

Exempt Fishery Proposal Application for Deep-Set Linked Buoy Gear

1. *Date of application:* 11/1/2016
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3. *A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP.*

The Pacific Fishery Management Council (PFMC) has expressed interest in the development and design of alternative swordfish gears for the U.S. west coast that reduce bycatch (i.e., turtles and marine mammals). Following this direction, PIER has focused on the use of depth segregation to selectively target swordfish during the day. The first phase of this work focused on designing a low-impact gear type to augment the low-volume harpoon fishery that operates off Southern California. This entailed the development and design of deep-set buoy gear (DSBG), a hook and line gear-type that selectively targets swordfish at depth (250-350m) during the day. DSBG was designed specifically for the west coast using depth distribution data from target (i.e., swordfish and opah) and non-target species (Carey and Robison; 1981; Sepulveda et al., 2010; Dewar et al., 2011; Sepulveda et al., 2014; Sepulveda et al., 2015). DSBG is now in the second year of exempted fishing trials and continues to demonstrate high selectivity for swordfish. DSBG has also grown in popularity among markets and stakeholders and has demonstrated a product quality that rivals that of any swordfish available today.

Because California also supports a higher-volume market that has historically been supplied by both longline operations as well as the CA Drift Gillnet Fishery (DGN), the second phase of this work is to test a gear configuration that is able to:

1. Provide vessels with a gear type that approaches the catch efficiency of DGN operations and exceeds that of DSBG
2. Augment domestic west-coast based operations
3. Provide vessels with an alternative gear type that has lower bycatch than DGN
4. Offset imports from foreign fisheries.

This submission requests to test “Linked Buoy Gear” under an exempted fishing permit (EFP). A description of Linked Buoy Gear is provided in subsequent sections of this proposal.

Disposition of Catch: During the proposed exempted trials, all marketable catch will be sold by cooperative fishers to offset cooperative fisher costs and assess economic viability.

#### *4. Justification for EFP issuance.*

This EFP application is the product of several years of planning, outreach and focused research on the development and trial of deep-set operations to target swordfish off the California coast. The proposed work expands upon successful DSBG trials and tests a configuration that is specifically designed for the U.S. West Coast. Despite the success of DSBG trials to date, there is still a need to identify ways to increase west coast landings and reduce bycatch of sensitive species.

Given that California has historically supported two markets, a high-value harpoon industry and a larger-volume DGN fishery, PIER has focused revitalization efforts in two phases. Phase I focused on the use of DSBG to augment the harpoon fishery (a low-volume industry). Phase II (this submission) builds upon this initial work to develop an expanded design that has been referred to as Linked Buoy Gear (LBG). LBG is specifically designed for vessels of the size currently used in the DGN fishery and has received positive support from active DGN fishers. Because California DGN fishers have been faced with numerous bycatch mitigation measures that have led to fishery decline (Carretta et al., 2003), the current design is focused specifically on a gear type that can be used by this fleet.

The purpose and goals of the proposed EFP are to collect the necessary performance information for considering LBG as a federally authorized gear type under the Highly Migratory Species Federal Management Plan (HMS FMP). The proposed EFP will bring together a cohesive team of scientists, managers, NGOs, and cooperative fishers to perform trials focused at evaluating LBG catch, economic viability and stakeholder acceptance. This work will occur in conjunction with a research team that will focus on quantifying post release disposition of non-retained catch and also coordinate and monitor fishing activities.

Based on two seasons (2015 & 2016) of gear development and field trials, the PIER team has developed deployment protocols that will be used to train cooperative fishers on the use of LBG. Parallel efforts will also be focused on an outreach platform that will facilitate market development, community acceptance and stakeholder buy-in.

As with the previous DSBG work, LBG has initiated environmental consultation with the NOAA West Coast Region and catch and progress to date has been shared in an open and transparent manner with the public and fisheries managers including the PFMC. In 2015-2016, funding was secured from the NOAA Bycatch Reduction and Engineering Program (BREP) and supportive partners (The Nature Conservancy, Pew Charitable Trust) to develop and refine LBG for this EFP submission.

To date, LBG trials have demonstrated similar catch composition to DSBG, with swordfish and other marketable species comprising over 90% of the catch (Figure 1). Similar to DSBG, strike detection and gear serviceability has made it so that all non-marketable species can be released alive.

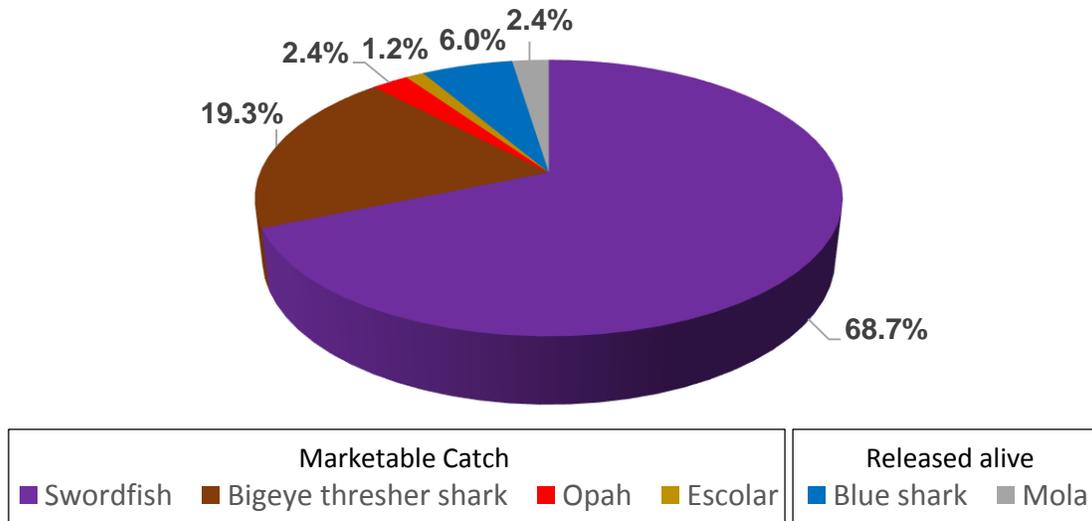


Figure 1: Catch composition for 36 Linked Buoy Gear sets (8h fishing days) conducted from 10/21/15 through 10/21/16 aboard the PIER Research Vessel, *Malolo*.

Specific goals of this EFP:

- a) Outfit three cooperative vessels and train their crew for LBG use.
- b) Conduct LBG sets targeting swordfish off the California coast aboard three cooperative vessels.
- c) Quantify all gear deployment details, including specifics on catch and bycatch (i.e., size, marketability, fate/disposition).
- d) Document market price of all species sold during the trials and quantify price-point compared to ongoing domestic DGN, harpoon and DSBG operations as well as seasonal imports from Mexico, Hawaii and other regions.
- e) Compare catch and bycatch between LBG and ongoing domestic operations (i.e., DSBG, DGN)
- f) Further develop the LBG market and foster community acceptance through outreach and public education.

Catch Disposition: All marketable species captured by cooperative fishers using LBG will be sold by the cooperative vessels to evaluate economic viability of a LBG fishery and offset the costs associated with the cooperative fisher trials.

*5. Broader Significance*

This EFP has been developed as part of a larger plan to revitalize California’s west coast swordfish fishery. Over the past 30 years, California’s primary swordfish fishery

has declined severely, primarily because of restrictions and bycatch mitigation mandates placed upon the CA DGN fishery. Subsequently, California has lost revenue and simultaneously increased its reliance upon foreign sourced swordfish.

PIER and several partners (NOAA; Cooperative Fishers; The Nature Conservancy; Pew Charitable Trust) have worked closely with industry to identify ways to reverse this trend and identify a low-impact fishing method that can be used to target the west coast swordfish resource. The continued goal of this work is to promote sustainable domestic swordfish operations, revitalize west coast ports and fishing communities, and increase gear selectivity for swordfish.

*6. Expected duration of the EFP (i.e., number of years proposed to conduct exempted fishing activities).*

We request an initial EFP trial period of two years.

*7. Number of vessels covered under the EFP*

We request three vessels during the first year of EFP activity. Upon demonstration of viability (i.e., economic and gear selectivity) the proposed EFP may request the inclusion of additional vessels.

*8. A description of species to be harvested (target and incidental) under the EFP and the amounts of such harvest necessary to conduct the experiment. Including harvest of protected or overfished species.*

Species to be harvested: Given that the proposed EFP will use techniques that have been developed and tested by PIER, we hypothesize that the species composition will be similar to that captured during the ongoing PIER-EFP (Figure 1). We propose that the catch will consist mainly of swordfish, opah and bigeye thresher sharks. Further, we also propose that nearly all non-retained catch will be released alive, as LBG is actively tended and strikes can be serviced to ensure non-target catch is released in good condition. Collectively, LBG catch to date does not contain any species of special management concern (i.e., overfished or restricted species). The northern elephant seal (*Mirounga angustirostris*) is the only protected species that we foresee any potential LBG interaction. Because LBG can be serviced similar to DSBG, we anticipate that such interactions can be detected resulting in a live, healthy release.

Amounts of harvest: Based on LBG trials to date, we anticipate total harvest of swordfish to be approximately 2 to 3 swordfish per 8h soak period. Given the low amount of incidental catch in our trials to date, we anticipate total harvest of other species to be insignificant.

*9. A description of mechanisms, such as at sea monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and accurately accounted for.*

The proposed EFP will use log books, at sea observer records and on-board communication protocols to track the course of all EFP deployments. Similar to the monitoring protocols developed and utilized under the PIER-DSBG EFP, all LBG sets will be monitored through a check in/out procedure for each trip, daily communication among EFP participants (via radio or satellite phone), daily fisher logbook entries and observer logbook records. The PIER team will work closely with each applicant and perform daily check-ins via satellite and radio-based communication systems to log fishing efforts, substantiate log books and manage EFP fishing operations. Costs associated with at-sea observers will be procured by PIER through several sources including federal and non-federal support.

In accordance with PFMC concerns, the proposed observer coverage plan for this EFP will include an initial trial period of 100% coverage on all cooperative vessels. Given the cost associated with each observer day (>\$500/day) and the need for a robust sample size to assess gear performance, we request a reduction in the minimum observer coverage rate to 30% after 10 sets are performed by each EFP participant.

Rationale for subsequent reduction in observer coverage rate:

1. The proposed LBG configuration uses the same number of hooks and fishing depths as DSBG, which has a mandated minimum 30% observer coverage
2. LBG has already been shown to be selective for swordfish based on recent PIER research trials (Figure 1)
3. Selected EFP participants will have undergone LBG training
4. The EFP will have additional data collection fail-safes to ensure accurate monitoring and reporting requirements (i.e., log books, at sea communication protocols)
5. A reduced observer coverage rate following the initial trial period will allow for an increased number of sets at a reduced cost to more efficiently evaluate EFP performance.

*10. A description of the proposed data collection and analysis methodology.*

The at sea sampling protocol will follow closely the procedures and guidelines utilized by the NMFS Observer Program to assess and monitor current DGN activities. The cooperative fishers will be responsible for the daily completion of detailed logbook templates that will be collected each month throughout the fishing season. The logbook data fields will include target and non-target catch, size, disposition, hook depth, bait type, set and haul position, soak time, sea surface temperature, and any additional observations. All data will be maintained in an Access database (Microsoft 2010) and metadata will be provided directly to the PFMC HMS advisory bodies and the California Department of Fish and Wildlife (CDFW). Findings will be periodically presented to the PFMC and its advisory bodies and upon termination of the EFP trials, findings will be published in a peer reviewed scientific journal.

11. *A description of how vessels will be chosen to participate in the EFP*

Vessels will be selected based upon:

1. Interest in the success of LBG as a future fishery for the west coast
2. Possession of a valid swordfish fishing permit (i.e., harpoon or DGN)
3. Experience using either deep-set or longline techniques
4. Willingness to work as a collaborative team and respect PIER's role as a managing entity
5. Availability during the primary months of the swordfish season (July-December).

Currently the proposed EFP vessel list includes:

<u>Fishing Vessel</u>	<u>Captain</u>
Gold Coast	Donald Krebs
Three Boys	Kelly Fukashima
Outer Banks	Tim Athens

Because Linked Buoy Gear is not an existing fishery, all cooperative fisher participants will be new to this gear type. Thus, all prospective applicants in this EFP will provide an indication of the "learning curve" associated with west coast-based Linked Buoy Gear fishing techniques. Given that the goal of this work is to identify whether LBG is a feasible technique for harvesting west coast swordfish with minimal non-target interaction, the project has attempted to use experienced fishers that have a history with either DSBG or other similar fishing techniques (i.e., short set-line operations). The use of individuals with no previous west coast experience may not reveal the true potential of the proposed techniques.

12. *For each vessel covered under the EFP, the approximate time(s) and location(s) fishing will take place and the type, size and amount of gear to be used.*

Time and Place: This EFP will focus on targeting swordfish during the seasonal migration off California which occurs from May through January each year. Precise set locations will be determined based on seasonal abundance, ocean conditions, water temperature and weather. Given the similarities of LBG and DSBG, the proposed EFP requests to have similar boundaries to the ongoing PIER-DSBG EFP. This includes federal waters from Half Moon Bay to the Mexican border and out 200nm. Because LBG is designed around the daytime depth distribution of swordfish, deployments will be conducted during the daylight hours from sunrise to sunset.

General description of gear to be used: The deep-set gear employed in this EFP will be standardized across vessels based on the design developed by the PIER research team. LBG was developed to increase gear retrieval efficiency, augment catch rates and provide an opportunity for vessels that may not want to deploy individual buoys. The LBG has also been designed so that it can be used with or alongside DSBG operations. As with DSBG, the Linked Buoy Gear design uses: (1) a maximum of 30

hooks deployed simultaneously, (2) fishes during the day below the thermocline to avoid non-target species, (3) has strike detection capacity to minimize non-target impacts and (4) uses heavy weights (4kg) to maintain taught vertical lines that minimize potential for marine mammal entanglement.

Gear specifics: One full set of linked buoy gear shall consist of a maximum of 30 individual hooks soaked at one time over a maximum horizontal foot-print of 5nm. A full gear compliment is comprised of 10 sections that individually extend up to 500m in horizontal length. The terminal junction of each horizontal piece shall be weighted (3.6 kg or 8lb.) and suspended by a vertical leg that is connected to a series of surface buoys that serve as a strike detection system (similar to that currently used in the DSBG design). Each section shall be adjoined with a 100m horizontal piece of mainline that is suspended at least 11m (36 feet) below the surface. At least one flag with a locator flasher or radar reflector must be affixed to one of the terminal ends. If the gear is parted for servicing, it may not be broken up into more than three sections and must include a locator flag on each free-floating section.

All hooks employed in the study shall either be 16/0 or 18/0 circle hooks and bait will consist of either mackerel, squid, or artificial lures. An illumination source (i.e., cyalume or power light) may be used proximal to each gangion. To increase sink rates, weighted swivels and a hydraulic line-shooter may also be used.

Vessels using the Linked Buoy Gear configuration will also be included in the DSBG EFP. Both gears may be used simultaneously as long as total hook-count does not exceed 30 and all DSBG EFP conditions are met (i.e., gear configuration, distance from gear, servicing requirements).

13. *Signature of Applicant*



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### References

Carey, F.G., Robison, B.H. 1981. Daily patterns in the activities of swordfish, *Xiphias gladius*, observed by acoustic telemetry. *Fish. Bull.* 79, 277–292.

Carretta, J.V., Price, T., Petersen, D., Read, R., 2003. Estimates of marine mammal, sea turtle, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996–2002. *Mar. Fish. Rev.* 66 (2), 21-30.

Dewar, H., Prince, E.D., Musyl, M.K., Brill, R.W., Sepulveda, C.A., Luo, J., Foley, D., Orbesen, E.S., Domeier, M.L., Nasby-Lucas, N., Snodgrass, D., Laurs, R.M., Hoolihan, J.P., Block, B.A., McNaughton, L.M., 2011. Movements and behaviors of swordfish in

the Atlantic and Pacific Oceans examined using pop-up satellite archival tags. *Fish. Oceanogr.* 20 (3), 219-241.

Hanan, D. A., D. B. Holts, and A. L. Coan Jr. 1993. The California drift gill net fishery for sharks and swordfish during the seasons 1981-1982 through 1990-1991. *Cal: Fish Game Bull.* 175, 1-95.

Sepulveda, C. A., A. Knight, N. Nasby-Lucas, and M. L. Domeier. 2010. Fine-scale movements and temperature preferences of swordfish in the Southern California Bight. *Fish. Oceanogr.* 19 (4): 279-289.

Sepulveda, C. Heberer, C. and S.A. Aalbers. 2014. Testing Modified Deep-Set Buoy Gear to Minimize Bycatch and Increase Swordfish Selectivity. *NOAA Tech. Rep. BREP* 1 pp. 27-32. [http://www.nmfs.noaa.gov/by\\_catch/docs/brep\\_2014\\_sepulveda.pdf](http://www.nmfs.noaa.gov/by_catch/docs/brep_2014_sepulveda.pdf)

Sepulveda, C.A., Heberer and Aalbers, S.A. (2015). Development and Trial of Deep-set Buoy Gear for Swordfish, *Xiphias gladius*, in the Southern California Bight. *Mar. Fish. Rev.* pp. 28-36. doi: [dx.doi.org/10.7755/MFR.76.4.2](https://doi.org/10.7755/MFR.76.4.2)