

## NATIONAL MARINE FISHERIES SERVICE (NMFS) REPORT ON SOCIOECONOMIC IMPACTS ANALYSIS FOR DEEP SET BUOY GEAR (DSBG) AUTHORIZATION

### **Introduction**

In addition to the socioeconomic impact analysis that NMFS submitted in its Preliminary Draft Environmental Impact Statement (PDEIS) for the Council's range of alternatives (ROA) to authorize DSBG under the Fisheries Management Plan for U.S. West Coast Highly Migratory Species Fisheries (HMS FMP), NMFS provides this supplemental socioeconomic impact analysis to further inform Council discussion.

The analysis in the PDEIS includes estimates of average future DSBG price, and the distribution of estimated DSBG landings and revenues by region, given estimates of effort under each alternative. This analysis relies on a number of assumptions, including that swordfish catch per unit effort (CPUE) will continue at a similar rate to that observed during DSBG exempted fishing permit (EFP) fishing. However, if swordfish CPUE declines with increasing levels of DSBG effort, this assumption is likely to result in an overestimate of landings and revenues under the action alternatives. Declines in CPUE may occur due to spatial crowding-out of vessels from optimal fishing locations, or differences in the experience levels and chance of fishing success among individual fishers as DSBG fishing levels expand. Swordfish CPUE is also influenced by other factors which are not constant over time, such as sea surface temperature, prey availability, effort and catch by other fisheries, and the highly migratory nature of the species.

Because we lack the necessary data to empirically estimate potential declines in swordfish CPUE and resulting effects on catch, landings, price, and revenues, we developed a scenario where CPUE declines with increasing effort to the rate observed during the 2018 calendar year of EFP fishing. This scenario may be useful for evaluating the economic performance of DSBG fishing in the event that CPUE does decline as effort increases.

### **Reduced CPUE Scenario Analysis**

Between January 2015 and February 2019, DSBG EFP vessels undertook 1,374 days fished and caught 1,825 swordfish. Table 1 shows the number of days fished, the total swordfish catch and resulting CPUE, and the number of vessels fishing in each year. The bottom row shows the total number of unique vessels and the average CPUE for the whole time period, based on the total days fished and total swordfish catch. It also shows the number of unique vessels that fished over the whole time period. Note the decline in CPUE from 2017 to 2018, when the number of active vessels rose from 5 to 26. Also note that we only have data available for January and February of 2019, not the complete year.

**Table 1.** DSBG EFP Swordfish CPUE and Number of Vessels by Year

Swordfish CPUE by Year				
Year	Days Fished	Swordfish Catch	Swordfish CPUE	Number of Vessels
2015	132	136	1.030	4
2016	280	474	1.693	5
2017	326	556	1.706	5
2018	606	640	1.056	26
2019	30	19	0.633	7
<b>TOTAL</b>	<b>1374</b>	<b>1825</b>	<b>1.328</b>	<b>28</b>

Table 2 reports the estimated levels of annual effort, swordfish catch, and swordfish CPUE from the PDEIS. These effort levels are for both proposed permit regimes (i.e., open access and limited entry) in each year once the maximum number of permits under each alternative are made available (see Agenda Item I.4a, NMFS Report 1, Appendix A for details on effort estimates).

**Table 2.** DSBG EFP Swordfish CPUE and Number of Vessels under Authorization Alternatives

Swordfish Catch Estimated for Authorization				
Alternative	Days Fished	Swordfish Catch*	Swordfish CPUE	Number of Vessels**
Open Access	5,051	6,678	1.322	215
Limited Entry	3,030	4,008	1.323	129

*\*Swordfish catch based on the estimated annual average (mean)*

*\*\*Number of vessels based on number of available permits, and assumed 43% active fishing ratio*

Note that our estimates of effort are based on the characteristics of DSBG EFP fishing in 2018 (e.g., the percentage of available permits that were actively fished and the average days fished per active vessel), as 2018 had the highest level of DSBG fishing effort to date and therefore may most closely resemble the effort characteristics of fully authorized DSBG fishing. However, our estimates of catch are based on the full dataset, which is why the estimated CPUE in Table 2 resembles the “total” CPUE from Table 1 as opposed to the CPUE in any one year.

The estimates of swordfish catch and landings in the PDEIS are based on the entire time period DSBG has been fished, and they assume a constant CPUE based on the average CPUE from EFP fishing to date, despite higher levels of projected effort. To evaluate a “reduced CPUE” scenario, we re-estimate swordfish catch using 2018 data only, so that the landings and revenue estimates are based on catch rates which occurred under higher levels of effort. Table 3 reports the estimated levels of annual effort, swordfish catch, and swordfish CPUE under this scenario.

**Table 3.** DSBG EFP Swordfish CPUE and Number of Vessels under Authorization Alternatives (Reduced CPUE Scenario)

Swordfish Catch Estimated for Authorization (Reduced CPUE)				
Alternative	Days Fished	Swordfish Catch*	Swordfish CPUE	Number of Vessels**
Open Access	5,051	5,250	1.040	215
Limited Entry	3,030	3,151	1.040	129

*\*Swordfish catch based on the estimated annual average (mean)*

*\*\*Number of vessels based on number of available permits, and assumed 43% active fishing ratio*

Under this scenario, swordfish CPUE is reduced to approximately one fish per day (similar to what was observed in 2018) and total catch falls by 21%. In other words, our analysis suggests that if swordfish CPUE under fully authorized DSBG fishing more closely resembles that seen in 2018, the expected annual average swordfish catch would be 21% lower than if CPUE resembles the average CPUE from the entirety of DSBG EFP fishing to date.

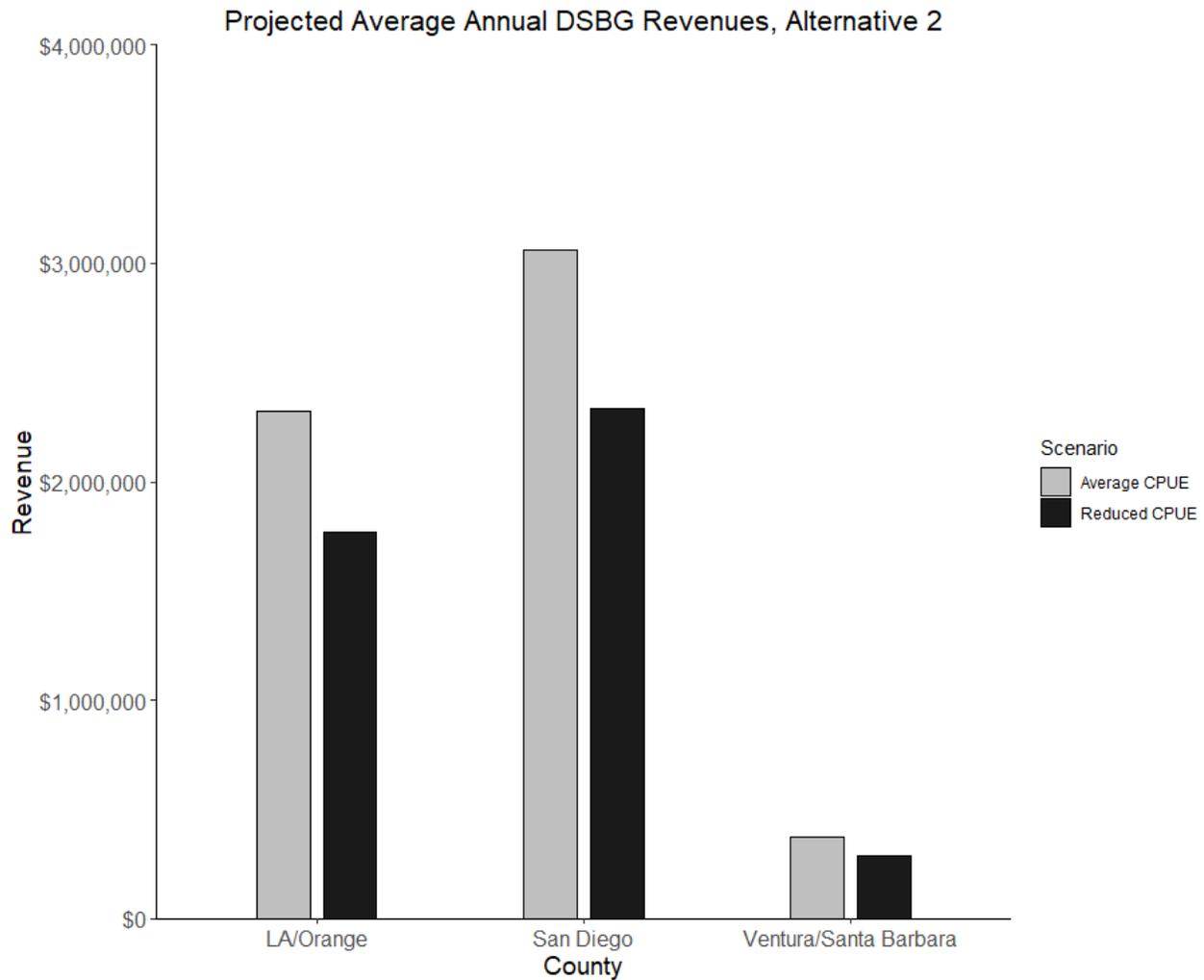
Using these estimates of average annual swordfish catch, we re-estimate socioeconomic impacts under a scenario with reduced swordfish CPUE. As described in the PDEIS, our analysis indicates that increasing DSBG landings by one percent would result in a drop in DSBG price of 0.03 percent (see I.4 Report, Attachment, Appendix B for details on the price analysis).

In 2018, 640 swordfish were recorded caught in DSBG EFP fishing, and a total landed weight of 45.35 mt was delivered to Southern California ports. The average weight of a DSBG-caught swordfish in 2018 was 0.07 mt. Based on the results of our reduced CPUE scenario catch estimates, DSBG swordfish catch in a given calendar year would reach an ongoing annual mean of 5,250 swordfish under Alternative 2. Assuming that the average weight of a DSBG-caught swordfish is constant, we project an ongoing annual mean of 353.47 mt in landed swordfish weight under Alternative 2. This is 113.85 mt (24.4%) lower than the projected landed weight under the average CPUE scenario presented in the PDEIS.

Based on the estimated price effect, and on the projected landings estimated under the reduced CPUE scenario, we calculate an estimated average annual price of \$5.63 per pound under Alternative 2, which is \$0.36 lower than the average price in 2018.

At the regional level, we estimate revenues under Alternative 2 for the reduced CPUE scenario by distributing projected DSBG swordfish landings under the Proposed Action (353.47 mt) to three regions, in the same proportions seen in 2018, and multiplying by the estimated average price per pound (\$5.63) to arrive at average annual revenues. Figure 1 displays the results of these projections, along with the projections from the PDEIS (i.e., where CPUE is based on the average CPUE across the entirety of EFP fishing).

**Figure 1. Projected Revenues under Open Access Alternative (Two CPUE Scenarios)**



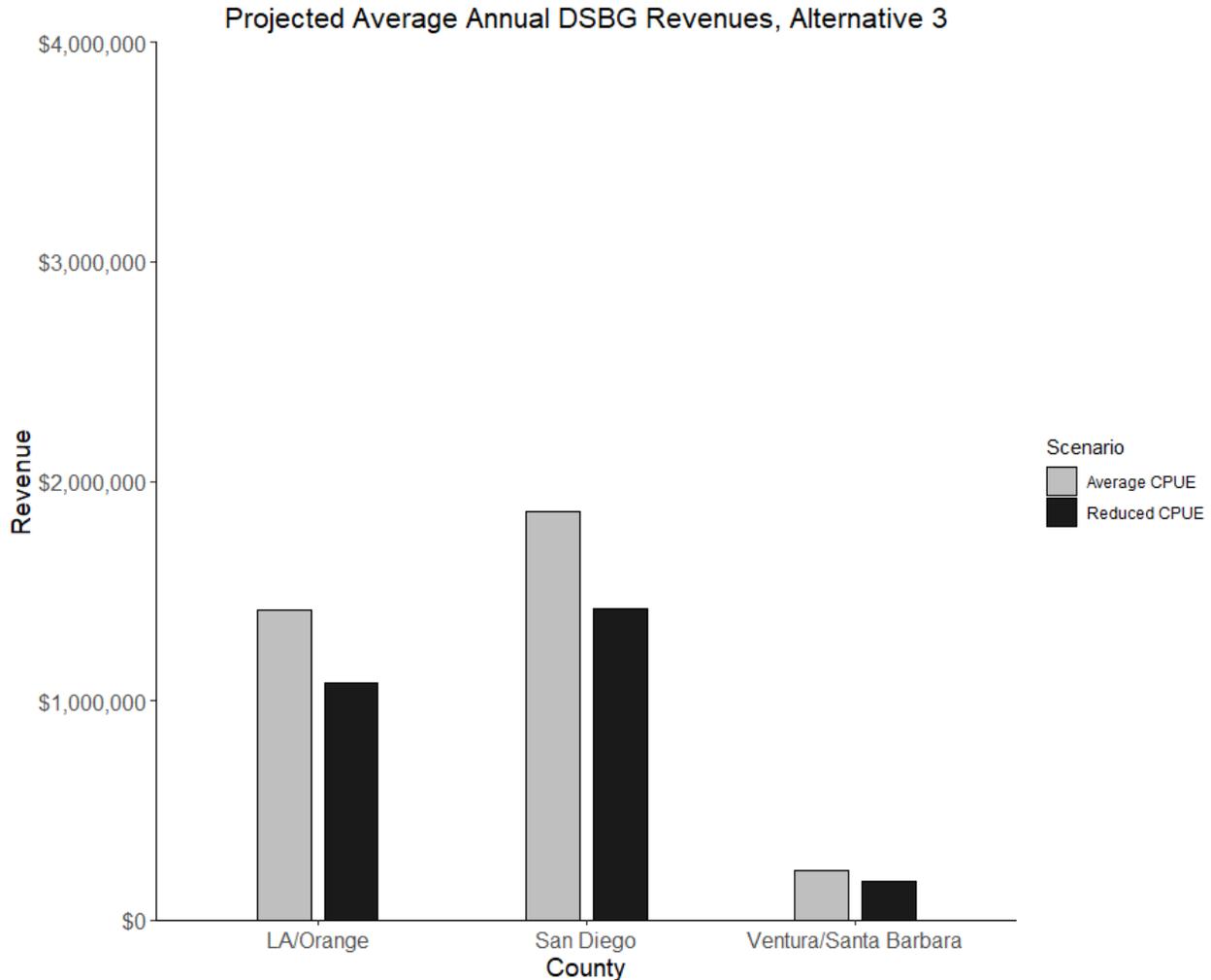
Based on the results of our reduced CPUE scenario catch estimates, DSBG swordfish catch in a given calendar year would reach an ongoing annual mean of 3,151 swordfish under Alternative 3. Assuming that the average weight of a DSBG-caught swordfish is constant, we project an ongoing annual mean of 212.04 mt in landed swordfish weight under Alternative 3. This is 68.44 mt (24.4%) lower than the projected landed weight under the average CPUE scenario presented in the PDEIS.

Based on the estimated price effect, and on the projected landings estimated under the reduced CPUE scenario, we calculate an estimated average annual price of \$5.71 per pound under Alternative 3, which is \$0.28 lower than the average price in 2018.

At the regional level, we estimate revenues under Alternative 3 for the reduced CPUE scenario by distributing projected DSBG swordfish landings under the Proposed Action (212.04 mt) to three regions, in the same proportions seen in 2018, and multiplying by the estimated average price per pound (\$5.71) to arrive at average annual revenues. Figure 2 displays the results of these

projections, along with the projections from the PDEIS (i.e., where CPUE is based on the average CPUE across the entirety of EFP fishing).

**Figure 2.** Projected Revenues under Limited Entry Alternative (Two CPUE Scenarios)



**Discussion**

For both Alternatives, revenues are understandably lower when swordfish catch is based on reduced CPUE. However, this reduction is mitigated to a small degree by the effect of DSBG quantity on price (i.e., reduced catch and landings results in a higher average price per pound).

We note that these estimates of revenue by region are based on swordfish CPUE as estimated using only 2018 data, which is the only complete year in which we saw a reduction in CPUE and an increase in participating vessels. However, this supposed effect of increased effort on swordfish CPUE may not necessarily persist under authorized DSBG fishing. It may be that the drop in CPUE from 2017 to 2018 was driven in part by non-fishery-related factors, such as weather conditions or the natural migration of swordfish. On the other hand, it is possible that the negative relationship between effort and CPUE would perpetuate under authorization, as higher numbers of vessels

participate. In this case, swordfish catch, landings, and revenues may be even lower than the 'Reduced CPUE' scenario presented in this report.

In addition to the assumptions and data limitations mentioned here and in the PDEIS, the issue of vessel-level profitability also adds uncertainty to projections of landings and revenues under authorized DSBG fishing. Our socioeconomic analyses thus far have assumed that the same proportion of available permits that was fished in 2018 will be fished under fully authorized DSBG fishing. However, participation may be constrained by the profitability of DSBG fishing. If DSBG is not expected to be profitable (e.g., due to low CPUE, low price, high cost of fishing, or better opportunities elsewhere), permit holders or potential permit holders may choose not to participate. In this case, the proportion of permits which are actively fished and/or the number of days fished per vessel may fall below the estimates in the current analysis, resulting in lower revenues than the above projections. The addition of more data will allow a more thorough analysis of the relationship between DSBG effort, CPUE, vessel-level profitability, and total revenues over time.