

Highly Migratory Species Management Team Report Regarding Amendment 2 to the Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species to Authorize a Shallow-set Longline Fishery Seaward of the EEZ

1 INTRODUCTION

Ms. Marija Vojkovich, California Department of Fish and Game representative of the Pacific Fishery Management Council (Council), made an oral motion at the March 2008 Council meeting describing a range of alternatives for a management framework for a shallow-set longline (SSLL) fishery in the high seas seaward of the U.S. west coast EEZ, which was adopted for public review by the Council. The motion was subsequently transcribed and in consultation with Ms. Vojkovich certain elements of the alternatives were clarified. The HMSMT then reviewed a description of the alternatives with the Highly Migratory Species Advisory Subpanel (HMSAS) on several occasions. This report includes a description of the alternatives for review by the Council. The HMSMT also makes several recommendations for additions, modifications, and clarifications of the alternatives.

A draft description of the proposed action and a purpose and need statement is included below along with information and analysis to give an initial picture of the effects of the action to the Council and the public. These are important elements of the environmental impact statement (EIS) that will be prepared to analyze the alternatives and help the Council choose a prepared alternative. The EIS is expected to be released in early 2009.

1.1 The Proposed Action

The proposed action is to amend the HMS FMP to authorize a shallow-set longline (SSLL) fishery seaward of the EEZ and east of either 150° or 140° W longitude. Use of SSLL gear is currently not authorized under the FMP and is prohibited by regulation, because, as originally described in the HMS FMP, this type of fishing without sufficient mitigation measures has been found to jeopardize the continued existence of loggerhead sea turtles, which are listed as endangered under the Endangered Species Act (ESA). The fishery authorized through Amendment 2 to the HMS FMP would incorporate the use of innovative longline gear and methodologies and be subject to a range of restrictions and mitigation measures so as to not jeopardize the continued existence of any species listed under the ESA. These restrictions and mitigation measures would also minimize the take of marine mammals, consistent with the Marine Mammal Protection Act (MMPA), and seabirds, consistent with other applicable law.

1.2 Purpose and Need

The HMS FMP, as submitted to NMFS for approval by the Council in August 2003, would have authorized a West Coast-based SSLL fishery on the high seas outside the EEZ; however, on February 4, 2004, NMFS informed the Council that it had approved the HMS FMP with the exception of the provision that would have allowed SSLL fishing by West Coast-based vessels targeting swordfish east of 150° W longitude. The disapproval was based on the ESA Section 7 consultation for the HMS FMP, which concluded that allowing shallow sets for swordfish with traditional gear and no effort limits east of 150° W longitude would appreciably reduce the likelihood of survival and recovery in the wild of loggerhead sea turtles (i.e., jeopardize). Hawaii-permitted vessels may currently fish seaward of the U.S.

West Coast EEZ and east of 150° W longitude and land on the West Coast; however, it is unclear how many may have done so since 2004.¹ In 2008, at least one Hawaii-permitted vessel fished shallow-set longline gear outside the EEZ and landed on the West Coast (Oregon).

Section 204(a)(3) of the MSA requires NMFS, if an FMP is disapproved in part or in whole, to advise the Council of actions it can take to address the disapproved FMP provisions. In a letter dated February 4, 2004, NMFS indicated to the Council that alternative gear and bait options (e.g., circle hooks and mackerel bait) being tested in the U.S. Atlantic SSSL swordfish fishery had proven successful in significantly reducing sea turtle interactions and consequent injury to and mortality of sea turtles. NMFS advised the Council that possible use of alternative gear and bait requirements, effort limits, time/area limits, turtle take limits, or other measures that would limit sea turtle mortality to low levels by any future west coast-based SSSL fishery might provide the necessary conservation and management measures to operate a fishery without jeopardizing the continued existence of ESA-listed sea turtles. Since that time, the alternate gear and bait options have reduced overall marine turtle interactions by 89 percent in the Hawaii-based SSSL swordfish fishery, and have also proven successful in foreign longline swordfish fisheries (e.g., Brazil, Italy, Ecuador and Uruguay), resulting in significant reductions in sea turtle interactions and mortalities while maintaining economically viable fisheries. As a result of these successful gear innovations, NMFS recommended at the April 2007 meeting that the Council re-visit the disapproved portion of the HMS FMP.

The purpose of the proposed action is to address the disapproved portion of the HMS FMP through a fishery management regime that is consistent with applicable law, specifically the ESA. The action is needed to carry out the goals and objectives of the HMS FMP.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Note: HMSMT recommendations for additions or modifications of the alternatives adopted in March 2008 are shown below in *bold italics*. Further rationale and discussion of these recommendations is provided in Section 3.

2.1 Alternative 1: Status Quo

Unless possessing both a Hawaii longline limited access permit (pursuant to the WPFMC Pelagics FMP, see 50 CFR 660.21) and a PFMC HMS FMP permit, swordfish caught using shallow-set longline (SSLL) gear cannot be landed on the west coast. Regulations pursuant to the HMS FMP prohibit such landings from fishing west of 150° W longitude. Endangered Species Act regulations prohibit such landings for swordfish caught east of 150° W longitude.

2.2 Alternative 2: A West Coast Limited Entry Program for SSSL Seaward of the West Coast EEZ

2.2.1 *Sea Turtle Take Mitigation Measures*

2.2.1.1 *Area Closure Options*

The fishery is only permitted east of:

Option 1: 150° W longitude

¹ Some pelagic longline swordfish landings have been recorded in the PacFIN database since April 2004. However, further investigation is required to determine if these were made by Hawaii-permitted vessels.

Option 2: 140° W longitude

The HMSMT recommends adding Option 3: No area closure west of the current west coast EEZ closure.

2.2.1.2 Gear and Other Mitigation Measures

The fishery would be subject to the following measures to mitigate potential impacts to ESA-listed loggerhead and leatherback sea turtles:

- Gear requirements, consistent with those currently applicable to Hawaii limited entry permit holders fishing with SSL gear. These include the requirement to use circle hooks and mackerel-type bait
- 100 percent observer coverage
- Take caps for loggerhead and leatherback sea turtles based on the biological opinion completed for the proposed action. Take caps are renewed annually and the fishery closes until the end of the fishing year (April 1-March 31) if they are ever reached. The fishery opens again at the start of the next year.

2.2.2 Limited Entry Program

2.2.2.1 Number of Permits

The potential fishery would be evaluated based on a fishery with an estimate of maximum fishing effort of 1 million to 1.5 million hooks. A maximum of 20 permits would be issued; the actual number of permits issued would be based on an evaluation of what would be an economically viable number, considering the effort estimate.

The HMSMT recommends adding the following options for analysis. Issue a maximum of:

Option 1: 20 permits

Option 2: 15 permits

Option 3: 10 permits

Option 4: 5 permits

2.2.2.2 Recent Participation Requirement Options

There would also be a recent participation requirement to be eligible to receive a permit. In order to qualify for a permit the applicant would have to have made at least one swordfish landing from:

Option 1: 2005 to 2007 (*the HMSMT recommends dropping this option*)

Option 2: 2001 to the present (*the HMSMT recommends using 2007 as “the present”*)

2.2.2.3 Qualification Criteria

Applicants would first be screened according to the recent participation requirement (options above). Then a ranking of qualified applicants to receive limited entry permits would be based on one of the following options. Under each of the given options, applicants would be ranked in decreasing order according to the applicable formula, and permits would be issued based on this rank order up to the maximum authorized number of permits.

Option 1

Applicants are ranked sequentially based on their total swordfish landings on the west coast, 1996-2006, with (1) SSL gear and with (2) drift gillnet gear (*The HMSMT recommends generalizing SSL gear to pelagic longline gear.*) and (2) drift gillnet gear. SSL landings would be attributed to the person owning the vessel *in 2007*. Drift gillnet (DGN) landings would be attributed to the person owning the California DGN permit or Oregon DGN developmental fishery permit *in 2007*. However, no Oregon developmental fishery permits were issued for DGN gear or LL gear in 2007.

Option 2

A point system for individuals based on the following criteria:

1. Currently possessing a DGN permit. (*The HMSMT recommends using 2007 for “currently possessing” here and below.*)
2. Currently possessing a DGN permit (*in 2007*) and made landings of swordfish on the west coast using longline gear in 2007. (*The HMSMT recommends qualifying this to pelagic longline gear.*)
3. Currently possessing a DGN permit (*in 2007*) and made swordfish landings between 2001 and 2007 using any gear.
4. Number of years owning a DGN permit.

The HMSMT recommends using the following scoring system:

1. One point would be awarded to each individual possessing a DGN permit in 2007 ($Q_1 = 1$ if a DGN permit holder, 0 otherwise).
2. One point would be awarded to each individual possessing a DGN permit in 2007 who made landings of swordfish on the west coast using longline gear in 2007 ($Q_2 = 1$ if this condition is met, 0 otherwise).
3. For applicants possessing a DGN permit in 2007 who made west coast swordfish landings between 2001 and 2007 using any gear, a point would be awarded for each year the applicant made at least one west coast swordfish landing during this period ($Q_3 = 0-7$).
4. A point would be awarded for each year the applicant owned a DGN permit ($Q_4 =$ number of years of DGN permit ownership).

The ranking would be based on a formula (F_2) calculated for an applicant as the sum of the first three point amounts plus a weighted multiple of the fourth criterion. Different values for this weighting factor (w_1) will cause the scoring to more or less value length of permit ownership. Section 4.3.2 presents information on several different weighting values for Council consideration.

The resulting formula is:

$$F_2 = Q_1 + Q_2 + Q_3 + w_1 * Q_4$$

Ties will be broken by using the total amount of swordfish landings, 2001-07.

Option 3

A point system for SSL based on the following criteria:

- The number of years in which at least one swordfish landing was made on the west coast 1996-2006 with SSL gear. (*The HMSMT recommends generalizing this to pelagic longline gear.*)

- The number of swordfish landings on the west coast made 1996-2006 with SSL gear. (*The HMSMT recommends generalizing this to pelagic longline gear.*)

The HMSMT recommends using the following scoring system:

1. The sum of the number of years in which at least one swordfish landing was made on the west coast 1996-2006 with SSL gear (S_1)
2. A weighted multiple of the tonnage of swordfish landings on the west coast made 1996-2006 with SSL gear (S_2):

$$F_3 = S_1 + w_2 * S_2$$

with a weight w_2 chosen to make S_1 and $w_2 * S_2$ of comparable magnitudes.

Permits are issued up to the maximum number authorized in rank order according to the scoring system.

2.3 Alternative 3: Open Access

Under this alternative no new permit requirement would be established. Participation in the fishery would not be limited by permit.

The management framework would contain the following provisions:

- For analysis overall effort is estimated at 1 million to 1.5 million hooks annually.
- The fishery is constrained to east of 140° W longitude.
- Owners of a Hawaii longline limited entry permit would not qualify for participation in this fishery.
- The sea turtle take mitigation measures listed under Alternative 2 (gear requirements, 100 percent observer coverage, take caps) would apply.

3 ADDITIONAL HMSMT COMMENTS AND RECOMMENDATIONS

Information on swordfish catch-per-unit-of-effort (cpue) (see Section 4.4) indicates a general increasing trend from east to west. Since turtle takes would already be limited by the take caps proposed under both of the action alternatives the HMSMT recommends that a third area closure option be added, no area closure.

The HMSMT notes that SSL landings on the west coast without a Hawaii longline limited entry permit have been prohibited since April 2004 and anecdotal information suggests that Hawaii permit holders have not made west coast landings during 2005–07. Therefore, the recent landings requirement Option 1 (2005-2007) would likely disqualify most or all people with SSL landings only under Options 1 and 3. Since only four vessels were recorded making west coast landings with pelagic longline gear outside the EEZ between 2005 and 2007, the HMSMT recommends dropping the 2005 to 2007 recent landings option.

The HMSMT recommends that in the qualification criteria options, landing swordfish with longline gear should apply to pelagic longline gear rather than specifically to SSL. Prior to the 2001-04 fishery closure Hawaii limited entry longline permit holders engaged in mixed trips in which both deep sets and shallow sets were made. In addition, anyone with a west coast HMS permit can land up to 10 swordfish per trip when using deep set longline gear (used to target tunas). It may be difficult to determine from PacFIN data whether swordfish landings using longline gear are from deep set or shallow set trips.

Furthermore, the only legal longline swordfish landings on the west coast without a Hawaii permit since 2004 would be from deep set trips and only from outside the west coast EEZ.²

The HMSMT recommends the Council adopt a fourth qualification formula option under Alternative 2 based on a weighted sum of the three ranking systems in the three qualification options, using the formula:

$$F_4 = F_1 + v_1 * F_2 + v_2 * F_3$$

With weights v_1 and v_2 chosen to make F_1 , $v_1 * F_2$, and $v_2 * F_3$ of comparable magnitudes.

One of the measures in Alternative 3 is to prohibit vessels registered to a Hawaii longline limited entry permit to land on the west coast. This measure may not be feasible to implement for legal and/or practical reasons. The Council should seek advice from Counsel as to the practicability of this measure. An alternative the Council may wish to consider would be a basic limited entry program with the sole qualification criterion being a single swordfish landing on the west coast during the years 2005-07. Few, if any, Hawaii permit holders have made SSLL landings on the west coast during that time period. West coast residents that possess a Hawaii permit but are also currently active in west coast fisheries would qualify.

Summary recommendations for Alternative 2:

- Add a third area closure option, Option 3: No area closure
- Drop recent participation requirement Option 1, 2005-07 swordfish landings
- Adopt a range of options for total number of limited entry permits to be issued
- For the purpose of analysis, identify 2007 as the year constituting “the present” for qualification under Option 1 and “current” for possession of a DGN permit
- Use “pelagic longline gear outside the EEZ” instead of “SSLL gear” in the qualification options
- Consider adopting a fourth limited entry qualification option that blends the scores of the three proposed options

Summary recommendations for Alternative 3:

Seek advice from legal counsel and consider revising the alternative as a limited entry program with a low qualification criterion

4 BACKGROUND INFORMATION AND ANALYSES

4.1 NMFS SWR Protected Resources Division Information on Protected Species Impacts

NMFS Southwest Region Protected Resources Division (PRD) previously provided preliminary estimates of anticipated takes and mortalities of leatherback and loggerhead sea turtles under the various fishing effort and area scenarios provided. These are summarized here:

Fishing Effort	Leatherbacks		Loggerheads	
	Takes	Mortalities	Takes	Mortalities
East of 150° W longitude				
1.5 million hooks	7	1-2	18	2-4
1.0 million hooks	5	1-2	13	2-3

² Prior to implementation of the FMP in 2004 longline landings were prohibited in California, but some legal landings may have occurred in Oregon.

East of 140° W longitude				
1.5 million hooks	6	1-2	10	1-3
1.0 million hooks	4	1	7	1-2

The above ranges in **loggerhead** mortality estimates are based upon currently available post-hooking mortality rates of 9.3% (from two scientific papers), 17% (based upon analysis of NED bycatch), and 20.50% (from NMFS Pacific Island Regional Office's [PIRO's] recent analysis of the Hawaii-based SSSL fishery).

The above ranges in **leatherback** mortality estimates are based upon currently available post-hooking mortality rates of 13.0% (based upon analysis of NED bycatch) and 22.5% (from the PIRO's recent analysis of the Hawaii-based SSSL fishery). The actual post-hooking mortality rate for a fishery is a subject of continued research by NMFS. The actual estimates are rounded up for this example.

As described in previous meetings and documents, the area between 140° and 150° W longitude has been identified as an area of relatively high loggerhead bycatch.

Coordination with NMFS PIRO

SWR PRD has been working closely with PIRO to share information on sea turtles and proposed amendments to the respective SSSL fishery. The Pacific Islands Fisheries Science Center has developed a model to quantitatively evaluate the risk of quasi-extinction of leatherback and loggerhead populations. [Note: a description of this evaluation is provided as Appendix II to WPFMC Pelagics FMP Amendment 18 DSEIS.] SWR PRD is continuing to work with PIRO on the use of this model and its application to fishery actions being considered by the PFMC and NMFS.

Loggerhead ESA petition

SWR PRD continues to be involved in the 12-month review of the petition to list north Pacific loggerheads as a distinct population segment and list them as endangered (currently, loggerheads are listed globally as threatened). A decision on this petition is expected before the end of 2008.

Marine mammals and SSSL

SWR PRD has not conducted an exhaustive analysis of the likelihood of marine mammal interactions with SSSL in the high seas adjacent to the west coast EEZ. Based upon an analysis of the Hawaii-based SSSL fishery, marine mammal interactions are not common; there were 4,167 observed sets made for swordfish (or configured for swordfish) and only 24 observed interactions (17 serious injuries or mortalities, 7 animals released uninjured). SWR PRD will analyze the available observer data from the historical SSSL fishery to determine which marine mammal species may be affected.

In the Hawaii-based SSSL fishery there is concern about the level of take of false killer whales and short-finned pilot whales. Both of these species are taken primarily in the deep-set, or tuna targeting, component of the fishery.

4.2 Potential Profitability of the Fishery at Different Numbers of Permits

The number of SSSL permits issued may have implications for the economic value of a limited entry permit. Fishermen who undertake longline fishing effort in a given season incur both fixed costs and variable costs of effort. The fixed costs are those incurred before the season begins such as maintenance costs to bring their gear and vessels into proper working condition and permit fees that are needed in order to fish legally. Variable costs are those such as fuel, labor, bait, and provisions that are accrued as

effort occurs, and which may be considered roughly proportional to the nominal level of fishing effort.³ In order for fishing to be economically viable, fishermen must be able to catch and sell a sufficient amount of fish to cover both their fixed costs and their variable costs of fishing effort.

An approximate estimate of the value of a permit may be obtained by considering historical data on swordfish catch per unit of effort, *ex-vessel* price, fixed costs, and variable costs of fishing effort. Assuming a given level of effort will occur, it is possible to estimate the net revenue for the fleet. Average net revenue may then be estimated by dividing fleet-level net revenue by the number of permits.

The following table shows the estimated effect of the number of permits and levels of effort on the annual net revenue per permit in thousands of dollars:

Number of Permits	Millions of Hooks		
	1	1.25	1.5
5	\$633	\$633	\$633
10	\$421	\$555	\$633
15	\$244	\$333	\$421
20	\$155	\$222	\$288

The estimates should be taken as approximations of what might occur in a reopened west coast based SSLL fishery. They are based on numerous assumptions developed using historic data from the Hawaii-based shallow set swordfish fishery and from the west coast based shallow set longline fishery for swordfish that existed before 2001 and thus may not be representative of potential future experience.

4.3 Information on Qualification Criteria Options

4.3.1 Option 1: SSLL and DGN Landings, 1996-2006

The following table shows the cumulative landings required to qualify for a permit, depending on the number issued. The landings have been rounded to the nearest 1,000 mt interval to preserve data confidentiality. The HMSMT is still determining which individuals participated in both fisheries. If it is determined that additional people participated in both fisheries the cutoff estimates provided here could change.

Number of Permits	Landings Cutoff (round mt 1000s)	
	Recent Landings 2001-2007	Recent Landings 2005-2007
5	2,400	2,400
10	1,800	1,800
15	1,500	1,500
20	1,300	1,200
Total w/ Recent Landings	139	60

4.3.2 Option 2: Point System for DGN Permit Holders

The recommended scoring formula was applied to data provided by CDFG and ODFW. Three different weights were applied to Q_4 for comparison. However, as can be seen in the following table, based on no weighting of the number of years owning a permit (i.e., $w_2 = 1.0$) those ranked 2nd through 16th and 17th through 20th were tied according to the formula. As recommended, swordfish landings 2001-07 were

³ Longer trips will naturally result in higher trip costs, due to greater necessary expenditure on fuel and labor.

used as a tie breaker. In order to preserve confidentiality the landings information is presented as a proportion of the 20th ranked qualifier.

Applying either of the two recent landings options (2001-07 or 2005-07) does not make a difference in the rankings.

Rank	Q1	Q2	Q3	Q4	F2*w1	F2*w2	F2*w3	Landings
1	1	1	7	12	15	21	33	203%
2	1		7	12	14	20	32	709%
3	1		7	12	14	20	32	406%
4	1		7	12	14	20	32	334%
5	1		7	12	14	20	32	305%
6	1		7	12	14	20	32	298%
7	1		7	12	14	20	32	244%
8	1		7	12	14	20	32	242%
9	1		7	12	14	20	32	209%
10	1		7	12	14	20	32	208%
11	1		7	12	14	20	32	188%
12	1		7	12	14	20	32	180%
13	1		7	12	14	20	32	179%
14	1		7	12	14	20	32	171%
15	1		7	12	14	20	32	154%
16	1		7	12	14	20	32	92%
17	1		7	11	13.5	19	30	245%
18	1		6	12	13	19	31	211%
19	1		6	12	13	19	31	174%
20	1		6	12	13	19	31	100%

Note:

Q1: Current DGN permit owner (max. 1 point)

Q2: Current DGN permit owner with LL landings in 2007 (max 1 point)

Q3: Current DGN owner with recent landings by any gear (2001-2007) (max 7 points)

Q4: Number of years that the person owned a DGN permit (max 12 points) weighted as follows:

$w_1 = 0.5$ (i.e., a maximum of 6 points)

$w_2 = 1.0$ (a maximum of 12 points)

$w_3 = 2.0$ (a maximum of 24 points)

The following table shows the number of permits that meet each of the qualification criteria.

Criterion	Total
Q1	90
Q2	3
Q3	68
Q4	210

4.3.3 Option 3: Point System for Pelagic Longline Vessels

There are 92 vessels that made at least one landing with pelagic longline from 1996 to 2006. As shown below, under recent participation requirement Option 1, 42 would qualify. Under recent participation

requirement Option 2 only four vessels would qualify. In terms of the overall 92 vessels, the lowest ranking of these four ranks 84th while the highest ranking ranks third.

No. of Permits	Recent Landings 01-07			Recent Landings 05-07		
	No. years, 96-06 (S ₁)	No. landings (S ₂)	Score*	No. years, 96-06 (S ₁)	No. landings (S ₂)	Score*
5	8	86	16.6	1**	1**	1.2**
10	8	62	14.2			
15	6	64	12.4			
20	5	56	10.6			
Total w/ recent landings			42			4

*For this example S₂ is assigned a weight of 0.1.

**Only four vessels qualify under this recent landings option.

4.4 Historical Swordfish CPUE

The following tables present a summary of catch rates by quarter east of 150° W to 140° W and east of 140° W longitude. The first table is based on observer records for the Hawaii fishery since it reopened in 2004. This fishery uses circle hooks and mackerel-type bait. The second table shows observer data for the fishery that operated out of the west coast during the period 2001-03.

Hawaii trips, 2004-2007

	Quarter 1		Quarter 2		Quarter 3		Quarter 4		Total	
	<150-140	<140	<150-140	<140	<150-140	<140	<150-140	<140	<150-140	<140
Sets	259	0	28	0	0	0	253	6	540	6
Hooks	21,885	0	23,340	0			202,233	4,769	247,458	4,769
Swords	3,164	0	436	0			2,530	84	6,130	84
cpue	0.144574	0	0.01868	0	0	0	0.01251	0.017614	0.024772	0.017614

"<": east of

West coast trips, 2001-2003

	Quarter 1		Quarter 2		Quarter 3		Quarter 4		Total	
	<150-140	<140	<150-140	<140	<150-140	<140	<150-140	<140	<150-140	<140
Sets	72	0	14	3	0	64	83	108	169	175
Hooks	51,574		17,255	3138		50,278	53,898	78,446	122,727	131,862
Swords	1,220		83	8		487	1,139	773	2,442	1,268
cpue	0.02366		0.00481	0.00255		0.00969	0.02113	0.00985	0.01990	0.00962

"<": east of

To provide an indication of differences in catch rates between the Hawaii and west coast fisheries and between west coast effort that occurred east and west of 140° W longitude, we computed t-tests for the difference between means using the available historic data samples. The statistical significance of the cpue difference east and west of 140° W for the Hawaii fishery was not compared in this manner due to the small sample size.

The results comparing cpue means between the Hawaii and west coast data sets shows no statistically significant difference based on the student's t-test. The results are as follows:

t= -1.16

sdev= 0.900E-02

degrees of freedom =888

The p-value for this result, assuming the null hypothesis, is 0.25, which is larger than levels which would lead to a conclusion the means were significantly different using a traditional 5 percent significance level (p-value < 0.05) or 1 percent level (p-value < 0.01) test.

Comparison of cpues between west coast effort that occurred east and west of 140° W longitude shows there is a statistically significant difference based on the t-test. The results are as follows:

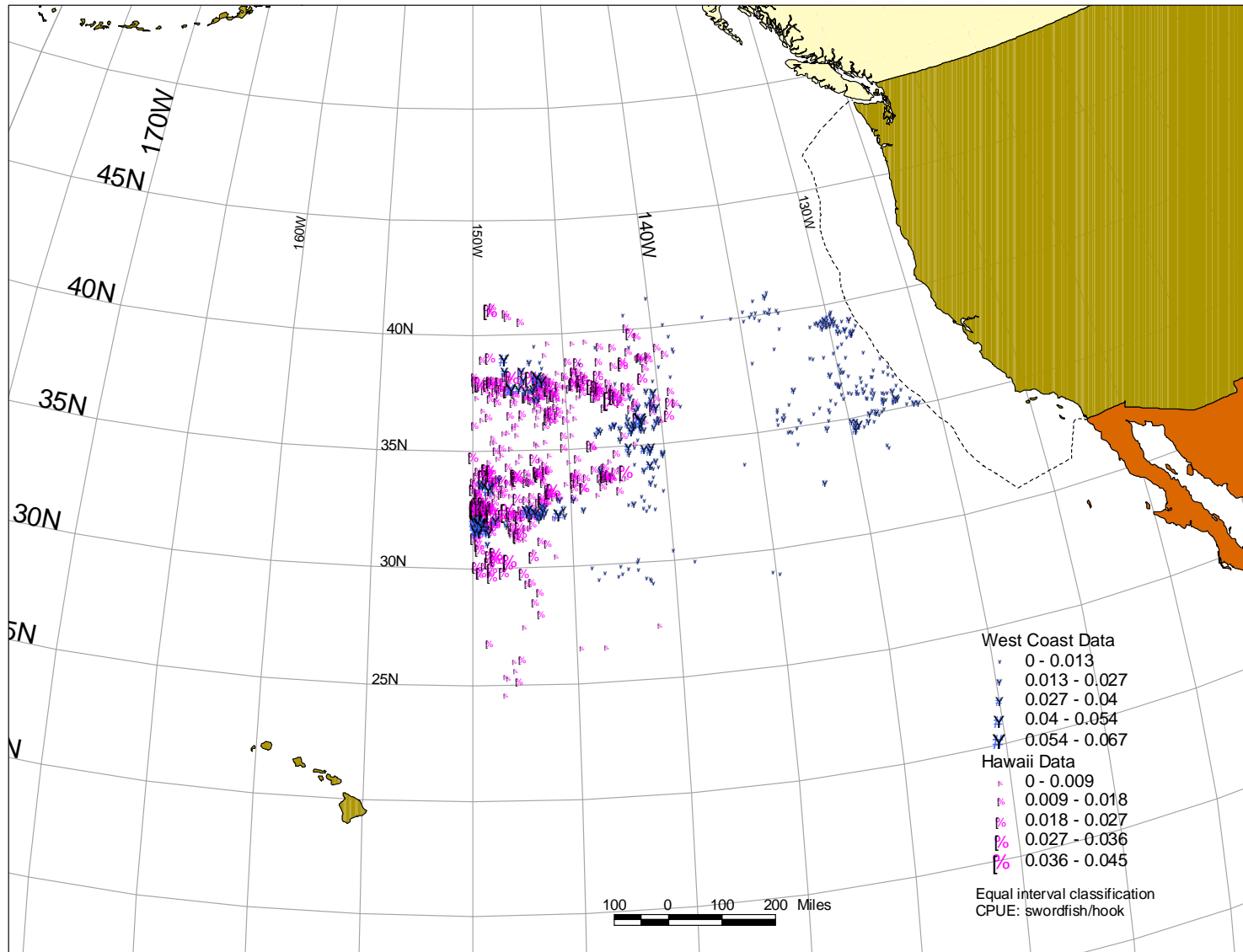
t= 10.3

sdev= 0.975E-02

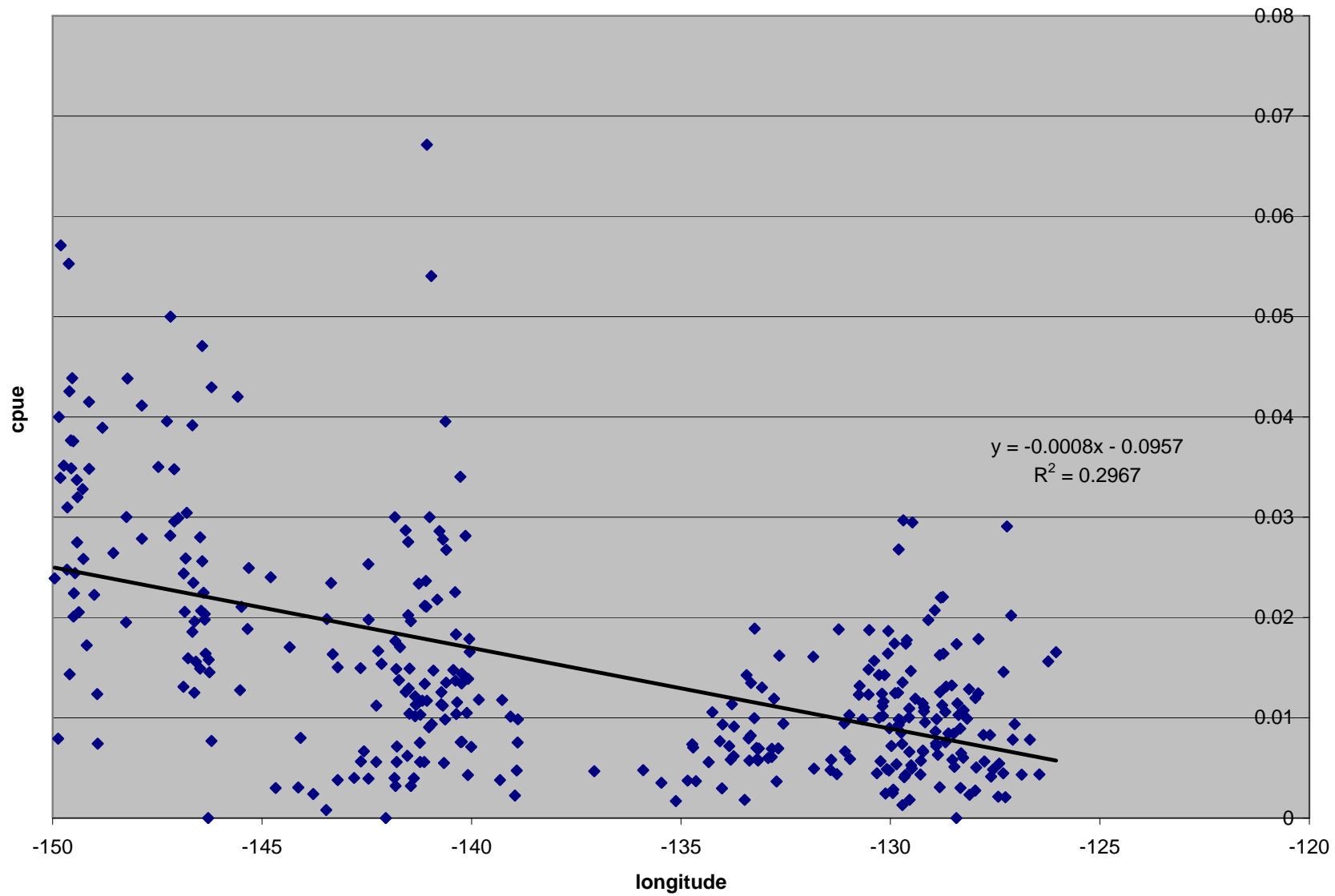
degrees of freedom =342

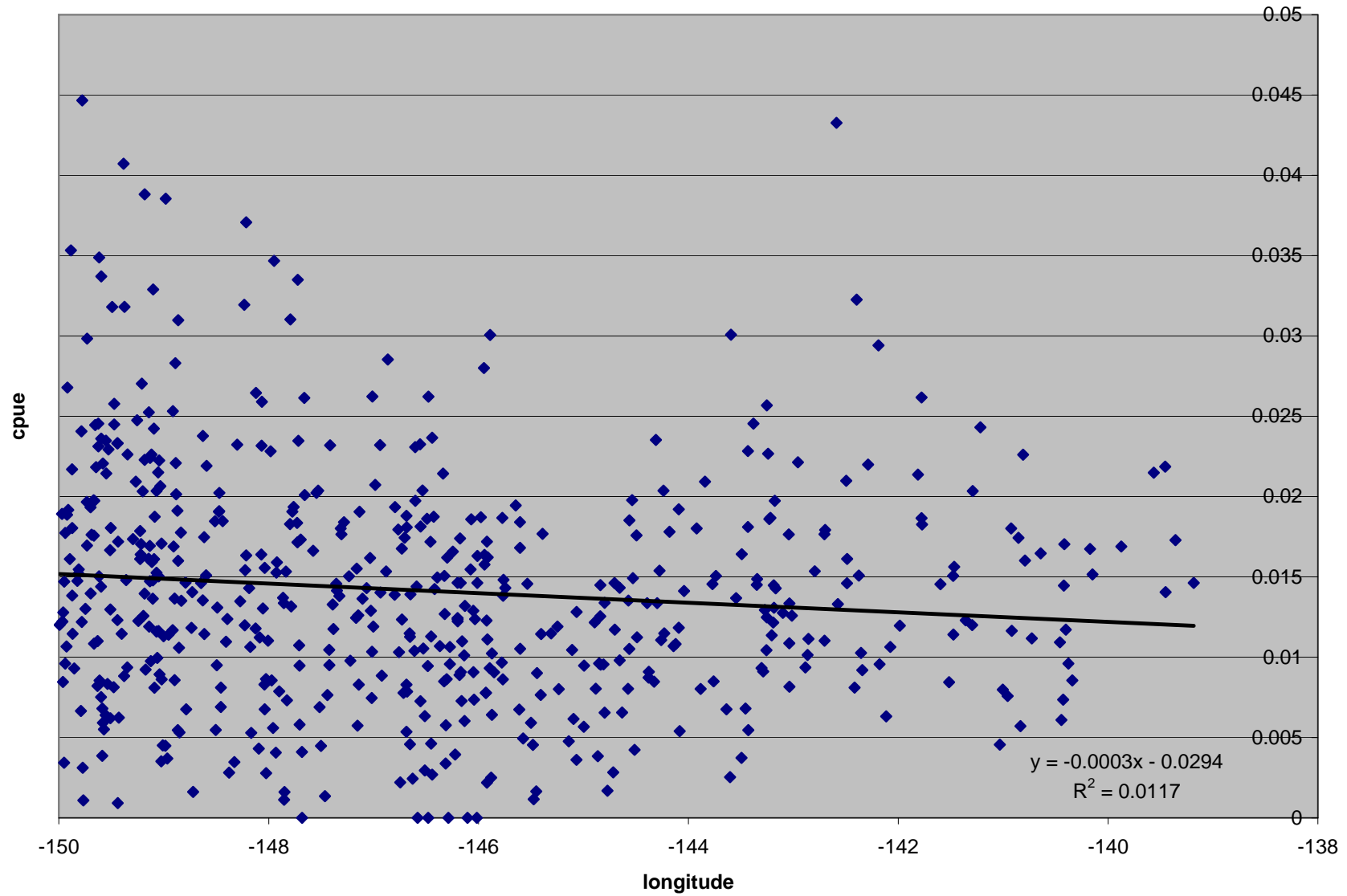
The probability of this result, assuming the null hypothesis, is less than .0001, which indicates a significant difference in cpues using a standard interpretation. This result suggests that a closure at 140° W longitude may have a negative effect on economic viability, as historic cpue is over twice as high west of 140° W compared to east of 140° W.

These results should be taken as indications of differences in cpues which are representative of long-term average experience rather than strong statistical evidence, as the data under comparison are not experimental and do not control for differences in stocks, oceanic conditions, season, and other unmeasured differences in factors which could influence cpue besides geography. Further, the data may fail to satisfy the standard set of assumptions (e.g., independent observations) which justify the use of a t-test to compare means across populations.



Map of west coast and Hawaii swordfish cpue data.





Plot of Hawaii swordfish cpues by longitude.

5 CONCLUSION

The HMSMT makes the following summary recommendations:

Summary recommendations for Alternative 2:

- Add a third area closure option, Option 3: No area closure
- Drop recent participation requirement Option 1, 2005-07 swordfish landings
- Adopt a range of options for total number of limited entry permits to be issued
- For the purpose of analysis, identify 2007 as the year constituting “the present” for qualification under Option 1 and “current” for possession of a DGN permit
- Use “pelagic longline gear outside the EEZ” instead of “SSL gear” in the qualification options
- Consider adopting a fourth limited entry qualification option that blends the scores of the three proposed options

Summary recommendations for Alternative 3:

Seek advice from legal counsel and consider revising the alternative as a limited entry program with a low qualification criterion