

## SURFACE TUNA-SCHOOL FISHING & BAITING AROUND SAMOA ISLANDS

Thomas S. Hida

The NMFS research vessel 'Charles H. Gilbert' returned to Honolulu on April 14, 1970, after completing a series of offshore and inshore surveys around the Samoa Islands. One of her primary missions was to survey the distribution and abundance of surface tuna schools through visual observations, trolling, and live-bait pole-and-line fishing. In the vicinity of the islands, 144 schools were seen. These included 28 skipjack tuna, 11 yellowfin tuna, and 10 mixed yellowfin-skipjack tuna schools.

Most of the observations and all of the live-bait fishing were carried out during the offshore surveys. Baiting was carried out in conjunction with live-bait pole-and-line fishing.

Other objectives accomplished by the 'Gilbert' included: (1) collecting blood samples from 216 skipjack tuna, *Katsuwonus pelamis*, and 26 yellowfin tuna, *Thunnus albacares*, for subpopulation studies; (2) making thirteen 30-minute surface plankton tows with a 1-meter net for larval tuna studies; (3) tagging and releasing 840 skipjack and 91 yellowfin tunas for growth and migration studies, and (4) conducting 35 inshore bottom fishing stations and a few miscellaneous stations in cooperation with the Government of American Samoa.

Because reports dealing with baiting and pole-and-line fishing near Samoa Islands are scarce, the cruise findings regarding these operations are presented in detail. (The results of the four other objectives will be reported elsewhere.)

### OFFSHORE SURVEY

#### Pole-and-Line Fishing

A total of 144 schools was sighted in the area covered by two offshore surveys (fig. 1). In most instances, schools were accompanied

by bird flocks composed of a few to over 1,000 birds. Birds most commonly associated with the schools were terns, boobies, and shearwaters. Schools sighted were identified as: 28 skipjack tuna, 11 yellowfin tuna, 10 kawakawa, *Euthynnus affinis*, 10 mixed yellowfin and skipjack tunas, 1 mixed kawakawa, dolphin, *Coryphaena hippurus*, and shark (unidentified), and 84 unidentified. The locations of the schools, with dates, are given in table 1. Many schools seen were not investigated because they were too far away, too fast or too small; more schools would have been fished had there been more live bait available. Sixteen schools were successfully fished. The catch included 1,075 skipjack tuna (4 to 17 pounds), 160 yellowfin tuna (2.5 to 60 pounds), and a few other fish. The locations of the tagged tuna releases are indicated with a "T" in figure 1.

Only 12 of the schools sighted were estimated to be large. Information on these schools, estimated to be over 50 tons, is given in table 2. Five were "breezers," six were "boilers," and one, which was loosely schooled over a wide area, was designated as a "jumper" (see Scott,<sup>1/</sup> 1969 for school descriptions). Activity of the "boilers" was not intense, with fish breaking surface only in small patches in pursuit of forage. Six of the schools had 5-10 pound skipjack tuna, two schools were of 20-50 pound yellowfin tuna, and four were mixed schools of 5-11 pound skipjack tuna and 5-60 pound yellowfin tuna. Locations of the large schools are indicated in figure 1 with an "X".

#### Trolling

Surface trolling was conducted with four lines during most of the daylight runs. Identification of schools and size of fish were often determined by troll-caught fish, especially during the second offshore survey when there was a shortage of live bait aboard the

Mr. Hida is Fishery Biologist, National Marine Fisheries Service, Southwest Region, Hawaii Area Fishery Research Center, Honolulu, Hawaii 96812.

<sup>1/</sup>"Tuna Schooling Terminology," James Michael Scott. Calif. Fish Game 55(2): 136-140. 1969.

Table 1.--Noon Positions, Dates and Number and Kinds of Schools Sighted Around the Samoa Islands During Cruise 117 of the 'Charles H. Gilbert'

Noon Position		Date	Number of Schools Sighted <sup>1/</sup>							Total
Lat. (S.)	Long. (W.)	1970	SJ	YF	KK	Mixed YF, SJ	UN	Mixed KK, DO, SK		
12°00'	169°15'	2/8	-	-	-	-	4	-	4	
South of Pago Pago		2/11	-	-	-	-	5	-	5	
16°55'	170°45'	2/12	2	1	-	-	4	-	7	
16°03'	170°13'	2/13	4	-	-	-	2	-	6	
14°33'	170°23'	2/15	2	-	-	-	2	-	4	
14°30'	169°22'	2/16	-	1	-	1	3	-	5	
13°37'	169°24'	2/17	-	-	-	-	1	-	1	
14°09'	171°00'	2/23	-	-	1	-	2	-	3	
14°27'	171°45'	2/25	1	-	-	-	-	-	1	
13°49'	173°15'	2/26	-	3	-	2	4	-	9	
13°50'	172°08'	2/27	-	-	2	-	3	-	5	
14°12'	172°12'	3/1	1	1	1	1	1	-	5	
14°45'	171°02'	3/2	1	-	-	-	5	-	6	
14°19'	170°36'	3/5	-	-	-	-	3	-	3	
14°18'	170°35'	3/6	-	-	-	-	4	-	4	
14°19'	170°39'	3/10	-	-	1	-	1	-	2	
14°17'	170°53'	3/11	-	-	1	-	-	1	2	
14°51'	170°30'	3/14	2	-	-	-	1	-	3	
14°11'	170°14'	3/18	-	2	-	-	4	-	6	
14°02'	169°22'	3/19	-	-	-	2	4	-	6	
14°39'	168°36'	3/20	4	-	-	1	2	-	7	
14°38'	170°14'	3/21	3	-	-	-	5	-	8	
14°25'	170°47'	3/23	3	-	-	-	4	-	7	
15°42'	170°45'	3/24	-	-	-	-	2	-	2	
14°23'	170°35'	3/25	-	-	-	-	1	-	1	
14°15'	170°56'	3/26	2	1	1	1	4	-	9	
13°46'	171°45'	3/27	-	-	-	-	2	-	2	
13°42'	173°08'	3/28	1	1	-	-	3	-	5	
14°15'	172°29'	3/29	-	-	1	-	5	-	6	
13°44'	171°50'	3/31	-	-	2	2	1	-	5	
15°03'	171°16'	4/1	2	1	-	-	2	-	5	
Total			28	11	10	10	84	1	144	

<sup>1/</sup> SJ = skipjack; YF = yellowfin; KK = kawakawa; UN = unidentified; DO = dolphin; SK = shark.

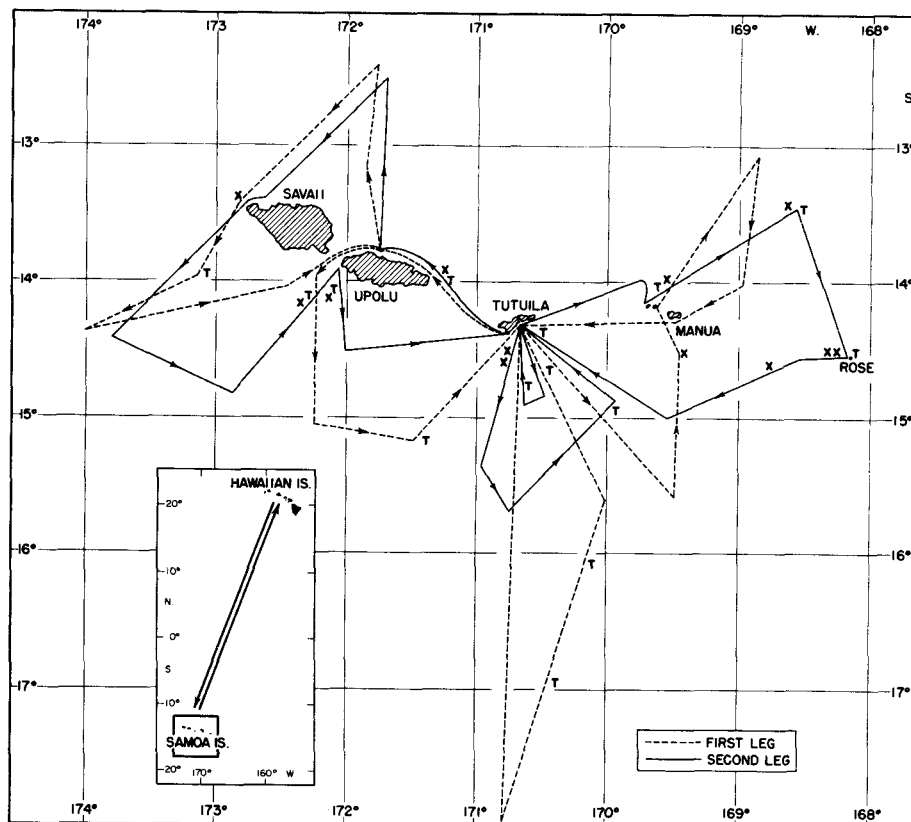


Fig. 1 - Offshore survey track chart, 'Charles H. Gilbert' cruise 117, January 30-April 14, 1970, showing locations of tag releases "T" and large schools "X."

'Gilbert'. The troll catches included 46 skipjack tuna, 30 yellowfin tuna, 31 kawakawa, 2 dolphin, and 1 shortbill spearfish, *Tetrapturus angustirostris*.

#### Environmental Conditions

The surface temperatures recorded by expendable and mechanical bathythermographs around the Samoa Islands during the survey ranged between 28° and 30° C. The thermocline depths were usually 30 to 60 meters ranging from 20 to 78 meters. The thermocline was not as "sharp" as that encountered in the Equatorial Countercurrent and the eastern tropical Pacific. Temperatures were typically 25°-27° C. at a depth of 100 meters; 20°-23° C. at 200 meters; and 15°-16° C. at 300 meters. The weather changed rapidly in the area, with seas mostly

moderate and winds usually blowing from points between northeast and southeast. The water color was the typical deep blue of the open tropical Pacific.

#### Transported Bait

Prior to leaving Honolulu, 135 buckets of threadfin shad, *Dorosoma petenense*, were loaded into three baitwells aboard the 'Gilbert' for use as live bait in pole-and-line fishing. The shad had been acclimated to sea water and were held in swimming pools for several months prior to the cruise. Shad mortalities were high during the rough 10-day voyage to Samoa. Only 30 buckets survived, but these worked well as chum during the first offshore survey for as long as they were available.

Table 2.--Information on Large Tuna Schools Seen in the Vicinity of the Samoa Islands During Cruise 117 of the 'Charles H. Gilbert'						
Position		Date	Species	Fish Size Pounds	Type of School <sup>1/</sup>	
Lat. (S.)	Long. (W.)	1970	Common Names of Tuna			
14°30'	169°21'	2/16	Yellowfin	20-50	Boiler	
13°25'	172°45'	2/26	Yellowfin	30-40	Boiler	
14°09'	172°11'	3/1	Yellowfin-Skipjack	7-16	Boiler	
14°12'	169°35'	3/19	Yellowfin-Skipjack	5	Breezer	
13°30'	168°41'	3/19	Skipjack Yellowfin	11 60	Breezer	
14°39'	168°25'	3/20	Skipjack	10	Boiler	
14°37'	168°25'	3/20	Skipjack	10	Boiler	
14°45'	168°51'	3/20	Skipjack	6	Boiler	
14°26'	170°42'	3/23	Skipjack	8	Breezer	
14°27'	170°46'	3/23	Skipjack	7-8	Breezer	
13°54'	171°21'	3/26	Skipjack	5	Breezer	
14°12'	172°04'	3/31	Skipjack Yellowfin	6 9	Jumper	

<sup>1/</sup> See Scott, 1969 for school terminology.

#### INSHORE BAIT SURVEY

##### Tutuila, American Samoa

Bait scouting was conducted from the shore in Tafuna, Alofau, and Fagasa Bays. Baiting conditions were poor in all three localities and suitable baitfish scarce. Therefore, baiting was confined to Pago Pago Harbor. A night light was submerged a few feet below the sea surface whenever possible in Pago Pago Harbor in depths ranging from 13 to 20 fathoms. Only eight sets with a lampara net were made around the light. No set was made unless an accumulation of baitfish was seen under the light.

A total of 54 buckets of a mackerel, *Rastrelliger kanagurta*, 22 buckets of sardines, *Sardinella melanura* and *Herklotsichthys punctatus*, and 4 buckets of bigeye scad, *Trachurus crumenophthalmus*, was caught night baiting. Small jacks, silversides, mullets, and a few other fish were also caught. Juvenile bigeye scad were not caught in large quan-

ties, although it was the most common fish hooked by natives in the harbor.

Most *Rastrelliger* and sardines were 5 to 7 inches long and were considered too large to be an effective live bait for small skipjack tuna. Problems were encountered in trying to keep *Rastrelliger* alive in the baitwells. On two occasions, after a few hours in the baitwells, they began surfacing in convulsive movements, turned on their sides and sank to the bottom. Mortality was very high and believed to be the result of oxygen deficiency. Unlike the other bait species, this larger baitfish could not be crowded into the baitwells.

Thirty-one sets were made with a bait seine (22 feet deep by 80 fathoms long) in 8 days of baiting in Pago Pago Harbor. Eighty-eight buckets of sardines, the most prevalent species, were caught; the largest catch in one set was 20 buckets. A few silversides, juvenile jacks, surmulletts, mullets, anchovies, tangs, and puffers were also caught in the seine. A few attempts to set on *Rastrelliger* during the

day in the deeper parts of the harbor were unsuccessful because they swam under and out of the seine before it could be pursed.

In summary, the most common baitfish found in Pago Pago Harbor with possibilities as a live bait was *Rastrelliger*, followed by sardines. The harbor was deep, mostly over 13 fathoms, and offered fairly good baiting conditions. Day seining for *Rastrelliger* would probably be more effective using a seine 30-40 feet deep. At the time of the surveys, most *Rastrelliger* and sardines were larger than desired as chum for small skipjack tuna. It is assumed that they would have been smaller and more suitable as live bait had the survey been conducted a few months earlier. Also, smaller ones may prefer areas other than Pago Pago Harbor and may have eluded detection during this survey.

#### Upolu, Western Samoa

In Western Samoa, bait scouting was limited to Apia Harbor. Little bait was evident around the main dock area and the adjacent shoreline, but the shallower and sandier grounds along the northwestern shores of the harbor appeared more suitable for baiting.

Observations under night lights showed a scarcity of suitable baitfish. Only a few mullet and schools of tigerfish (*Theraponidae*), which were too large for use as live bait, were attracted to the light. Five daytime seine sets were made in the harbor. The catch included 13 buckets of large (3-4 inch) silverside, tentatively identified as *Hepsetia pinguis* (Lacépède), and 5 buckets of small (2.5-inch) sardines. The silverside died in the baitwell before they could be used for fishing, probably affected by the long skiff ride from baiting area to vessel. The sardines, on the other hand, did very well in the baitwell and were effective as chum.

Baiting was poor in Apia Harbor during the survey. Further scouting should be conducted in other areas and at different times to better assess the live-bait resources of Western Samoa.

#### ACKNOWLEDGMENTS

Mr. Peter Whitehead of the British Museum (Natural History) was kind enough to identify the sardines from samples sent to him. Mr. Susumu Kato of NMFS, Fishery-Oceanography Center, La Jolla, Calif., and Mr. Hiromu Heyamoto of NMFS, Exploratory Fishing and Gear Research Base in Seattle, reviewed this paper.

