



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Southwest Fisheries Science Center  
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## CRUISE REPORT

**VESSEL:** F/V *Ventura II*

**CRUISE NUMBER:** LL-JS-0024

**CRUISE DATES:** June 24, 2011 – July 13, 2011 and October 21, 2011 – October 30, 2011

**PROJECT:** Highly Migratory Species (HMS) Abundance Survey: Fisheries Resources Division

### ITINERARY

Leg 1: Vessel departed San Diego on June 24, 2011 and proceeded to fishing grounds in the Southern California Bight. Longline sets were conducted twice in each CDFG blocks 707, 723, 742, 805, 828, 846, and 848 (see Figure 2) during the first 8 days for the juvenile shortfin mako (*Isurus oxyrinchus*) and blue shark (*Prionace glauca*) abundance survey. Replicate sets commenced during the remaining days inside the survey blocks. Opportunistic trolling for tuna and tuna like species was conducted between survey sets. A night set was conducted, targeting swordfish (*Xiphias gladius*), in an area where sightings had been reported. Vessel returned to San Diego July 3, 2011 to exchange personnel and resupply.

Leg 2: Vessel departed San Diego on July 4, 2011. Pelagic longline sampling was conducted in the remaining survey blocks to complete the juvenile shark abundance survey. Opportunistic trolling was conducted between survey sets. Vessel moved outside of the survey area to target tuna, swordfish and sharks for electronic and conventional tagging studies. Fishing was conducted in areas near the Mexico border where bluefin (*Thunnus orientalis*) catch were reported. Similar to the previous year, a large concentration of juvenile blue sharks was encountered in this area and shark deterrent experiments were conducted. A swordfish set was conducted at night in an area with a high SST gradient and fronts. Vessel returned to San Diego July 13, 2011.

Leg 3: Vessel departed Ventura on October 21, 2011 and proceeded to fishing grounds off Point Conception and Central California. The crew developed methods to set the longline deep during the day to target the daytime depths of swordfish. Eleven sets were conducted. Opportunistic trolling for tunas was conducted between survey sets. The vessel returned to Ventura October 30, 2011.

### OBJECTIVES

- 1) Conduct the juvenile shark abundance survey, occupying each of the 7 standard stations twice.
- 2) Conduct sampling at alternate sites as time permits.
- 3) Record and document species captured and determine distribution by size and area.
- 4) Tag and release healthy sharks with conventional and satellite tags for migration patterns information.
- 5) Collect biological samples from animals that do not survive including DNA, muscle tissue, stomach contents, spiral valve, eye, and whole specimens.
- 6) Conduct oceanographic measurements in the survey areas using CTD and acoustics.
- 7) Conduct shark deterrent experiments in areas where high shark catch is expected.
- 8) Develop and test daytime longline deep set methodology for targeting swordfish.
- 9) Target swordfish based on water mass features including fronts and eddys and tag healthy swordfish with archival tags.
- 10) Target small tuna (albacore (*Thunnus alalunga*), bluefin, yellowfin (*Thunnus albacores*) and skipjack (*Katsuwonus pelamis*)) by surface trolling and tag healthy albacore with archival tags.

## **SURVEY LONGLINE SET METHODS**

Replicate longline sampling operations were conducted at each sampling site during daylight hours. Daytime sets commenced at approximately 0600 and 1200. Average soak time was 4 hours 00 min ( $\pm 2$  min SE). 9/0 J style hooks were set in the upper 50 m and baited with whole mackerel. For each set, approximately 210 hooks were set 50 feet apart along 2 miles of stainless steel mainline. Shark fork lengths were measured, condition of the shark and location of the hook was recorded, a fin clip was taken for DNA and healthy sharks were tagged with conventional and/or satellite tags and released. Time and location of the set and haulback were recorded to document captures, and temperature and depth profiles were recorded at each location to examine the water column in each sampling location. Additionally, backscatter within the water column between the surface and 750 m was recorded using a 50/200 kHz echosounder and data logging system during all hours of fishing operations.

## **ANCILLARY LONGLINE SET AND TROLLING METHODS**

During all ancillary fishing operations, backscatter within the water column between the surface and 750 m was recorded using a 50/200 kHz echosounder and data logging.

Longline sets targeting swordfish conducted during Leg 1 and 2 were completed during the night. Sets commenced between 2100 and 2200 and were soaked for approximately four hours. Monofilament branchlines were approximately 55 feet in length and set along a monofilament mainline. 14/0 C style hooks were baited with whole mackerel. Light sticks were placed on the branchlines. Approximately 200 hooks were evenly spaced along 6 miles of mainline.

Shark deterrent experiments were completed during the second leg using similar methods and gear as survey sets. Number and type of hook, spacing, soak time, and length of cable were all similar. Individual deterrents consisted of a small plastic pvc pipe covering an electrical component that emitted a small electrical charge.

Longline sets targeting swordfish during Leg 3 were conducted during the daytime. Time-depth recorders were used to document hook depth across all sets and hook numbers; the average depth was 230 m. For each set, approximately 10 miles of monofilament mainline was set with an average of 266 branchlines, 36 feet in length. 18/0 C style hooks were baited with whole mackerel or sardine.

Trolling occurred opportunistically during transit, soak time or between longline sets during daytime hours. Trolling gear was either handlines, commercial outrigger trolling lines or rod and reel lines with surface lures. Typically 2 to 8 lines were set. Barbless hooks were used when targeting albacore for archival tagging.

Detailed morphometric information and biological samples were collected from dead animals collected during all fishing events. Stomachs and reproductive tracts were collected. Tissue biopsies were collected from most sharks in support of a study conducted at Stanford University investigating niche overlap and separation using isotope analysis. Digestive tract tissue samples were collected for researchers at California State Fullerton (CSF) examining digestive enzyme activity. Eyes were also collected for CSF to examine differences in eye muscle function across species. During opportunistic fishing, Pacific mackerel were collected for an ongoing reproductive maturity study being conducted by the FRD Coastal Pelagics Species Research Group.

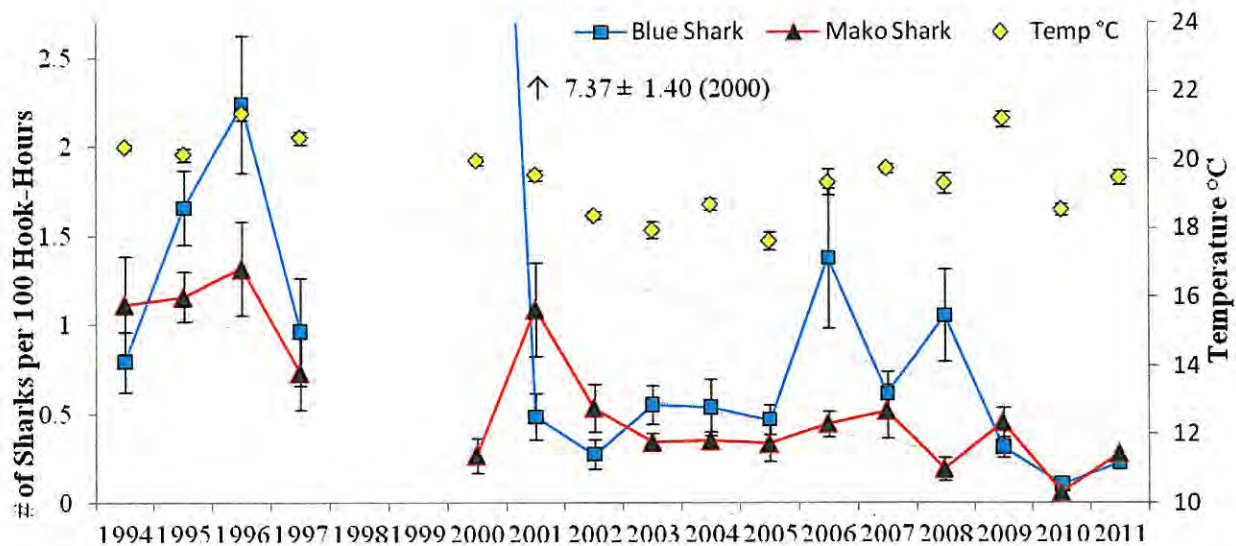
## **RESULTS**

The annual abundance survey for juvenile shortfin mako and blue sharks was completed during the first two legs. A total of 28 sets were completed within the survey blocks (Figure 2). One set was omitted from the survey results because fishing continued into crepuscular hours. 5493 hooks were fished during the 27 daytime survey sets. Survey catch totaled 61 shortfin makos, 49 blue sharks, 5 pelagic rays (*Pteroplatytrygon violacea*), 4 opah (*Lampris guttatus*), 1 lancetfish (*Alepisaurus ferox*) and 1 common mola (*Mola mola*). The preliminary data indicate that the nominal survey catch rate was 0.277 per 100 hook-hours for shortfin mako and 0.220 per 100 hook-hours for blue sharks. The nominal CPUE for both blue and shortfin mako sharks were slightly higher than the previous year. However, there is a declining trend in nominal CPUE for both species over the time series of the survey (Figure 1).

Three shark deterrent experiment sets were completed during Leg 2. Preliminary results indicate that the deterrents did not affect the catch rate of shortfin mako and blue sharks.

During Leg 3, eleven deep longline sets and many hours of trolling were conducted in an area west of Point Conception and offshore up to Central California. All fish caught were documented and either released with or without tagging or retained for biological sampling. Three swordfish were caught and one was tagged with a satellite tag. The three species that composed the majority of the catch were blue sharks (n=105), albacore (n=25, 23 of which were caught while trolling), and opah (n=10). A total of 97 blue sharks were tagged with conventional tags. A number of rare deep water species such as the king of the salmon (*Trachipterus altivelis*) were also caught.

Forty eight longline sets and over 30 hours of trolling were completed during the three legs of the research cruise. A total of 474 animals were caught (Table 1). Ancillary sampling, including trolling, resulted in 353 captures, which was nearly 75 percent of the total catch. Many of the captures outside of survey blocks were juvenile blue sharks caught near the Mexico border (~ 32N, 18.2W) (Figure 2). Fourteen opah were caught during the cruise. Sixteen opah were caught during longline sets in 2010 and eight were caught in 2009. Prior to 2009, only one other opah had been recorded during a longline survey cruise, in June of 2000. No interactions with marine mammals, seabirds or sea turtles occurred.



**Figure 1.** Average ( $\pm$  se) temperature and nominal catch per survey set for shortfin mako and blue sharks, 1994 – 2011. No data were collected in 1998 and 1999. Blue shark nominal catch per 100 hook-hours was 7.372 in 2000.

Most animals were brought onboard and measured, tagged, and a DNA sample was collected before they were released. A total of 366 conventional spaghetti tags were released on sharks (Table 1) for movement and stock structure data. A total of 452 DNA samples were collected, including samples from 315 blue sharks, 68 shortfin makos, 25 albacore, 12 opah, 9 skipjack, 7 bluefin tuna, 4 Pacific pomfret (*Brama japonica*), 4 lancetfish, 3 king of the salmon, 3 pelagic rays, 1 common thresher and 1 swordfish.

In a cooperative effort with TOPP (Tagging of Pacific Pelagics), a total of 7 electronic tags were deployed on sharks to examine the habitat-use patterns of these species in the California Current System (Table 1). Two shortfin mako sharks (182 and 235 cm fork length) and four blue sharks (161, 164, 169, 171, and 226 cm FL) were released with a radio position transmitting tag (SPOT). Early results indicate that the blue and mako sharks tagged with SPOTs are surfacing and data transmissions are providing

location data. Additionally, two opah and one swordfish were tagged with mk10-PAT pop-off archival tags.

**Table 1.** Catch summary for the HMS abundance research cruise. Pelagic longline (LL) catch during survey and ancillary sets, trolling and number of conventional and electronic tags deployed by species.

Species	Survey	Ancillary	Trolling	Total	Conv. Tag	Elect. Tag
	LL	LL				
<i>Isurus oxyrinchus</i>	61	14	0	75	64	2
<i>Prionace glauca</i>	49	272	0	321	301	5
<i>Alopias vulpinus</i>	0	1	0	1	1	0
<i>Xiphias gladius</i>	0	3	0	3	0	1
<i>Thunnus alalunga</i>	0	2	23	25	0	0
<i>Thunnus orientalis</i>	0	2	5	7	0	0
<i>Katsuwonus pelamis</i>	0	0	9	9	0	0
<i>Pteroplatytrygon violacea</i>	5	0	0	5	0	0
<i>Mola mola</i>	1	1	0	2	0	0
<i>Lampris guttatus</i>	4	10	0	14	0	2
<i>Trachipterus altivelis</i>	0	4	0	4	0	0
<i>Brama japonica</i>	0	4	0	4	0	0
<i>Alepisaurus ferox</i>	1	3	0	4	0	0
<b>Total</b>	<b>121</b>	<b>316</b>	<b>37</b>	<b>474</b>	<b>366</b>	<b>10</b>

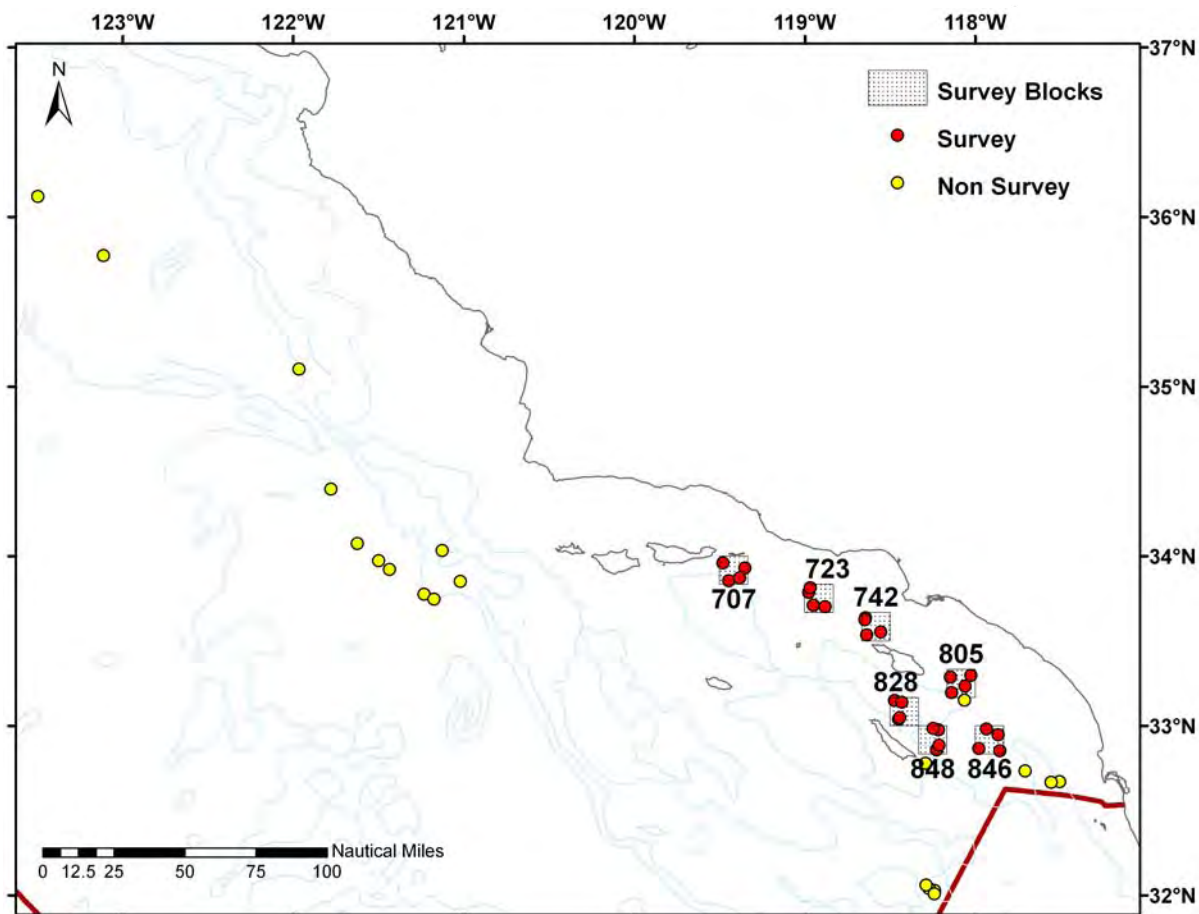
#### MISCELLANEOUS

- 1) The disposal of fish caught was in accordance with NOAA Administrative order 202-735B dated January 25, 1989.
- 2) The Cruise Leaders held a pre-cruise meeting aboard the vessel with the ship's crew before departure and a post-cruise meeting upon termination of the cruise. The charter captain and crew were well experienced and knowledgeable and all operations proceeded smoothly.

#### PERSONNEL

Leg 1:	James Wraith, Chief Scientist	SWFSC
	Owyn Snodgrass	SWFSC
	Lai Ngai	UCSD
	Kyle Newton	CSUF
	Mariela Brito	CICESE
	Erin Fedewa	SWFSC Hollings Scholar
Leg 2:	John Hyde, Chief Scientist	SWFSC
	Natalie Spear	SWFSC
	Liana Heberer	Seattle Univ.
	Nathan Mertz	UCSC
	Mackenzie Merkel	Yale
	Paul Rodgers	SARDI (Australia)
Leg 3:	Suzanne Kohin, Chief Scientist	SWFSC
	Owyn Snodgrass	SWFSC
	Natalie Spear	SWFSC
	Helena Aryafar	SWFSC
	Joel VanNoord	SWFSC

Figure 2. 2011 HMS Abundance Survey longline set locations.



Date: 1/3/12 <sup>RV</sup>

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