Exempt Fishery Proposal Application for Deep-Set Buoy Gear

a. *Date of application*: 2/1/2015

b. *Applicant*: Pfleger Institute of Environmental Research (PIER), 2110 South Coast Highway, Oceanside, CA 92054

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c. *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 (Pacific Council) has expressed the desire for the development and design of alternative swordfish gears that reduce the potential for interactions with bycatch species of concern (i.e., turtles and marine mammals) along the U.S. west coast. Among the gears recently tested off California is deep-set buoy gear (DSBG), a configuration that was patterned after a federally authorized fishery in Florida (FL buoy gear fishery, SAFE, 2006[1]). DSBG is a simple hook and line gear-type that selectively targets swordfish at depth (250-350m) during the day (Figure 1). DSBG was designed specifically by PIER for the west coast using depth distribution data from target (i.e., swordfish and opah) and non-target species (Sepulveda et al., 2010; Wegner et al., unpublished; Polovina et al., 2003). The DSBG configuration uses a heavy (4 kg) weighting system along with several bycatch mitigation measures (discussed below) to further minimize potential for interaction with species of concern. DSBG has been tested and modified by PIER and cooperative fishers over the course of three field seasons with the final configuration proposed for use in this EFP application. To date, experimental trials have confirmed that (1) swordfish can be selectively targeted at depth, (2) non-target catch of species of concern are minimal , and (3) swordfish caught on DSBG are of high quality and received by southern California markets at a premium price-point.

The purpose and goals of the proposed work are to collect the necessary performance information for considering the transition of DSBG from research project to a federally authorized gear 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 fishing operations focused at evaluating DSBG catch, economic viability and stakeholder acceptance off the coast of California. This work will also use a research team aboard the PIER research vessel *Malolo* to coordinate and monitor fishing activities. The PIER team will focus on training cooperative fishers on the use of DSBG gear and the use of field-tested techniques that can shorten the learning curve associated with new methods. Parallel efforts will also be focused on an outreach platform that will facilitate market development, community acceptance and stakeholder buy-in.

[1] http://www.nmfs.noaa.gov/sfa/hms/documents/safe_reports/2006/2006_safe_final.pdf

Specific goals:

1. In year 1, conduct a minimum of 120 fishing days targeting swordfish using DSBG off the California coast aboard six cooperative vessels and one research application.

2. Quantify all gear interactions including specific details on catch and bycatch (i.e., size, marketability, fate/disposition).

3. Document market price of all species sold during the trials and quantify price-point in relation to concurrent domestic DGN and harpoon operations as well as seasonal imports from Mexico, Hawaii and other areas.

4. Further develop DSBG sustainability and market and foster community acceptance through outreach and public education.

Catch Disposition: All marketable species captured by cooperative fishers using DSBG will be sold by the cooperative vessels to evaluate economic viability of a DSBG fishery off the California coast. Market price for swordfish landed off California has been shown to be variable and dependent on both product quality as well as gear type (SAFE, 2013). In the 2011 to 2012 season, ex-vessel prices of harpoon caught swordfish were more than double that of DGN product. Price-point variability is based on a combination of factors including product quality or freshness, ecological impacts of harvest means (i.e., net vs harpoon) and season (i.e., time of year). Despite a consistent demand for harpoon-caught swordfish, harpoon fishers have struggled with extremely poor success over the past three years (SAFE, 2013[2]). Given that the market niche for harpoon swordfish is well established off California, we hypothesize that DSBG swordfish can be used to augment harpoon landings and supplement the high-value industry that has been severely suppressed over the past several years. We believe that DSBG will provide fishers with a complementary gear type that can be used in conjunction with harpooning to harvest swordfish using low-impact methods. Similarly, given that DSBG methods are performed during the day and DGN operations are nocturnal, we propose that DSBG could also be used to compliment ongoing DGN activities.

Fish captured aboard the PIER research vessel will be donated to various markets and processors to facilitate market development and outreach. In doing so, the team will highlight the selective nature of DSBG and promote the need for a higher price-point based on product quality and the reduced ecological impacts associated with low-impact harvest methods. These operations will compliment ongoing market development efforts currently sponsored through federal and non-governmental grants.

Species Composition: Given that the proposed EFP will use similar techniques to those previously tested by PIER, we hypothesize that species captured during the EFP period will be similar to that captured during previous DSBG trials (figure 1; Sepulveda et al., 2015). DSBG catch composition has been comprised of 94% marketable catch. The

[2] http://www.pcouncil.org/wp-content/uploads/2014_HMS_SAFE_Report_archive_copy.pdf

catch has consisted primarily of swordfish (~60%) and opah (~20%, *Lampris guttatus*) with marketable sharks making up the additional landings. Collectively, the marketable does not contain species of special management concern (i.e., overfished or restricted species).

Despite seasonal variations and oceanic conditions, the DSBG catch to date has consisted of very low rates of non-marketable catch. Because DSBG is actively tended and strikes can be detected immediately, all catch is retrieved in a short time frame (i.e., minutes) and arrives at the vessel in good condition. The rapid processing allows fishers the option to release any non-target catch that is not retained for sale. The tagging of DSBG swordfish over the past three years has revealed 100% post-release survivorship, despite their known fragility and mortality rates associated with longline capture (Dewar et al., 2011).

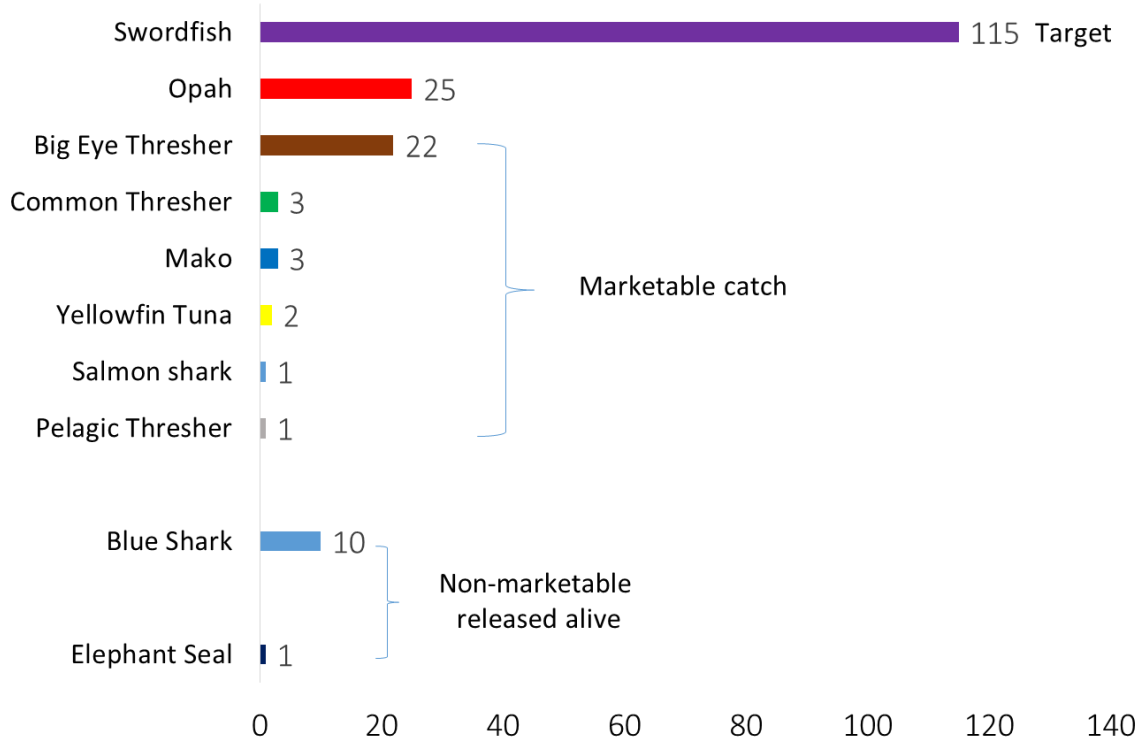

Figure 1. Collective catch from all DSBG experiments to date. Data is from 130 8h fishing days in which a full 10-buoy set was made.

d. *Valid justification explaining why issuance of an EFP is warranted*

This EFP application is the product of several years of planning, outreach and focused research on the development and trial of DSBG to target swordfish off the California coast. Initial research efforts were funded through a NOAA Saltonstall-Kennedy award in 2011 to design DSBG. This work evaluated the feasibility of targeting swordfish at depth based on swordfish and non-target tagging data from the SCB (Sepulveda et al., 2010). This DSBG study included an environmental assessment (EA) and other

required analytical documents prepared by NOAA Fisheries West Coast Region. The results of the research have been shared in an open and transparent manner with the public and fisheries managers including the Pacific Council members (Sepulveda et al., 2014; Sepulveda et al., 2015). In 2012-2013 additional funding was secured from the NOAA Bycatch Reduction and Engineering Program (BREP) to refine DSBG to reduce the potential for lost-gear, increase fisher acceptance and enhance gear efficiency. Subsequent trials revealed higher catch rates than the initial study and have garnered support from several interested fishing groups (both harpoon and DGN).

Swordfish tagged during experimental fishing trials conducted by PIER (2011 to 2014) have revealed that basking rates have been severely reduced when compared to previous seasons (Sepulveda and Aalbers, unpublished). The environmental factors that determine basking rates are unknown (Takahashi et al., 2003; Sepulveda et al., 2010; Dewar et al., 2011), and provide a level of uncertainty affecting harpoon fisheries around the world (Ward et al., 2000). The lack of basking swordfish within the SCB has been a factor in reduced landings and fleet participation. Collectively, the ~20 active harpoon vessels landed less than 5 mt of swordfish in 2013 (SAFE, 2014[2]). This quantity is less than half of the swordfish that were caught using DSBG techniques by 3 vessels during the 2014-2015 season (Figure 1; Sepulveda and Aalbers, unpublished).

Given that the harpoon fishery is the only permissible gear-type currently available to harvest swordfish within the coastal waters off CA during the early summer months (June-August 15), DSBG has the potential to positively impact local ports and associated shore-side businesses with an additional domestic source of high-value swordfish. Reduced domestic swordfish supply during the early summer months provides fishers with an opportunity to sell swordfish at a high price-point, making lower-volume techniques, such as harpoon and DSBG potentially profitable. In 2014 the team of cooperative DSBG fishers documented an average ex-vessel price of $8.75/lb for dressed swordfish (head and gutted). These values are typical of harpoon-caught swordfish and nearly double that of typical DGN operations (SAFE, 2014[2]). We propose that the increased market price of DSBG swordfish, especially during the early summer, will provide the basis for a viable west coast fishery.

Based on trip expenses calculated in 2014, swordfish fishers using a two-person operation (captain and one crew member) had average trip expenses around $500/day. With the capture and sale of one average sized swordfish (200-lb dressed weight) at the average market price of 2014 ($8.75), the 2-person operation could result in a net gain of $1,250/day. Given that PIER and cooperative fisher catch rates ranged from 0.6 to 1.75 swordfish/day in 2014, we propose that DSBG can be profitable and provide a valuable contribution to the portfolio of fisheries currently used by swordfish fishers off the west coast.

e. *A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals*

This work has been developed by PIER scientists and staff from NOAA's West Coast Region Sustainable Fisheries Division to provide an additional, low-impact opportunity for fishers to capitalize on a healthy and underutilized west coast resource. The primary goal of this EFP is to transition DSBG from research application to the initial stages of fishery implementation. This work been transparent and repeatedly vetted through the Pacific Council process and other public venues since its inception. The development and initial testing phases were primarily funded through federal sources with the resultant material published in scientific literature (Sepulveda et al., 2015). The continued goal of this work has been to promote sustainable domestic swordfish operations, revitalize west coast ports and fishing communities, and increase gear selectivity for swordfish.

f. *An expected total duration of the EFP (i.e., number of years proposed to conduct exempted fishing activities)*

The proposed EFP is anticipated to parallel the timeline necessary for potential fishery implementation, and we anticipate this to be as long as two consecutive field seasons. The advantages of an extended EFP period would be to accommodate for variability in seasonal swordfish abundance as well as the learning curve associated with training participants on the use of new techniques. Funds for equipment, observer coverage and fishing supplies have been procured by the PIER team for the 2015-2016 season. Funds for the 2016-2017 season have been identified and will be procured during the year 1 activities.

g. *Number of vessels covered under the EFP*

We propose six vessels for the 2015-2016 season including 5 seasoned west coast swordfish fishers with extensive history in the west coast fishery. Four of the vessel owner/operators (F/Vs *Aurelia, Spirit, Goldcoast, Chula*) are DGN/harpoon fishers with over 30 years of experience respectively. Two of the vessels are harpoon fishers (F/Vs *Leah Gail and Patricia J.*) with extensive fishing history and participation. A rubric was used to select final applicants based on fishing history, compatibility with project objectives and availability during the field season. The PIER staff and research vessel *Malolo* will oversee all operations and provide an at-sea and land-based platform to support the overall goals of the EFP. All commercial vessels currently possess valid HMS permits, have not incurred previous violations, and have a recent history of swordfish landings.

The research applicant maintains a current California scientific collection permit and NOAA letter of authorization and will be responsible for record keeping, data analyses, training and market development. Each vessel will be required to make a minimum of 20 8h sets with a target set level of 30 to 40 during the 2015-2016 season. Set limitiations are primarily based on funding constraints for observer coverage and not based on concerns over harvest or any associated environmental impacts.

h. *A description of the species (target and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment; this description should include harvest estimates of overfished species and protected species*

DSBG is specifically designed to target swordfish with one to two hooks positioned at depths (250-350m) where swordfish spend most of the daytime hours (Sepulveda et al., 2010; Dewar et al., 2011; Abecassis et al., 2012). One additional hook is positioned at a mid-water depth (100m) to target opah or marketable sharks (i.e., mako shark and common thresher shark). The secondary targets are essential for fishery viability during periods of reduced swordfish abundance. A similar species complex is currently harvested and marketed in the CA DGN fishery.

Anticipated target catch: Based on 2013-2014 PIER and cooperative fisher DSBG trials, catch rates of swordfish have ranged from 0.6 to 1.8 swordfish/day. Using an average of 1 swordfish per fishing day, we propose that DSBG will harvest between 100-150 swordfish in year 1. With an average weight of 100kg, this translates into 10 to 15 metric tons of swordfish or 5 to 8% of the 2013 DGN harvest (176 mt, SAFE, 2014[2]). The North Pacific Swordfish stock is considered healthy and under-exploited and the level of catch under this EFP will not change the stock status. (Hinton and Maunder, 2012).

Secondary target catch: Secondary targets may be essential for fishery viability during periods of reduced swordfish availability and/or market price fluctuations. Although one of the cooperative fishers during the 2014 DSBG trials targeted only swordfish (by using only a bottom hook), another cooperative fisher was able to supplement his profit margin by landing secondary targets species, including opah, thresher sharks, and mako sharks [by inclusion of the opah hook (100m) on each deployment]. Based on 2013-2014 DSBG trials, it can be anticipated that approximately 40 opah, 20 common thresher sharks, and 15 mako sharks will be landed during the 2015-16 EFP period. These estimates are based on the relative frequency each secondary target was captured during the 2014-2015 trials and may not accurately represent the proposed EFP, as some fishers may choose to focus more rigorously on a specific species when abundant.

From the DSBG trials to date, the most common non-retained species captured was the bigeye thresher shark (*Alopias superciliosus*). Despite low market value, bigeye threshers have, and can be marketed in California (Hanan et al.,1993). The bigeye thresher is often released or not retained in the DGN fishery due to limited hold space and the low market value. Potential markets for this species will be explored in the 2015 season. Based on the previous trials, we anticipate there to be ~25 bigeye threshers captured during the first year of the EFP. To date, all bigeye thresher sharks captured on DSBG have been released in good condition (i.e., actively swimming) and post-release mortality rates are anticipated to be low. Although there does not exist a quantitative stock assessment for bigeye thresher shark, the stock is not considered

overfished or at risk given the low level of harvest of this species in other fisheries. (SAFE, 2005).

Non-retained Catch: To date, the blue shark is the primary non-retained species captured during the DSBG trials. Unlike most longline operations of the eastern Pacific, the present study had a relatively low blue shark (*Prionace glauca*) catch (~5%). The blue shark has no market in the U.S. despite its value in bordering Mexican fisheries. The blue shark is not currently overfished and the low numbers caught in the proposed activities do not pose any risk to the population (ISC Shark Working Group, 2013[3]).

Incidental species: To date there have been more than 150 sets performed using various DSBG configurations for all research trials combined. Catch data suggest that DSBG is highly selective, with target and marketable catch comprising 94% of the catch. The trials have resulted in only one interaction with a protected species (Northern elephant seal, *Mirounga angustirostris*). During this event, the strike detection system enabled for the rapid release of the elephant seal (ES) in good condition within 5 minutes of the initial interaction.

Figure 2. A set of DSBG showing the strike detection system at work. In this image, a swordfish is on the line resulting in the presentation of the white strike indicator at the surface.

Elephant seals are one of the few species of marine mammal that feeds on a similar species complex and at similar depths as swordfish. Although we considered the ES interaction to be a rare event, the potential biological removal (PBR) of this species is estimated to be over 4,882[4] and not currently considered a species of concern. Given the ability to rapidly detect strikes (Figure 2) and service gear, we propose that mortality resulting from a DSBG interaction will be low.

i. *A description of a mechanism, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted for*

The proposed EFP will use log books, at sea monitors and on-board communication protocols to track the course of all EFP deployments and interactions. The cost to deploy at sea monitors will be paid for by PIER and the PEW Charitable Trust. In

[3] http://www.wcpfc.int/system/files/SA-WP-11-ISC-Blue-Shark-NP-SA.pdf

[4] http://www.nmfs.noaa.gov/pr/sars/pdf/pac2014_draft.pdf

accordance with the current DGN standards, the proposed observer coverage rate is slated for a minimum of 20%, with a target rate of 25-30%. Per management team recommendations, the EFP will strive to increase set days which may slightly decrease observer coverage rates given funding limitations. The rationale for the proposed coverage rate is based on previous work done by the NOAA South West Fisheries Science Center (SWFSC) which determined a minimum sampling coverage rate of 20% to detect rare events[5]. An effort will be made to provide a 5-10% coverage buffer consistent with Management Team recommendations for the current DGN fishery.

Based on (1) the initial research trials demonstrating low rates of non-target catch, (2) the absence of interaction with species of concern in the NOAA sanctioned Florida buoy fishery, and (3) the supervision and involvement of the research team in all EFP activities, we feel that a 20-30% coverage rate will provide adequate coverage for the proposed work. Additional electronic monitoring efforts have also been considered; however, the funding has not been identified or secured at this point.

The PIER team will work closely with each applicant and perform daily check-ins via satellite and radio-based communication. The check-in procedure will be used to coordinate fishing efforts, substantiate log-books and manage fishing operations.

j. *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 DGN activities. The cooperative fishers will be responsible for providing detailed log book templates that must be completed after each set and will be collected each month throughout the fishing season. The logbook date fields will include target and non-target catch, size, disposition, hook depth and bait type, set and haul position, soak time, sea surface temperature, and light color. Biological samples will be collected and shared with respective research institutions and agencies (e.g., genetic and stomach samples for the SWFSC, La Jolla). All data will be maintained in an Access database (Microsoft 2010) and metadata will be provided directly to the Council's HMS Advisory Bodies and the California Department of Fish and Wildlife (CADFW). Upon termination of the EFP trials, findings will be presented to the PFMC and published in a peer reviewed scientific manuscript.

k. A description of how vessels will be chosen to participate in the EFP;

Vessels were invited to join the EFP team based on: (1) active participation and recent history of swordfish landings, (2) interest in the success of DSBG as a future fishery for the west coast, (3) possession of a valid harpoon fishing permit, (4) willingness to work as a collaborative team, and (5) availability during the primary months of the swordfish season (July-December). The participants have worked together as a code group and have supported the research trials over the past three years. This unique group of

[5] https://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-528.pdf

individuals each brings a specific expertise to the table that collectively will provide a strong team approach.

l. *For each vessel covered by the EFP, the approximate time(s) and place(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 which occurs from May through January off the California coast each year. Given the west coast market-void during the early summer months, we anticipate that most of the sets will occur during the months of July through October. Precise set locations will be determined based on seasonal abundance, water temperature and weather. Given the selective nature of DSBG and the low swordfish abundance within the SCB in recent years, deployments are proposed from Half Moon Bay to the Mexican border. Because DSBG is designed around the daytime depth distribution of swordfish, DSBG will be fished during the daylight hours from sunrise to sunset.

Gear to be used: The deep-set gear employed in this EFP will be standardized across vessels and follows the gear design presented to the Pacific Council and HMS teams in 2014 (Figure 3). One set of DSBG shall consist of a maximum of 10 individual pieces that can be individually soaked simultaneously. Each buoy gear piece consists of 800-1200m of vertical mainline (2.8mm) attached to a 3-4 kg lead weight. A maximum of up to three 8 to 10m branching gangions will be used at different depths, all of which must be below the mixed layer (>90m). An illumination source (i.e., cyalume or power light) will be positioned proximal to each gangion. Two of the branching gangions will be used to target swordfish at depths between 700 and 1200m. A third optional hook can be fished at >90m to target opah and common thresher shark when available.

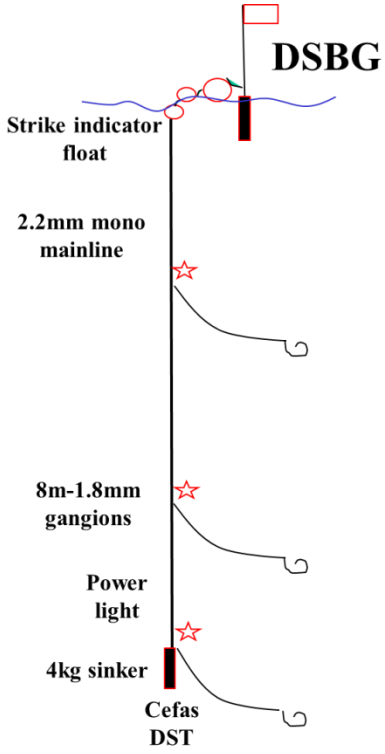

Figure 3. A diagram of DSBG proposed in this EFP application. The three hook design is based on target and secondary target depth distribution.

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. Bait predation at depth can be significant, at times necessitating the use of artificial lures. Because interactions with bycatch species of concern are greatly reduced when using artificial lures, “J” hooks can also be used when in conjunction with artificial lures.

The surface floatation and identification system will consist of a minimum of three floats with a flag and light or radar reflector. At least one float will be a non-compressible float (46-lb floatation) to prevent gear loss. This design

follows that of the previous DSBG experiments, greatly reduces the risk for lost gear, and aligns directly with the mandates of the shallow-set buoy gear fishery off Florida. To date, no individual pieces of gear have been lost or sunk out during the initial three years of experimental trials.

m. *The signature of the applicant*

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