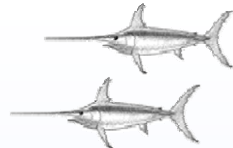


Characterization of swordfish buoy gear catches in the Florida Straits

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Introduction

- The regulatory prohibition of pelagic longline gear within the Florida Straits in 2001 led to the displacement of fishing effort targeting swordfish *Xiphias gladius*. Swordfish buoy gear (SBG) was developed ca. 2002 as an alternative harvesting method.

- The basic configuration of SBG includes a short section of heavy monofilament mainline, to which is attached one or two long leaders usually terminating in a size 9/0 J-style hook. The "piece" of gear is then supported at the surface by at least one large buoy.

- A nightly set of SBG involves the simultaneous deployment of 10-20 individual, freely-floating pieces which are monitored visually from the deploying vessel. These are often small boats < 20 m LOA (Figure 1) which store the large monitoring buoys in custom racks along the stern or gunwale of the vessel (Figure 2).

- Because of the gear construction and fishing style, SBG shares many characteristics of pelagic longline gear. These shared characteristics include incurring potentially high catch rates of juvenile swordfish within the Florida Straits nursery grounds.

Goal 1: To describe the nature of the catch by SBG gear in the Florida Straits.

Goal 2: To use electronic monitoring equipment to determine the physical parameters of the SBG gear type.

Materials and Methods

- 56 observed trips between 3 Q 2007 and 3 Q 2009 (Table 1) taken aboard commercial SBG vessels (Table 2) in U.S. waters of the Florida Straits. Data recorded at sea by PI or NSU graduate student observers using custom datasheets.

- Movements of SBG pieces and vessels monitored with hand-held GPS units.

- Individual buoys included temperature-depth recorders (TDRs; Lotek LTD_1100 model) deployed 2 m shallower than the hook. Data were recorded by TDRs at 15 sec. intervals and used to determine actual fishing depths and time of hooking.

- All animals caught measured for length, with other biological data collected if fish was retained for sale or dead at haulback (gear retrieval).

	1 Q	2 Q	3 Q	4 Q
2007	--	--	2	10
2008	6	6	0	5
2009	9	4	14	--
	15	10	16	15

Table 1. Seasonality of observed swordfish buoy gear research sets within the Florida Straits between 3 Q 2007 and 3 Q 2009.

Vessel	Homeport	Length	Engine Type
Kristin Lee	Pompano Beach, FL	16.4	Inboard
Blue Baron	Jupiter, FL	12.5	Inboard
Nauticat	Miami, FL	10.7	Outboard * 2
Blue Baron II	Jupiter, FL	12.5	Inboard
John B	Deerfield Beach, FL	10.7	Outboard
Slice 'n' Dice	Hollywood, FL	8.2	Outboard
Miss Quik	Pompano Beach, FL	10.7	Outboard * 2
Wonkajoe	Hollywood, FL	8.2	Outboard

Table 2. Descriptions of the eight vessels used during study of southeast Florida swordfish buoy gear fishery.



Figure 1. The F/V Wonkajoe. This type and size of vessel is typical within the Florida swordfish buoy gear fleet.



Figure 2. Buoy rack aboard the F/V Nauticat, showing large monitoring buoy and attached smaller bite indicator float.

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Results

Goal 1: Description of Catches by SBG in the Florida Straits fishery

- Catch composition:

- Catches dominated by swordfish (143 of 171 total fishes; Figure 3)

- No bycatch of istiophorid billfishes, sea turtles, sea birds, or marine mammals

- For swordfish, only 39 undersized individuals, of which only 4 released dead

- Unlike all previous pelagic longline (PLL) hook comparison study data with high rates of gut-hooking, most swordfish caught by J-style hooks on SBG are externally hooked (Figure 4).

- Catch-per-unit-effort (CPUE; catch per 1000 hooks) rates are very high (Figure 5A), especially when contrasted with historic PLL CPUE values that are an order of magnitude lower. Varying lengths of SBG deployments and SBG CPUEs suggests a future scientific examination of alternate CPUE metrics than those used with PLL data, perhaps standardized by hour (Figure 5B).

Goal 2: Description of SBG Gear Behavior

- Actual fishing depth of SBG is usually less than that predicted by current NOAA Fisheries Pelagic Observer Program (POP) estimator (see scatter plot in Figure 6). Preliminary GLM modeling indicates a clear, significant relationship ($r^2 = 0.823$, $P < 0.001$) between predicted and actual depths; ongoing work is evaluating potential oceanographic correction factors.

- TDRs indicate that few fish remain as long on the hook prior to gear retrieval ($1:36 \pm 1:33$; $n=73$) with SBG as with PLL gear ($6:59 \pm 3:23$; $n=30$; Kerstetter and Graves, 2006, *Fish. Res.* 80: 239-250), supporting anecdotal data from active fishery participants.

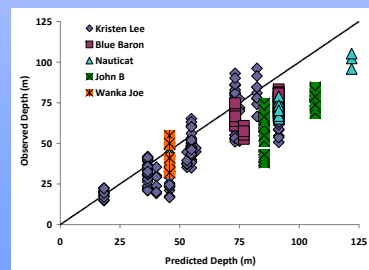


Figure 6. Relationship between predicted and observed individual hook depths for five different SBG vessels engaging in monitored fishing in the Florida Straits. Predicted depths were calculated as the combined lengths of fishing line from the hook to the buoy. Observed depths were measured with temperature-depth recorders.

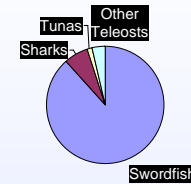


Figure 3. Composition of catches during swordfish buoy gear research sets within the Florida Straits.

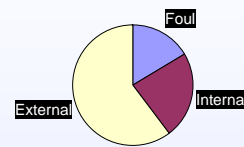
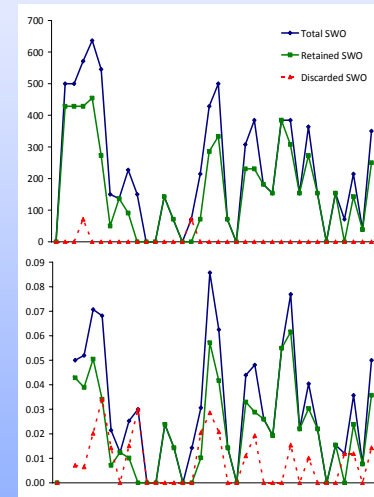


Figure 4. Descriptions of hooking location for swordfish catches during swordfish buoy gear research sets within the Florida Straits.



Figures 5A and 5B. Analyses of catch-per-unit-effort (CPUE) for swordfish buoy gear research sets within the Florida Straits. Figure 5A (top) shows CPUE based on catch per 1000 hooks, as is the convention for pelagic longline gear. Figure 5B (bottom) shows CPUE based on catch per 1000 hooks per hour.

Conclusions

- Catches by SBG are high compared with traditional pelagic longline gear, with lower rates of juvenile swordfish bycatch and higher rates of discard live releases.

- Although formally approved as an authorized gear by NOAA Fisheries in 2006, persistent gear conflicts regularly occur between recreational hook-and-line anglers and commercial SBG fishers. Ongoing efforts by politically-connected recreational swordfish angling clubs to prohibit SBG in the Florida Straits suggest that the future of the commercial use of SBG remains in doubt.

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