1.9 m.t.), soldierfishes and squirrelfishes (*Holocentridae*, 1.7 m.t.), requiem sharks (*Carcharhinidae*, 1.4 m.t.), goatfishes (*Mullidae*, 1.2 m.t.), and reef white-tip sharks (*Hemigaliedae*, 1.1 m.t.). For approximately 20% of the bottomfish catch, a species breakdown was not obtained due to time constraints imposed by the fishermen. All complete bottomfish interviews consisted of catch, effort, and participation information.

Comparing bottomfish participation with FY97, the number of bottomfish trips increased 23%, 8,810 trips up from 7,139. Approximately 81% of these trips were from non-charter boats. The number of persons participating in bottomfishing decreased 8%, 36,263 compared with 39,660 in FY97. The number of people participating in bottomfishing was evenly distributed between charter and non-charter bottomfishing. There was an average of 4.71 trips on weekdays and 8.92 on weekends and holidays, with an overall average of 6.81 bottomfish trips per day. Bottomfish trips made up 30% of total offshore trips, each trip averaging 4.02 hours and having 3.90 fishermen.

Comparing bottomfish effort with FY97, the number of boat hours increased 39%, 39,538 boating hours up from 28,469 hours. Approximately 10% of this effort were from charter bottomfishing boats. There were 135,366 bottomfish person-hours and 126,796 bottomfish gear-hours during FY98.

Overall bottomfish catch decreased 21%, 40.3 m.t. down from 52.1 m.t. in FY97. Comparing the four top families, *Lutjanidae* catches increased 12.8%, 7,965 m.t. compared with 7,062 m.t. in FY97), *Lethrinidae* decreased 47.9%, 7,258 m.t. compared with 13,925 m.t. in FY97, *Serranidae* increased 12.8%, 6,408 m.t. compared with 5,682 m.t. in FY97, and *Carangidae* increased 39.7%, 3,800 m.t. compared with 2,720 m.t. in FY97. Comparing the overall catch of most commonly caught bottomfish species between FY98 and FY97, the black-tipped grouper (*E. fasciatus*) increased 92.6% (3,523 m.t. compared with 1,829 m.t.), the red-gilled emperor (*L. rubrioperculatus*) decreased 29.8% (2,067 m.t. compared with 2,943 m.t.), uku (*A. virescens*) increased 37.5% (1,722 m.t. compared with 1,252 m.t.), the honeycombed grouper (*E. fasciatus*) increased 92.6% (3,523 m.t. compared with 1,829 m.t.), the yellowtail kalikali (*P. auricilla*) decreased 10.3% (1,425 m.t. compared with 1,588 m.t.), the blue-lined snapper increased 113.1% (1,266 m.t. compared with 594 m.t.), and the yellowstripe emperor (*L. obsoletus*) decreased 72.6% (1,119 m.t. compared with 4,080 m.t.).

Comparing catch rates, the overall catch rate (kg/hour) decreased 44%, 1.02 kg/hr compared with 1.80 kg/hr in FY97. Bottomfish catch per boat trip decreased 37%, 4.6 kg/boat trip compared with 7.3 kg/boat trip in FY97. Comparing catch rates between charter and non-charter bottomfishing, charter boats had catch rates of 0.92 kg/hr and 0.11 kg/gear-hour, while non-charter fishing had catch rates of 1.03 kg/hr fished and 0.39 kg/gear-hour. The low catch rate for charter boats could be due to the low catch rates of Agat Marina charter boats. These Agat charter boats, which make up 90% of the total bottomfish charter trips, often have upwards five or six trips a day, as many as 25 gear units per trip, and fish in the same area. Their catches consist primarily of low numbers of triggerfish and goatfish, resulting in extremely low catch rates and low catches.

Deep water species comprised 11% of the total bottomfish catch (Table 4). An increase in deep bottomfish was observed compared with FY97, 4.6 m.t. in FY98 compared with 4.0 m.t. Deepwater species encountered consisted primarily of *Etelis*, *Pristipomoides*, and *Carangidae* species. The dominant deepwater bottomfishes were the yellowtail kalikali (*P. auricilla*, 1.4 m.t.), opakapaka (*P. flavipinnis*, 969 kg.) and gindai (*P. zonatus*, 609 kg.).

TABLE 4: Composition of the Guam deep bottomfish catch during FY98. Estimated weights are in kilograms.

Species	Total Catch (kg.)	% Total Deep Bottomfish Catch
<i>Pristipomoides auricilla</i>	1,425	30.8
<i>P. flavipinnis</i>	969	21.0
<i>P. zonatus</i>	609	13.2
<i>P. argyrogrammicus</i>	252	5.5
<i>P. filamentosus</i>	106	2.3
<i>Etelis carbunculus</i>	379	8.2
<i>Seriola dumerili</i>	329	7.1
<i>Aphareus rutilans</i>	318	6.9
Misc. deep bottomfish*	226	4.9
Total	4,613	100.0

*unable to obtain species breakdown

Atulai Night-Light Jigging

Atulai night-light fishing was encountered year round during FY98. This method experienced the most significant increase in participation and catch compared with the other offshore methods. An estimated 31.3 m.t. of fish were landed, a 550% increase from the 5.6 m.t. harvested in FY97 (Table 5). Unlike FY97 where atulai (*Selar crumenophthalmus*) comprised 95% of the night-jigging catch, atulai comprised only 54% of the night-jigging catch. The remainder of the night-jigging catch consisted of sharks (*Carcharinidae*, 8.1 m.t.), dogtooth tuna (*G. unicolor*, 1.9 m.t.), black-spotted stingrays (*Taeniura melanospilos*, 2.1 m.t.), and other species of jacks, snappers, groupers, squirrelfishes, and soldierfishes.

The number of atulai night-light jigging trips increased 413%, 1,655 trips compared with 401 trips during FY97. Effort comprised of 11,587 fishing hours, 29,645 person-hours and 37,976 gear-hours. Each night-jigging trip averaged 18.9 kg, an increase of 40% from FY97. Approximately 52% of all night-jigging trips occurred on weekends and holidays, with 62% of the trips originating from the Agat Marina and Merizo pier. There was an average of 1.1 night-jigging trips per day, 0.7 on weekdays and 1.6 on weekdays and holidays. Each trip averaged 7.0 hours and 2.4 fishermen. Average catch rates were 2.7 kg/hr and 0.8 kg/ gear-hr.

TABLE 5: Composition of the Guam atulai (*Selar crumenophthalmus*) night jigging catch during FY98. Estimated weights are in metric tons.

Species	Total Catch (kg)
<i>Selar crumenophthalmus</i>	16.9
<i>Carcharinidae</i>	8.1
<i>Dasyatidae</i>	2.1
<i>Gymnosarda unicolor</i>	1.9
<i>Sphyracidae</i>	1.0
Other	1.3
Total Catch (kg)	31.3

Spearfishing

An estimated 55.5 m.t. of speared fish, crustaceans, and mollusks were landed during FY98 (Table 6), an increase of 26% from FY97. The spearfish finfish catch (see Table 7) was dominated by surgeonfishes (*Acanthuridae*, 17.8 m.t.), parrotfishes (*Scaridae*, 11.5 m.t.), groupers (*Serranidae*, 2.8 m.t.), emperors (*Lethrinidae*, 1.8 m.t.), and mullets (*Mullidae*, 1.4 m.t.). The bluespine unicornfish (*Naso unicornis*) was the most important spearfish species taken, comprising 61% of the *Acanthuridae* catch and 19% of the total spearfish catch, followed by the Pacific longnose parrotfish (*Hipposcarus longiceps*, 2.7 m.t.), the yellowband parrotfish (*S. schlegeli*, 1.9 m.t.), and the bullethead parrotfish (*S. sordidus*, 1.4 m.t.). Marine invertebrates, *Trochus niloticus* (1.3 m.t.) and the spiny lobster (*Panulirus penicillatus*, 1.2 m.t.), followed in overall catch. For 19% of the spearfish catches, a species breakdown was not possible due to time constraints imposed by fishermen. For these interviews, an estimated catch weight, as well as participation and effort data, was taken.

TABLE 6: Composition of the Guam spearfish catch during. Weights are in kilograms.

Family/Species*	Total Catch (kg)	% Total Catch
<i>Acanthuridae</i>	17,769	32.0
<i>Naso unicornis</i>	10,775	60.6+
<i>N. lituratus</i>	2,972	16.7+
<i>A. xanthopterus</i>	1,021	5.7+
<i>A. lineatus</i>	1,013	5.7+
<i>N. caesius</i>	588	5.3+
<i>Scaridae</i>	11,470	20.7
<i>Hipposcarus longiceps</i>	2,715	23.7+
<i>S. schlegeli</i>	1,893	16.5+
<i>S. altipinnis</i>	1,684	14.7+
<i>S. sordidus</i>	1,439	12.5+
<i>S. frontalis</i>	842	7.3+
<i>S. microrhinos</i>	746	6.5+
<i>S. rubroviolaceous</i>	519	4.5+
<i>Trochus niloticus</i>	1,318	2.4
<i>Kyphosidae</i>	1,297	2.3
<i>K. cinerascens</i>	984	75.9+
<i>Palinurinae</i>	1,426	2.6
<i>Panulirus penicillatus</i>	1,155	81.0+
<i>Lethrinidae</i>	1,796	3.2
<i>L. harak</i>	615	34.2+

<i>Serranidae</i>	2,815	5.1
<i>Epinephelus lanceolatus</i>	1,010	35.9+
<i>Mullidae</i>	1,364	2.5
<i>Siganidae</i>	1,331	2.4
<i>S. punctatus</i>	679	51.0
<i>Lutjanidae</i>	1,211	2.2
<i>Diodontidae</i>	799	1.4
<i>Diodon hystrix</i>	779	97.5+
<i>Labridae</i>	1,187	2.1
<i>Cheilinus undulatus</i>	736	62.0+
<i>Carangidae</i>	763	1.4
<i>Holocentridae</i>	595	1.1
<i>Octopus</i> sp.	539	1.0
Assorted Reef Fish**	10,323	18.6
Total	55,527	100.0

*Family and Species over 500 kg. +% in respective Family. **unable to obtain species breakdown.

Spearfishing participation increased during FY98. There was a 68% increase in the number of spearfishing trips compared with FY97, 3,515 trips versus 2,091 trips, and a 22% increase in the number of people participating in this fishery, 10,054 people compared with 8,216 in FY97. Effort increased 74%, up 9,409 boat hours from 5,399 boat hours in FY97. Total spearfish catch increased 26%, 55.5 metric tons compared with 44.2 metric tons in FY98.

Snorkel spearfishing accounted for 2,610 trips, 74% of all spearfishing trips, harvesting a total of 21.9 m.t. (Table 7). Snorkel spearfishing averaged 0.8 trips a day, with each trip averaging 1.3 hours and 3.8 fishermen, and had an average catch of 1.25 kg/gear-hour. Compared with FY97, the catch rate for each trip decreased 43%, from 14.8 kg/trip in FY97 to 8.4 kg/trip. In terms of effort, snorkel spearfishing had a total of 7,750 hours, 6,737 persons in the fishery, and 17,455 gear hours. The most common species caught by this method were the orangespine unicornfish (*Naso lituratus*, 2.2 m.t.), the bluespine unicornfish (1.9 m.t.), the Pacific longnose parrotfish (1.2 m.t.), the tan-faced parrotfish (*S. frontalis*, 0.8 m.t.).

TABLE 7: Comparison of Participation and Catch between Snorkel spearfishing and SCUBA spearfishing during FY98.

Spearfishing Method	Number of trips	Catch metric tons (mt)	Catch per trip (kg/trip)	Catch per gear hour (kg/gh)
Snorkel Spear	2,610	21.9	8.37	1.25
SCUBA Spear	905	33.7	37.21	7.20
Total	3,515	55.5		

SCUBA spearfishing accounted for 905 trips, approximately 27% of all spearfishing trips, with a harvest of 33.7 m.t., or 61% of all spearfishing catch (Table 7). SCUBA spearfishing averaged 0.7 trips per day, with each trip averaging 4.3 hours and 2.5 fishermen, and had an average catch of 7.2 kg/gear-hour. Compared with FY97, the catch rate for each trip increased slightly, 37.2 kg/ trip up from 36.2 kg/trip. In terms of effort, SCUBA spearfishing had a total of 1,659 hours, 6,187 person-hours, and 4,678 gear-hours. The most common species caught by this method were the bluespine unicornfish (8.8 m.t.), the Pacific longnose parrotfish (1.5 m.t.), trochus (1.3 m.t.), the filament-finned parrotfish (*S. altipinnis*, 1.4 m.t.), the yellowband parrotfish (1.1 m.t.), and the giant grouper (*Epinephelus lanceolatus*, 1.0 m.t.).

Other Methods

Other less common fishing methods encountered during the offshore surveys accounted for 24.4 m.t. of finfish, less than 5% of the total offshore catch. This category experienced a thirteen-fold increase in finfish catch between FY96 and FY97, but decreased 22% between FY97 and FY98. The most common methods in this category were gillnetting (14.0 m.t.), castnetting (1.9 m.t.), jigging (1.1 m.t.), and spincasting (1.0 m.t.), and other rarely encountered methods. Fish species dominating these methods were atulai caught using gillnets (12.0 m.t.), the bluespot mullet (*Valamugil seheli*, 1.1 m.t.), octopus (1.9 m.t.), and the convict tang (*Acanthurus triostegus*, 0.8 m.t.),

DISCUSSION

The total offshore catch for FY98 increased slightly compared with FY97, less than 8%. An increase in catch was observed with trolling (6%), atulai night-light jigging (550%), and spearfishing (26%), while a decrease in catch was observed with bottomfishing (21%) and other boat-based methods (22%). Increased catch rates were observed with atulai night-light jigging (40%), SCUBA spearfishing (3%) and trolling (15%), while decreased catch rates were observed with bottomfishing (44%) and snorkel spearfishing (43%). The decrease in catch rates for bottomfishing and spearfishing, combined with an increase in their participation and effort could reflect an over-utilized limited marine resource. Since FY94, except for FY95 when offshore data was not expanded, catch rates for bottomfishing, total spearfishing, and snorkel spearfishing have been decreasing. This trend could seriously impact many of the species important in nearshore fisheries, especially if other methods impacting shallower areas, such as gillnetting, and the continued increase in SCUBA spearfishing continue unrestricted.

Participation and effort in SCUBA spearfishing has been steadily increasing. Participation and effort for this method may be underestimated since several unsurveyed ports, especially Ylig River, are important launch sites for SCUBA spearfishing. The east side of Guam, while inaccessible to most boats during most of the year, is fished heavily during periods of calm weather. Therefore, spearfishing catches may be underestimated. For the past several years, the increase in SCUBA spearfishing activity was due to a small core of commercial spearfishermen concentrating their efforts in waters over 30 meters deep, fishing primarily at night. During FY98, these spearfishermen have been reported to dive in waters as deep as 50 meters, use state-of-the-art diving computers, and perform multi-tank dives as often as three times a week, weather permitting. Continued unrestricted use of this method can potentially become a serious threat to many reef species, especially diurnal herbivores such as parrotfishes, unicornfishes, and surgeonfishes. Since these fish sleep at night and occur in the diving range of SCUBA spearfishermen, an increase in effort could seriously deplete these species, especially large individuals. Compared with FY97, the most important spearfishing species, the bluespine unicornfish (*Naso unicornis*), and the most important Family, *Acanthuridae*, have experienced a decrease in catch of 35% and 10%, respectively.

The decrease in the overall harvest and catch per unit of effort for bottomfishing during FY98 seems to also reflect an over-utilized nearshore and shallow water fishery. The most significant drop was observed with species of *Lethrinidae*, which contain several of the most important bottomfish species on Guam. This fishery has been experiencing a decrease in catch rate (kg/hour fished) since FY94, with several important species (*L. rubrioperculatus* and *V. louti*) showing a decrease in overall catch. Continued increases in participation and effort could result in a further lowering of overall catch and catch rates for bottomfishing.

Charter boat activity comprises a significant portion of the trolling activity. Since the end of FY97, however, a significant decrease in the number of charter trolling trips per day was observed throughout FY98. This was due to a drastic drop in the number of tourists, related to the current Asian economic crisis, resulting in a significant drop in charter boat activity (32%) and charter boat catch (35%) during FY98. Since charter boats target marlin during the summer months, this could account for the decrease in marlin catch during FY98.

A major deficiency with comparing FY98 CPUE with previous years is the lack of one consistent measure of CPUE. During FY97, the only measure of CPUE available was kilograms of catch per boat trip. While this measurement of CPUE was also available for FY98 to compare with FY97, other appropriate measures of CPUE were also used in the FY98 report.

RECOMMENDATIONS

The new survey design and computerized database analyzing the offshore data is currently being completed, with the assistance of NMFS. The new offshore expansion program is designed to provide a standard methodology for analyzing and comparing historical offshore data in order to obtain a more reliable history of the various offshore fisheries on Guam. This is especially important with bottomfishing and spearfishing, since these fisheries are heavily impacted by exclusively local fishing pressure. It is recommended to continue working with NMFS on completing the offshore expansion program and continue entering historical data into the system for re-expansion and analysis.

Separate studies on fishing pressures by particular methods, fishing pressures on specific areas, and the on the biology and effects on recreationally important fishes are also recommended. The decrease in the overall catch and catch rates of bottomfishing and spearfishing, and continued unrestricted fishing pressure by methods such as SCUBA spearfishing and gillnetting is a cause for concern. While there are other factors that contribute to the decline in reef fish catch, data resulting from these studies should provide a clearer picture on the contribution of unrestricted fishing pressures on local fish stocks. Based on recent trends, appropriate management schemes should be implemented in the near future to halt further depletion of recreationally important fishes.

PROGRAM COSTS

The estimated cost of the project is \$202,000.

Report was prepared by: Thomas Flores, Jr.