Evaluation of the Sampling Distribution of Tournament Versus non-Tournament Trips in the Large Pelagics Survey

Prepared by:

MRIP Highly Migratory Species Work Group

&

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1. Executive Summary

Tournaments are an important part of the total directed fishery for pelagic highly migratory species (HMS). For certain species, catch rates and fish sizes from tournament trips can differ from those associated with non-tournament trips. It is important that fisheries surveys represent tournaments in proportion to their occurrence as either over- or under-representation of tournament trips could affect the accuracy of HMS catch rates, estimates, and size distributions. This study evaluated the sampling distribution of tournament trips in the NMFS Large Pelagics Survey (LPS) and pilot tested alternative data collection methods for HMS tournaments. The rate at which tournament trips are sampled in the LPS was evaluated to assess whether tournaments are being disproportionately represented in the data compared to non-tournament large pelagic trips. LPS data from 2003-2008 were analyzed to compare tournament sampling rates from the Large Pelagics Intercept Survey (LPIS) with tournament trip rates reported on the Large Pelagics Telephone Survey (LPTS). Results suggest that tournaments are being oversampled in the dockside LPIS compared to rates of tournament trip reporting on the complementary phone survey (LPTS). Oversampling of tournaments in the LPIS, and the potential for biased estimates associated with oversampling, is significantly more prevalent in LPS states north of Delaware (i.e., New Jersey through Maine) and in the private boat mode than the charter boat mode.

For comparison with LPS tournament data, an attempted census was conducted of all 2008 HMS tournaments from Maine through Virginia based on tournament operators summary reports. Operators of all identified HMS tournaments were mailed a notification letter and reporting summary form prior to the start of the event. Data from the pilot study were combined with Recreational Billfish Survey summary form data and Massachusetts' Sportfishing Tournament Monitoring Program data. Of the 89 total HMS tournaments identified, 63 (70%) had registered with NMFS. Data were collected from 59 of the 89 identified tournaments (66%). The average tournament had about 60 boats, although the data were heavily skewed in favor of smaller tournaments with only a few very large tournaments. The median value of 34 boats per tournament may, therefore, be a more appropriate central measure.

Dockside interviews were conducted with captains at five HMS tournaments. These data were analyzed, along with data from a new question added to the LPIS in 2009, to determine what proportion of fish caught in tournaments actually get weighed-in or reported to the tournament director. Findings showed that, overall, a significant proportion of tournament landings are never weighed-in, although results varied by species. For example, based on LPS June-August 2009 data, the proportion of

tournament landed fish weighed-in was 79% for sharks (thresher, shortfin mako, and blue), 67% for bluefin tuna, 48% for BAYS tunas (bigeye, albacore, yellowfin, and skipjack), and only 19% for dolphin. Results from the pilot study dockside sampling suggest that an even larger proportion of releases are not being reported to tournament directors.

Comparisons of 2008 total landings and total releases for select species were made between LPS tournament domain estimates and tournament director reports. Results indicate a systematic difference between director reports and LPS domain estimates. For all species analyzed, LPS tournament domain estimates of total landings and total releases were larger than corresponding totals from director reports. The systematic differences found when comparing LPS tournament domain estimates with director reported catches are likely due to a combination of two main factors: 1) A positive bias in LPS catch estimates resulting from dockside oversampling of HMS tournaments, and 2) Captains not reporting all fish caught to directors combined with the inability to identify reported fish in the 2008 LPIS catch data (question added to 2009 LPIS to identify reported tournament fish).

A sensitivity analysis was conducted on LPS estimates to determine: 1) which particular species are more sensitive to this potential bias, and 2) the relative magnitude of the catch estimation bias resulting from differing hypothetical rates of oversampling tournaments in the LPIS. For many species, including bluefin tuna, all BAYS tunas, and dolphin, down-weighting of tournament trips by as much as 25% or 50% still resulted in fairly insignificant changes to LPS landings estimates. Thus, these species appear to be fairly robust to oversampling of tournaments, indicating that catch rates (i.e., catch per LPS intercepted vessel trip) do not differ greatly between tournament and non-tournament trips within a given month/area/mode cell. By contrast, landings estimates for commonly targeted sharks (i.e., blue, common thresher, and shortfin mako) were particularly sensitive to tournament trip down-weighting. These shark species are more likely to be landed during an intercepted tournament trip than a non-tournament trip within a given cell. Results suggest a positive bias in LPS shark landings estimates and billfish release estimates due to LPIS disproportionate sampling of tournaments.

These findings support the need for changes in the current LPS design and possibly a new data collection methodology focused on HMS tournaments to improve on the accuracy of recreational shark catch estimates and estimates of billfish released alive. Based on the results of this pilot study, four alternative approaches for future sampling of HMS tournaments were identified: 1) Status quo, 2) Full tournament census, 3) Modified survey design, and 4) Hybrid design using census for effort and survey for catch rates. This study highlighted the tremendous diversity that exists among HMS tournaments. If

a census program is implemented a "one-size-fits-all" approach to data collection may not be optimal and different sampling strategies may be needed depending on tournament size, duration, target species, rules, and other characteristics. Criteria used to compare and contrast each alternative included cost, effect on identified bias, effect on precision of resulting HMS catch estimates, reporting burden, and overall feasibility in terms of constraints or key assumptions. The selection of a preferred alternative will require a more thorough evaluation of trade-offs, and weighing the relative advantages and disadvantages of implementing each alternative. This decision should ideally be based on input from HMS data users, data collection managers, tournament directors, and other affected stakeholders. Although this study focused on sampling HMS tournaments in the LPS geographic range, the recommendations and lessons learned may have wider applicability for sampling HMS tournaments in other geographic regions, as well as for sampling saltwater tournaments in general, regardless of target species.

1.1 Summary of Data Collection and Management Recommendations

- A targeted outreach program aimed at increasing compliance with the HMS tournament registration and reporting requirements should be developed by NMFS to improve the accuracy and completeness of the current RBS or of a full tournament census or hybrid census-survey approach (if either of these alternatives are implemented). NMFS should routinely conduct Internet searches and employ other search techniques to identify and contact unregistered HMS tournaments.

- NMFS should continue to provide HMS tournament captains and directors species identification materials to both improve on the quality of self-reported tournament data and to promote good-will and compliance with registration and reporting requirements. In particular, NMFS should develop and distribute a billfish identification guide to help captains differentiate between roundscale spearfish and white marlin.

- To increase the enforceability of the tournament registration requirement, NMFS should consider issuing an actual permit to directors that legally allows them to hold the tournament. While increased enforcement, or the real threat of enforcement, will likely improve compliance rates, this option should only be exercised as a last resort given the social and economic

importance of HMS tournaments, and the fact that many tournaments are run as charity events or memorials.

- NMFS should encourage its state agency partners to get more involved with tournament data collection programs. The Massachusetts Sportfishing Tournament Monitoring Program (MSTMP) provides an excellent model that could perhaps be exported to other states. If a tournament census program is implemented, NMFS should consider providing funding for state agency involvement with HMS tournament data collections.

- Given the close link between registering and reporting, the project team recommends that NMFS consider giving a single office responsibility for administering both HMS tournament registration and data collection programs. If the full census alternative is selected, it is strongly recommended that a single NMFS office with a full-time program manager be identified as the lead for this attempted census of both billfish (RBS) and non-billfish tournaments. NMFS should also explore the feasibility of establishing regional coordinators responsible for collecting HMS tournament data in their particular region and feeding the information to a central office.

- NMFS should consider developing an online HMS tournament registration tool similar to the system currently in place for HMS permits.

- NMFS should consider revising the current HMS tournament director summary form for clarity and improved accuracy. Specific recommendations for improving this form are provided in Section 6.1.1.

- If a full census of all HMS tournaments (billfish and non-billfish) or hybrid census-survey is implemented, this new program will need to be integrated with the RBS in such a way as to assure that the integrity of the time series and the ability of RBS to continue to meet ICCAT and domestic reporting requirements are maintained.

- If the full census or hybrid census-survey alternative is selected NMFS should shift some of the reporting burden from tournament directors to captains. Innovative methods for collecting tournament catch and effort data from captains and for improving director-captain communications should be explored (e.g., texting, email, Internet). NMFS may also need to provide directors of larger tournaments with trained samplers to assist in the attempted census of catch and effort from all vessels.

- If the full census alternative is selected, NMFS should develop a standard web-based tournament reporting form to encourage posting and reporting of data on the Internet. With director permission summary results from the census can be posted at an official NMFS website as an outreach product for directors and captains that may help promote compliance with the reporting requirement.

2. Background and Statement of Purpose

With increasing demands for accurate and reliable marine recreational fisheries data it is critical to assess how we currently monitor these fisheries and to resolve any problems or gaps identified with existing data collection programs. For trans-boundary, highly migratory species (HMS) populations such demands can come not only from domestic fisheries stakeholders but increasingly from an international community with whom these valued resources are shared. Populations of large pelagic apex predators such as tunas, sharks, and billfish are susceptible to overfishing and many are still being actively overfished throughout the world. The collection of fishery dependent data on Atlantic HMS fulfils U.S. obligations under international treaty and provides data for stock assessments and management in domestic and international waters. Additional authority for NOAA Fisheries to collect information from these fisheries comes from the Atlantic Tunas Convention Act. If the U.S. expects other nations to accurately monitor their HMS fisheries we need to lead by example through identification of biases and gaps in our own monitoring programs and evaluation of ways to improve them.

In 2005 NOAA Fisheries asked the National Academy of Sciences' National Research Council (NRC) to conduct an independent scientific review of the government's marine recreational fishery data collection programs. In their report[1] the NRC identified a number of potential biases associated with existing programs and made several recommendations for improvements. In the reauthorized Magnuson-Stevens Fishery Conservation and Management Act of 2007 Congress echoed many of the concerns raised by the NRC in calling for redesigned saltwater angler surveys to better meet fisheries management and stock assessment needs. Shortly thereafter a new initiative called the Marine Recreational Information Program, or MRIP, was formed to address this mandate. MRIP is a collaborative effort that brings together federal, state, and interstate agency data collection experts and fishing industry representatives. This project was conducted by the MRIP Highly Migratory Species (HMS) Work Group, one of four work groups established by MRIP to develop and implement project plans aimed at improving marine recreational fisheries data collection.

Offshore fishing trips targeting pelagic highly migratory species typically make up a relatively small proportion of all recreational fishing trips. As a result of the "rare event" nature of these trips,

[1] National Research Council of the National Academies. 2006. Review of Recreational Fisheries Survey Methods. The National Academies Press, Washington, D.C.

generalized angler surveys aimed at estimating catch and effort for all species do not produce very precise estimates for many large pelagic species. In such cases specialized surveys or other data collection approaches are needed to achieve the desired level of statistical precision. The Large Pelagics Survey (LPS) was specifically designed to collect information on recreational fishing directed at large pelagic species (i.e., tunas, billfishes, swordfish, sharks, wahoo, dolphin, and amberjack). This specialization has allowed higher levels of sampling needed to provide more precise estimates of pelagic fishing effort and catches of large pelagic species. The LPS has been conducted since 1992 from Maine through Virginia. The LPS includes two independent, complementary surveys which provide the effort and average catch per trip estimates needed to estimate total catch by species. The Large Pelagics Intercept Survey (LPIS) is a dockside survey of private boat and charterboat captains who have just completed fishing trips directed at large pelagic species. This survey is conducted at public fishing access sites that are likely to be used by offshore anglers, and is primarily designed to collect detailed catch data. The Large Pelagics Telephone Survey (LPTS) collects fishing effort information directly from captains holding Highly Migratory Species (HMS) permits (required by NOAA Fisheries to fish for these species). Data from the phone survey are used to estimate the total number of boat trips on which anglers fished with rod and reel or handline for large pelagic species.

Large pelagic recreational fisheries differ from near-shore saltwater fisheries in many aspects including fishing locations, fishing methods, gear types, expenditures, and socio-economic level of participants. Another notable difference is the relative importance and impact of fishing tournaments targeting large pelagics. Tournaments are an important part of the total directed fishery for pelagic HMS. NOAA Fisheries defines an HMS tournament as "any fishing competition involving HMS in which participants must register or otherwise enter, or in which a prize or award is offered for catching or landing such fish (i.e. billfish, tunas, sharks, or swordfish)." HMS tournament operators are required to register all tournaments in the Atlantic, Gulf of Mexico, U.S. Virgin Islands, and Puerto Rico. A total of 267 HMS tournaments were registered in 2008, 69 of which took place in LPS states from Maine through Virginia. It is likely that several other non-registered HMS tournaments take place each year, although the exact number is unknown. It is, therefore, important that tournaments are not only included in surveys aimed at estimating large pelagic catch but that they are sampled correctly as either over- or under-representation of tournament trips could affect the data quality.

Tournament trips targeting large pelagics are randomly sampled along with non- tournament trips in the LPS both during telephone interviews (LPTS) and dockside intercepts (LPIS). The LPTS uses a list-based

sampling frame derived from HMS permit lists for private boats and a for-hire directory for charter boats. Vessel captains are randomly selected from these lists to report their LPS fishing effort during one-week (charter) or two-week (private) sampling periods. LPTS data suggest that roughly 10% of all LPS boat trips taken from Maine through Virginia are fishing in tournaments. For the LPIS sample design, site clusters made up of one or more individual sites are randomly drawn for sampling based on the relative mode-specific fishing pressure (i.e., average LPS boat trips per day) within each cluster. The pressure assigned to a given cluster can vary by month and day type (i.e., weekday versus weekend/holiday). The current sample design does not account for variable site/cluster pressures associated with specific tournament days. Some preliminary analyses suggested that tournament trips are being over-sampled in the LPIS compared to their prevalence in the phone survey. Since tournament trips may differ from non-tournament trips in terms of target species, catch rates, and fish size, disproportionate sampling of tournaments introduces a potential bias in the catch rates, catch estimates and length frequency distributions. LPIS data are also used to expand LPTS effort estimates to account for vessels not on the telephone sampling frames and for out-of-state trips. Disproportionately sampling tournament trips could bias effort estimates if tournament trips differ from non-tournament trips in terms of the ratio between on-frame/off-frame vessel trips or in-state/out-of-state trips.

The purpose of this project was to evaluate potential biases associated with the sampling distribution of tournament versus non-tournament trips in the Large Pelagics Survey. The advantages and disadvantages of alternative approaches designed to reduce any identified biases (or potential for bias) associated with HMS catch and effort estimates were assessed. Alternatives explored include a modified survey approach, an attempted census of HMS tournaments, and a combined hybrid census-survey approach. Another goal of this project was to characterize HMS tournaments and describe the diversity of tournaments in the LPS range. Tournament size and fishing effort can range widely from just a few boats to several hundred boats and from single day to week-long events. HMS tournaments also differ from one another in terms of target species and catch disposition (catch and release events versus bringing fish to the scale). These differences were analyzed in an attempt to categorize HMS tournaments for purposes of sampling and estimation. A “one-size-fits-all” approach to collecting information from HMS tournaments may not work and, therefore, recognition of this diversity is an important first step in designing a new data collection approach.

Since the Large Pelagics Survey is currently only conducted from Maine through Virginia the focus of this project was limited to this geographic area. However, accurate and precise estimation of recreational

catch and effort for large pelagics is important and has been identified as a priority in other regions. The HMS Work Group is conducting pilot studies that address existing gaps in large pelagics recreational data in the South Atlantic, Gulf of Mexico and Caribbean sub-regions. Similar to the Northeast region, HMS tournaments are an important component of the recreational catch and effort for large pelagics in these areas. Recommendations for HMS tournament sampling resulting from this project will likely apply to other geographic areas. Likewise, although the focus of this study was on highly migratory species, the recommendations may have wider applicability to tournaments for other species (e.g., king mackerel or striped bass) that are not adequately covered by existing data collection programs.

3. Report Organization

Data from the 2008 Large Pelagics Intercept Survey (LPIS) and Large Pelagics Telephone Survey (LPTS) were analyzed to assess the potential bias associated with tournament sampling in the LPS, and to compare with results from this pilot study. The approach used to compare LPIS and LPTS tournament trip sampling rates and the results of this comparison are provided in Section 4. For purposes of comparison and validation, HMS tournament data for this pilot study were collected using three different data collection approaches: 1) faxed or mailed tournament director reporting forms, 2) dockside face-to-face interviews with tournament participants, and 3) data posted on official tournament web sites. Section 5 describes the data collection and analysis methods used for each of these three approaches. Section 6 discusses the findings from each data source: 6.1 Tournament Director Reports, 6.2 Dockside Sampling, and 6.3 Internet Data Gathering. Section 7 compares the cumulative catch data from all director reports with LPS tournament domain catch estimates for matched tournaments. Section 8 describes the methodology and findings of an LPS catch estimate sensitivity analysis under different hypothetical scenarios of LPIS tournament sampling over-representation. The report concludes with a discussion of the major findings and how they relate to each other, recommendations for future tournament data collection efforts, and an evaluation of the advantages and disadvantages of identified alternatives for sampling HMS tournaments (Section 9).

4. Comparison of Tournament Sampling Rates between LPIS and LPTS

4.1 Methods

The rate at which tournament trips are sampled in the LPS was evaluated to assess whether tournaments are being disproportionately represented in the data compared to non-tournament large pelagic trips. As discussed above, disproportionate sampling of tournaments can introduce a potential bias in catch rates, catch estimates, length frequency distributions, as well as effort estimator expansion factors. Tournament sampling rates over the past six years were compared between dockside survey (LPIS) and telephone survey (LPTS) components. For analyses that involved pooling across LPS cells (i.e., year/mode/area/month level) data were weighted by cell level effort estimates. LPIS data were weighted by the estimated total number of LPS boat trips, whereas LPTS data were weighted by estimated number of "on-frame" LPS boat trips. "On frame" refers to in-state trips taken by vessels on one of three HMS permit lists (HMS Angling, Charter/Headboat, or Atlantic Tunas General category) which the sampling frame is based on. "Off-frame" trips (i.e., out-of-state trips and trips by non-permitted vessels) were not included in the weighting of phone data because this effort component is based on dockside intercept data.

4.2 Results

Pooling data across all LPS months (June-October) and areas (Virginia through Maine) shows that tournament trips are consistently sampled at an overall higher rate through the dockside LPIS than they are reported through the telephone survey (Table 1). This trend is consistent across all years from 2003-2008 and in both modes. The proportion of private boat intercepted trips in tournaments ranged from 22 to 34% over the time series compared to only about 7 to 13% of private boats trips reported through the LPTS as tournament trips. A similar pattern held for charter boats, although differences between dockside and telephone were not as pronounced as for private boats.

Table 1 also shows the tournament proportion of LPTS reported trips that returned to sites on the LPIS master site register (MSR). This column excludes phone reported trips from private access sites and from public sites that could not be matched to an existing site on the LPIS site register. Excluding these trips did not markedly change the overall tournament sampling rates as reported through the phone survey. This suggests that the large differences found between LPIS and LPTS tournament rates can not be explained by differences in tournament rates between trips on the MSR versus trips not on the MSR.

Potential bias associated with disproportionate representation of tournament trips also varied by area. Tournament trips are sampled at a higher rate through the dockside LPIS than they are reported through the telephone survey in both modes for all areas except Maryland/Delaware (Figures 1 and 2). For the private boat mode, differences in tournament sampling rates were most pronounced in three areas: NH/ME, NY, and NJ. Tournament trip dockside intercepts in these areas accounted for between 42-45% of the LPIS sample from 2003-2008, and differences between dockside and telephone tournament sampling rates ranged from 30-39% (Figure 1). The potential for bias associated with over-sampling private boat tournament trips is, therefore, considered greatest in these areas. In MA, CT/RI, and VA tournament trips only accounted for between 19-23% of the private boat sample but differences between dockside and telephone tournament sampling rates were still noticeable.

Table 1. Proportion of dockside intercepts (LPIS) and telephone reported trips (LPTS) participating in a fishing tournament by year and mode.

	PRIVATE BOAT MODE			CHARTERBOAT MODE		
Year	LPIS Private Boat	LPTS Private Boat All Trips	LPTS Private Boat Site Register Trips	LPIS Charter boat	LPTS Add-on Charterboat All Trips	LPTS Add-on Charterboat Site Register Trips
2003	29.9	7.3	7.4			
2004	34.3	12.6	10.2	16.8	8.8	9.4
2005	34.4	9.0	9.7	20.4	10.0	7.9
2006	31.2	8.8	8.9	17.5	8.0	10.5
2007	22.4	8.1	10.3	18.3	12.4	15.1
2008	24.9	10.2	14.7	22.5	14.2	15.5

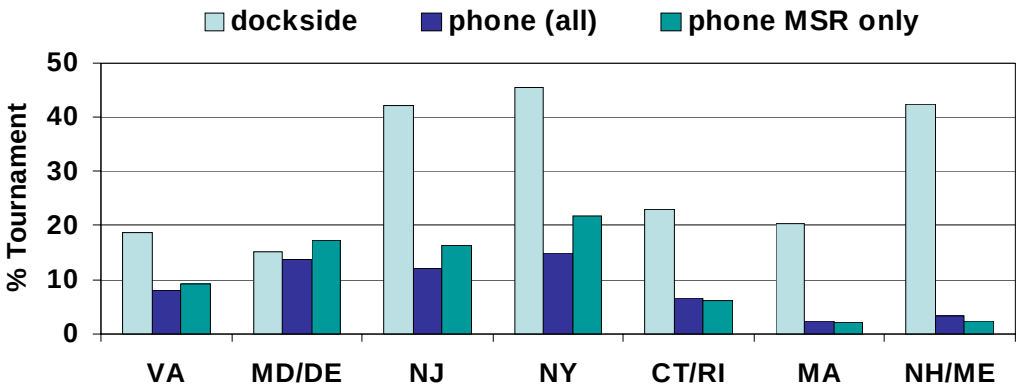


Figure 1. Proportion of private boat dockside intercepts (LPIS) and reported phone trips (LPTS) in tournaments, 2003-2008 data pooled.

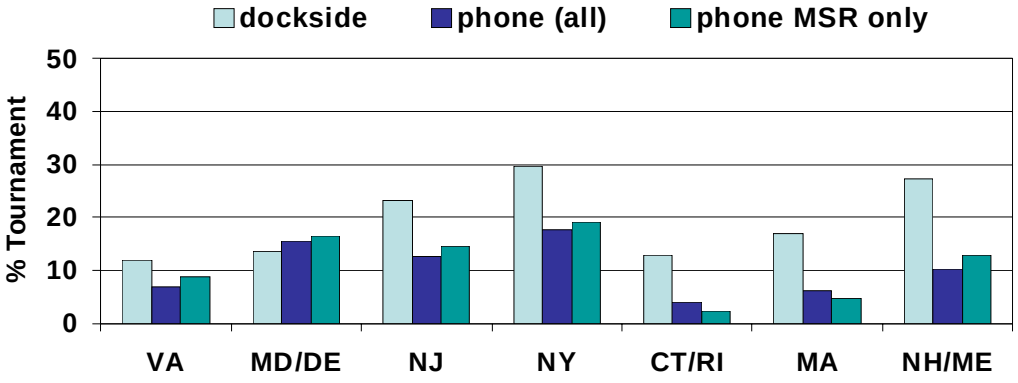


Figure 2. Proportion of charter boat dockside intercepts (LPIS) and reported phone trips (LPTS) in tournaments, 2004-2008 data pooled.

Figure 1 also shows the proportion of private boat LPTS reported trips in tournaments of only those trips taken from sites on the LPIS master site register. The change in private boat phone survey tournament sampling rates after excluding trips not on the MSR was less than 5% in all but one area (New York changed by 7%).

For the charter boat mode, the largest difference in tournament sampling rates after pooling 2004-2008 was in NH/ME (17%), while most other areas ranged from 9% to 12% (Figure 2). In general, differences in charterboat mode tournament rates were smaller and more similar across areas as compared to the private boat mode. The potential for bias associated with over-sampling charterboat tournament trips is, therefore, considered smaller in this mode. The change in charterboat phone survey tournament sampling rates after excluding trips not on the MSR was less than 2% in all areas.

The analyses above indicate that when data are pooled, either across months and areas or months and years, tournaments are sampled at different rates in the dockside LPIS compared to the LPTS. However, actual bias associated with disproportionately sampling at tournaments would manifest itself at the year/mode/area/month cell level for which estimates are produced. Cell-level differences in "off-frame" catch rates, fish sizes, or expansion factors, between tournament and non-tournament trips could, therefore, result in biased effort estimates, catch estimates, and length frequency distributions.

Cell level comparisons between dockside and telephone tournament sampling rates are noisy and unpredictable due to small sample sizes. Small sample sizes of LPS trips are more of an issue with LPTS data where sampling targets are based on the number of attempted contacts (permit holders drawn) as opposed to LPIS targets based on the number of LPS trips intercepted. Thus, the actual number of LPS trips reported through the phone survey can be more variable and unpredictable at the cell level than the number of trips intercepted dockside. For this reason, a multi-year average LPTS tournament sampling rate at the mode/area/month level was used for comparison with annual cell level LPIS tournament sampling rates.

Figure 3 shows the high, low and multi-year average difference (i.e., annual LPIS tournament rate minus multi-year average LPTS tournament rate) by month and area for the private boat mode. The potential for bias associated with disproportionately sampling tournaments varies greatly by month, area, and year within the private boat mode. For example, overall potential bias is greater in July and August than in June or September. Exceptions to this occur in New York and New Jersey during June and in Maine/New Hampshire during September where LPIS tournament sampling rates were on average

between 35-45% higher than the multi-year LPTS average. In some cells the LPIS tournament sampling rate is fairly consistent from year to year while in other cells it fluctuates widely. If a bias is introduced by over-representation on the dockside survey, the magnitude and direction of this bias from one year to the next will be more predictable in some mode/area/month level cells than in others. For example, the LPIS private boat tournament sampling rate for New York/June ranges from 85-98% from 2003-2008. By comparison, the LPIS private boat tournament sampling rate for Massachusetts/July ranges from 13-88% over the same six years. Cells with such large fluctuations from year to year likely have a few big tournaments in them. The tournament sampling rate, and therefore potential bias, associated with such cells are largely determined by whether or not those few tournament day/cluster combinations are randomly selected for sampling that year.

In the charterboat mode the multi-year average difference between annual LPIS and multi-year average LPTS tournament sampling rates only exceeds 30% in three cells: NJ/June, NY/June, and NY/July (Figure 4). The New England states show large fluctuations in LPIS tournament sampling rates in July and August from 2004-2008. While the LPIS tournament sampling rate is on average only between 15-26% higher than the multi-year LPTS average for these cells, in some years this difference exceeds 40% or 50% while in others the absolute difference is less than 10%. While the overall potential bias associated with disproportionately sampling tournaments is less for the charterboat mode than the private boat mode, this potential bias can still be quite large for charterboat mode in certain year/month/area cell combinations.

A schematic overview of the difference between LPIS and LPTS tournament sampling rates in a particular cell is shown in Table 2 (private boat mode) and Table 3 (charterboat mode). For each area/month combination these tables display: 1) the average difference between annual LPIS and multi-year average LPTS tournament sampling rate (**top rectangle**); and 2) the greatest single year difference between LPIS and average LPTS tournament sampling rates (**bottom rectangle**). The rectangles are coded along a gray-scale gradient from lightest (0-15% difference) to darkest (>40% difference).

The true proportion of large pelagic fishing effort associated with tournaments is unknown. Therefore, it is not possible to determine which, if either, of the surveys tournament proportion is systematically closer to the true value. Differences found in tournament sampling rates between the two complimentary survey components could indicate that either the LPIS is over-representing tournaments, the LPTS is under-representing tournaments, or some combination of both effects over time and area. Comparing the LPIS and LPTS survey designs, it seems more likely that tournaments are being over-

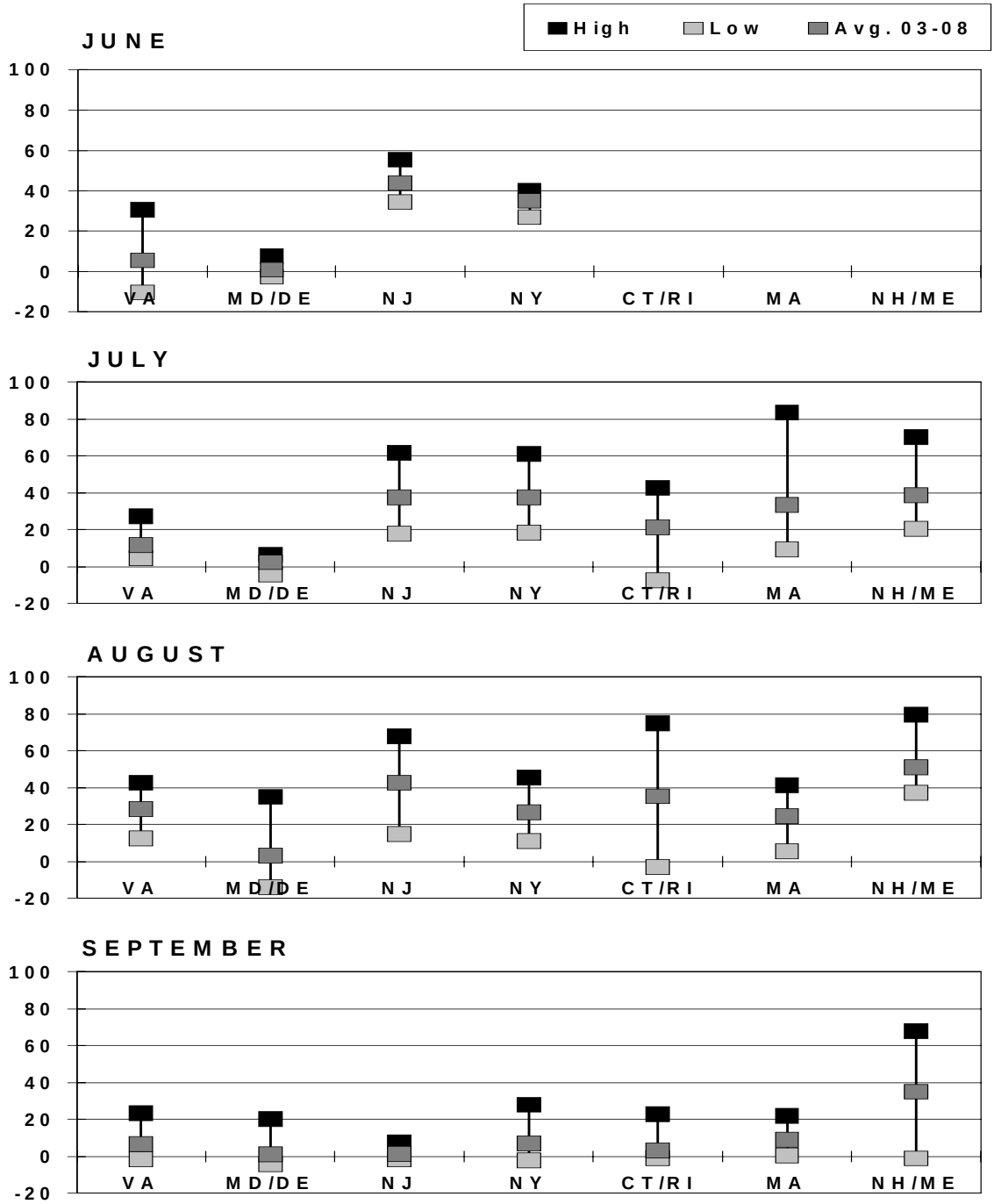


Figure 3. Private boat LPIS dockside tournament sampling rate at the cell level minus 2003-2008 average LPTS tournament sampling rate at the mode/area/month level. Graph displays the high, low and average of this difference (LPIS rate - LPTS rate).

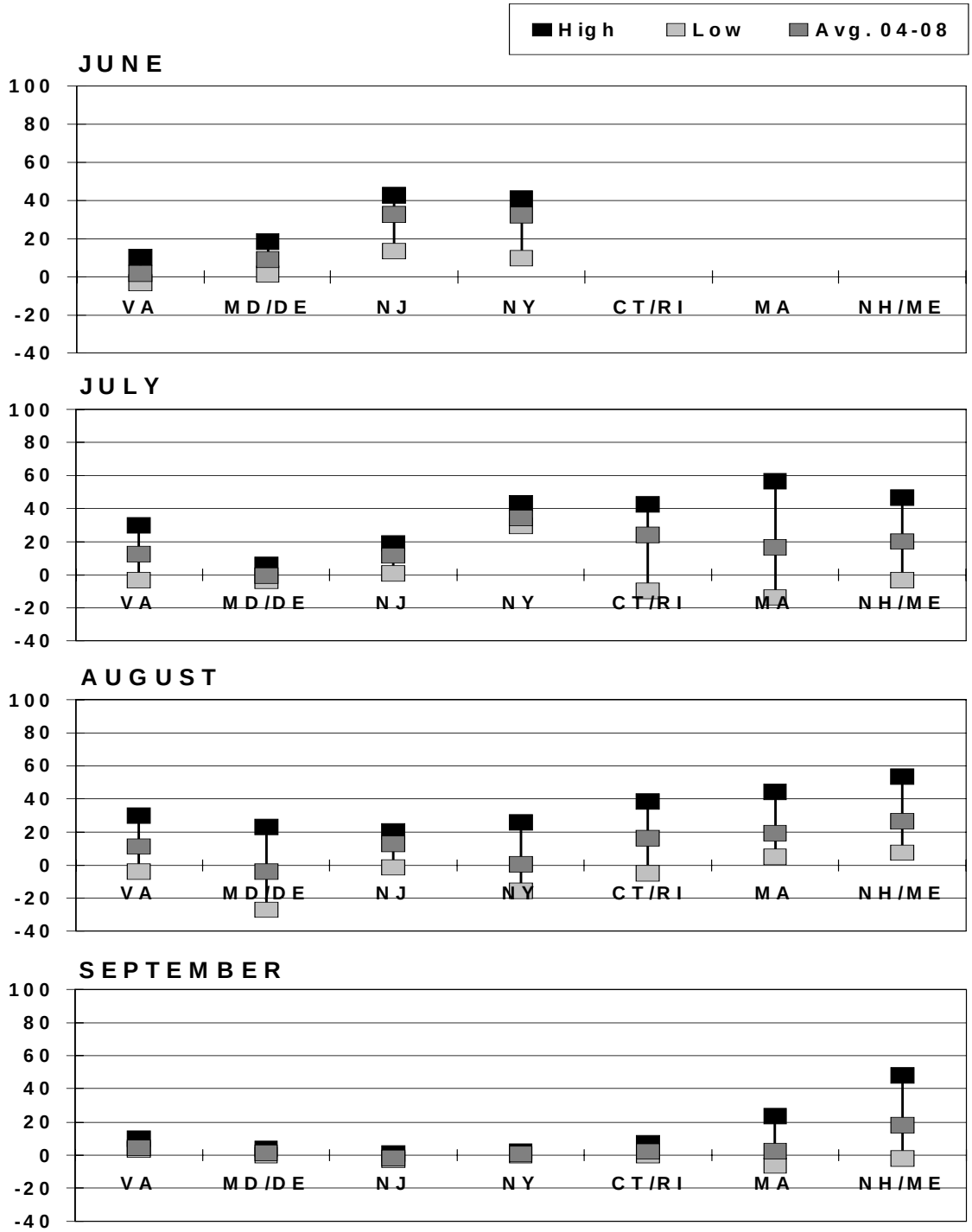


Figure 4. Charterboat LPIS dockside tournament sampling rate at the cell level minus 2004-2008 average LPTS tournament sampling rate at the mode/area/month level. Graph displays the high, low and average of this difference (LPIS rate - LPTS rate).

sampled dockside than under-sampled by phone. The current LPIS sample design does not account for variable site/cluster pressures associated with specific tournament days. Since site/cluster pressures are based on historical productivity (measured as LPIS interviews obtained per assignment), if a tournament is randomly selected one year it can influence the pressure associated with that cluster/month/day type in future years. However, the probability of a given cluster being drawn in a particular month is the same on a busy tournament day as any other day of the same day type. Therefore, depending on the draw, a large tournament may not be sampled at all in the LPIS some years and may be heavily sampled in other years.

Since LPIS data are not currently weighted to account for mismatches between sampling effort and actual effort distribution, it is very likely that tournament trips are not represented in proportion to their occurrence. By contrast, the LPTS selects vessels for reporting from a list of HMS permit holders (or for-hire directory for charter boats) using systematic random sampling. Unlike LPIS trip selection, vessel selection probabilities for the LPTS are both known and equal across vessels (no weighting required). Another difference is that the LPTS only includes permit holders whereas the LPIS includes permit holders and non-permitted captains. Differences in tournament participation rates between permitted captains and non-permitted captains could affect the accuracy of LPTS tournament sampling rates. For this analysis, cell-level LPTS tournament rates were pooled across years for a multi-year average to reduce the cell level variability resulting from small sample sizes. This approach assumes that the actual proportion of HMS tournament trips of all LPS trips in a given year/mode/area/month cell is either relatively stable or randomly varying around a stable mean from year to year. This assumption may be reasonable since most tournaments, particularly the larger ones, are annual events held in the same month and state year after year, and the overall number of tournaments is also similar over time.

If we assume that the multi-year LPTS average tournament rates represent the “true” cell level tournament trip proportions (or at least a closer approximation to the “true” proportions than the dockside rates), there is strong evidence for LPIS oversampling of tournaments across several year/mode/area/month cell combinations. Oversampling tournaments affects both modes but is clearly more prevalent in the private boat mode than charter. Seasonally, oversampling coincides with the months when most HMS tournaments take place in the LPS range (i.e., June, July, and August).

Table 2. Schematic overview of the difference between private boat LPIS and LPTS tournament sampling rates in a particular area/month cell. For each area, the upper rectangle represents the average difference between annual LPIS and multi-year average LPTS tournament sampling rate. The lower rectangle represents the maximum single year difference between LPIS and average LPTS tournament sampling rates.

Average / High	June	July	Aug	Sept
VA Avg.				
VA High				
MD/DE Avg.				
MD/DE High				
NJ Avg.				
NJ High				
NY Avg.				
NY High				
CT/RI Avg.				
CT/RI High				
MA Avg.				
MA High				
NH/ME Avg.				
NH/ME High				

Key: 0-15% 15-30% 30-40% >40% did not sample

Table 3. Schematic overview of the difference between charterboat LPIS and LPTS tournament sampling rates in a particular area/month cell. For each area, the upper rectangle represents the average difference between annual LPIS and multi-year average LPTS tournament sampling rate. The lower rectangle represents the maximum single year difference between LPIS and average LPTS tournament sampling rates.

Average / High	June	July	Aug	Sept
VA Avg.				
VA High				
MD/DE Avg.				
MD/DE High				
NJ Avg.				
NJ High				
NY Avg.				
NY High				
CT/RI Avg.				
CT/RI High				
MA Avg.				
MA High				
NH/ME Avg.				
NH/ME High				

Key: 0-15% 15-30% 30-40% >40% did not sample

Geographic differences were also found. Potential bias associated with oversampling tournaments is greater in states north of Delaware. Oversampling tournaments is less prevalent in Maryland and Virginia, even though these two states host about one-fourth of the registered HMS tournaments in the LPS range. These geographic differences were likely due to a combination of factors including the size of tournaments, the relative degree of dispersion (or concentration) of non-tournament LPS fishing effort, and the LPIS target samples sizes in each state. In states where non-tournament LPS fishing activity is dispersed widely across many low pressure access sites, most interviewer assignments will yield very few (if any) interviews. If such a state also has several very large tournaments, some of which are randomly selected for sampling, the result could be a very large proportion of all LPIS interviews for that month coming from tournament trips. By contrast, in states where non-tournament LPS effort is concentrated into a few high pressure (high-use) sites, interviewer productivity (interviews per assignment) should be relatively high, even on non-tournament days. If a big tournament is selected in such a state, a potentially large number of interviews will be conducted. However, unlike in the dispersed effort state example, in a concentrated effort state the large number of tournament interviews should be balanced somewhat by reasonable productivity of non-tournament interviews. New Jersey is an example of a state with dispersed LPS effort and several very large HMS tournaments. While Maryland also has large HMS tournaments, LPS effort is more concentrated at a few very active sites, making it easier to obtain a lot of non-tournament interviews on a given assignment. Comparison between New Jersey and Maryland in the relative distribution of LPS fishing pressure across clusters and individual sites within a cluster is shown in Figure 5. A cluster consists of one or more sites that are grouped together for sampling. Interviewers are assigned a particular cluster to sample on an assignment. In this graph, pressure represents the expected number of LPIS interviews (private and charter combined) one can obtain from the cluster or individual site on an average weekend sampling day in July. In addition to lower pressures for both clusters and individual sites, there are more sites per cluster in New Jersey which means more time spent travelling between sites to get interviews.

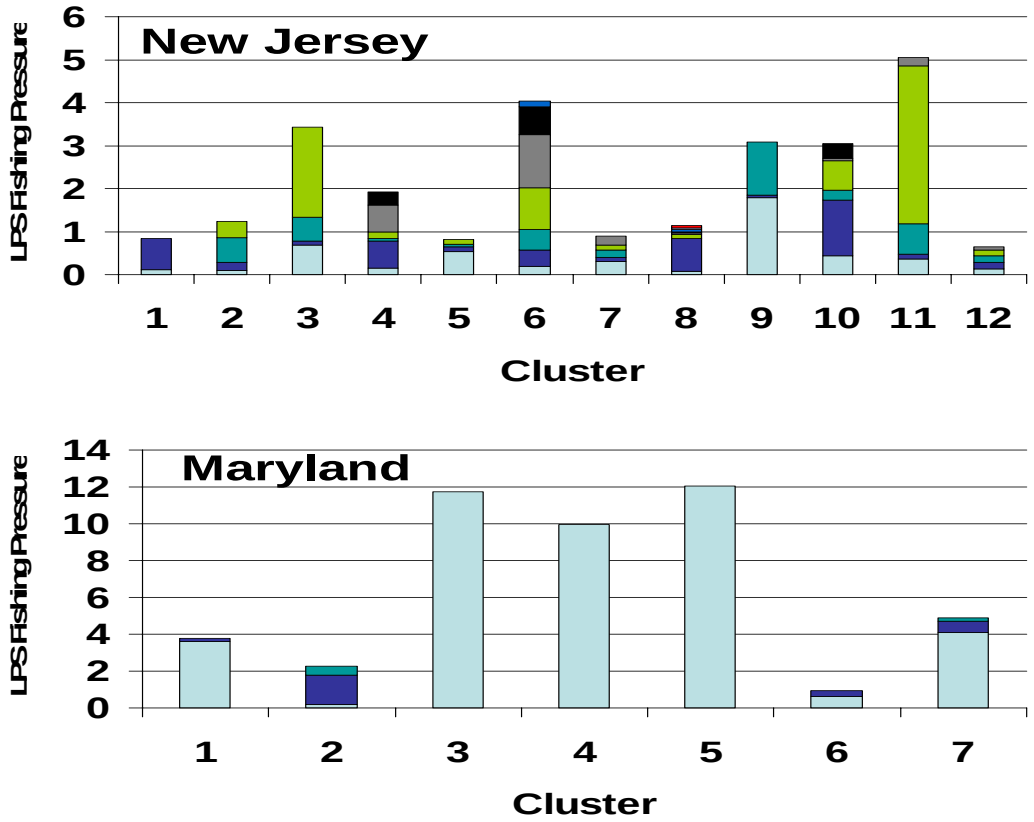


Figure 5. Comparison of New Jersey and Maryland Large Pelagics Intercept Survey site register fishing pressures by cluster and individual site. Pressures reflect average number of LPS trips (private and charter combined) returning to site on a typical July weekend day. Subdivisions within each bar represent the contribution of individual sites to total cluster pressure. Bars with no subdivisions indicate a single site cluster.

5. Data Collection Methods

For purposes of comparison and validation, HMS tournament data for this pilot study were collected using three different data collection approaches: 1) faxed or mailed tournament director reporting forms, 2) dockside face-to-face interviews with tournament participants, and 3) data posted on official tournament web sites. The methods used for each approach are described below in Section 6.1, 6.2, and 6.3.

5.1 Tournament Director Reports

As a starting point for creating an inventory of HMS fishing tournaments, all registered 2008 tournaments in the LPS range from Maine through Virginia were compiled into a spreadsheet. NOAA Fisheries compiled this list from the HMS Tournament Registration database. The following information was obtained from the registration database for each tournament:

- Tournament name
- Location (state, city)
- Start and end dates
- Operator name and phone number
- Whether or not it was a billfish tournament

The tournament registry database was downloaded weekly by NOAA Fisheries from June through the end of September. Any newly registered tournaments (from Maine through Virginia) for that week were added to the master spreadsheet. While most registered tournaments were discrete, short-term events generally lasting less than 10 days, a few were registered by sportfishing clubs as longer-term events (e.g., summer series or seasonal derbies). These longer-term events were not included on the master list, nor were they selected for data reporting.

The master spreadsheet was subsequently augmented with: 1) billfish tournaments identified by the Recreational Billfish Survey (RBS) program manager that had not appeared on the registration list; 2) tournaments previously identified in LPIS and LPTS datasets; 3) tournaments found on the Internet through advertisements and sports fishing websites; and 4) tournaments discovered via word of mouth from talking with operators of registered tournaments. For unregistered HMS tournaments that came to our attention, attempts were made to contact the organizers and remind/encourage them to register and provide them with information on how to do so. Unregistered tournaments were included in the

master spreadsheet and attempts were made to collect summary reporting forms from these tournaments as well. The master spreadsheet was also updated as needed to account for tournaments that were rescheduled or cancelled. Cancelled tournaments were difficult to keep track of as cancellation was often at short notice due to insufficient participants or bad weather.

Tournament operators for HMS tournaments listed on the master spreadsheet were asked to complete and return summary reporting forms. Two slightly different forms were used: one for RBS (billfish) tournaments (i.e., marlin, sailfish or swordfish is a target species) and one for non-billfish tournaments that was designed for this pilot study (**Appendix A**). The non-billfish form was designed to look as similar as possible to the RBS form for consistency since some tournament directors operate both billfish and non-billfish tournaments. The Recreational Billfish Survey, run out of the SEFSC, has been collecting summary reports from billfish tournament organizers since 1972. The current RBS program manager was a member of the project team and coordinated with other team members to avoid overlap and establish data sharing protocols. Data reported by tournament operators to the RBS were integrated with data collected specifically for this project prior to analysis. Operators of non-billfish HMS tournaments were asked to send their reports to the NOAA Fisheries Statistics Division in Silver Spring, Maryland. A notification letter was mailed to these operators (**Appendix B**) at least two weeks prior to the start of the tournament. Enclosed with this letter was the non-billfish tournament summary reporting form and samples of waterproof tuna identification guides and shark placards. Some tournaments registered very close to or after the start date for the competition and. for these events letters were mailed after the tournament was completed.

A few days before the start of the tournament, the operators were called by either the project leader or UMASS consultant (see **Appendix C** for the script used for these calls). The purpose of these calls was to:

- briefly explain the goals of the MRIP HMS tournament project,
- confirm receipt of the letter and summary form,
- verify they understand their reporting requirements,
- obtain additional information about the tournament such as estimated number of boats, location of official weigh station, types of data they collect (releases, non-tournament fish, vessel list, detailed vessel specific catch)
- offer to send additional fish identification materials to hand out at the captain's meeting

Most tournament operators were friendly and wanted to cooperate by providing summary data and allowing dockside sampling if their tournament was selected. Only a very small percentage refused to answer the questions at all. Some were difficult to contact on the phone in the days before the tournament when they were likely very busy making arrangements. It was interesting that many had trouble estimating the number of boats in the tournament, even up to the day before the captain's meeting. This suggests that many captains wait until the last minute to sign-up for tournaments, perhaps gauging the weather and fishing conditions before they commit. Over 700 waterproof shark and tuna guides were shipped to tournament operators upon request. These outreach materials likely increased tournament operator reporting cooperation rates.

Non-billfish tournament operators returned their reporting forms to NOAA Fisheries either by fax or mail, and receipt of forms was tracked in the communication spreadsheet. All forms were photocopied and originals were mailed to UMASS for data processing and error-checking. The UMASS consultant routinely monitored the return of forms and made follow-up phone calls to operators, as necessary, either to remind them to send their data forms in or to clarify any ambiguous or illegible information they provided. To avoid the 'embarrassment' factor, operators were sent an e-mail reminder about returning the summary form before a follow-up call. Most operators responded to the e-mail within 24 hours and explained their situation and gave an estimated mailing time for the results.

The Massachusetts Division of Marine Fisheries has collected catch and effort data from HMS tournaments since 1987 through the Massachusetts Sportfishing Tournament Monitoring Program (MSTMP). The MSTMP is an attempted census of all tournaments in the state targeting pelagic tunas, sharks and billfish. To avoid overlap and duplication of sampling efforts, this project did not attempt to collect data from Massachusetts tournament operators or captains. The MSTMP program manager is a member of the project team and agreed to share their data for this project. Data from the MSTMP, RBS and this project were integrated for analysis and comparison with LPS tournament data.

Data were entered into Microsoft Excel© and analyzed using SYSTAT© Software. Descriptive statistics and frequency tables were generated to summarize the majority of the data.

5.2 Dockside Sampling

Dockside sampling was conducted to collect catch data directly from captains participating in HMS tournaments. The project team worked collaboratively to develop a dockside interview questionnaire (**Appendix E**). In addition to detailed catch data by species (i.e., number kept, released alive/dead, reported to tournament, tagged), the dockside survey collected information on effort (hours fished), identifiers (vessel name, captain name, phone number, HMS permit number) and vessel overnight location. Overnight location was asked to try to estimate the proportion of vessels that are not kept at the official tournament marina during the tournament. This information could be important for designing a specialized tournament sampling program in the future. Vessels not kept at the tournament site that do not have catch to weigh-in are not likely to stop at the tournament site. This potential bias would need to be considered in the design of a dockside tournament sampling program.

For logistical reasons (i.e., budget and available personnel), only a subset of tournaments were selected for dockside sampling. The project team agreed that for purposes of sampling efficiency (i.e., interviews per assignment) and optimization we should focus our dockside sampling efforts on the larger tournaments. Tournament location was also taken into consideration as some attempt was made to distribute dockside sampling assignments across states. No tournaments were sampled dockside in Massachusetts since agency biologists attend most HMS tournaments in that state as part of the MSTMP. Due to a late start caused by funding delays, no dockside tournament sampling was conducted in June. Table 11 lists the five tournaments sampled along with the tournament fishing days, boats registered, and interviews obtained.

NOAA Fisheries checked for possible overlap with LPIS or LPBS dockside sampling assignment schedules. Both of these established surveys took precedence over the MRIP tournament pilot project and samplers were instructed to avoid sites where such overlap might occur. All sampled tournaments were multi-day events and there was always at least one day available for sampling. Overlap with Marine Recreational Fisheries Statistics Survey (MRFSS) was not an issue since this survey does not sample at official tournament locations.

Interviewers contacted tournament operators prior to the start date to request permission to interview at the tournament and get more information about tournament rules and logistics. Official tournament

web sites were also a good source of information in preparing for a dockside tournament assignment. Due to LPIS overlap, limited personnel, and scheduling conflicts, it was not possible to attend all days of a multi-day tournament. All tournaments were sampled on just one day, except the Ocean City Tuna Tournament and the Virginia Beach Invitational which were sampled for two days. Emphasis was placed on attending the last fishing day of a tournament whenever possible. By doing this interviewers could collect catch and effort information from prior tournament fishing days missed, as well as the current day's fishing trip. In some cases, captains that did not even fish the last day (i.e., lay day) but were still on site and could be interviewed about previous days fished. This strategy maximized the amount of information that could be collected on a single sampling day.

Initially interviewers were instructed to try to attend the captain's meeting which is typically held a day or two prior to the first fishing day. The project team agreed that this would be a good opportunity for the sampler to meet the tournament staff and many of the captains, and to explain the purpose of the project. However, no captain's meetings were actually attended due to limited resources and time constraints. Most of the operators gave permission over the phone for someone to attend their captain's meeting and this protocol is still considered beneficial for future dockside tournament sampling efforts.

All but one of the tournaments sampled dockside were covered by the UMASS consultant (a NOAA Fisheries biologist covered the Ocean City Tuna Tournament). Once on-site, interviewers notified the tournament official that they would be conducting interviews with captains and requested access to the area where tournament fish are weighed in. However, interviewers were instructed to also canvass the entire site and walk the docks looking for tournament vessels. Interviewing only at the official weigh station could bias the results towards only vessels with catch. Tournament operators were also asked to provide a list of all registered vessels in the tournament with contact information for follow-up surveys with captains (this component of the pilot study was eventually dropped). Operators were more willing to provide vessel lists to on-site interviewers than to someone making the same request over the phone. Some operators expressed concerns about releasing participants personal contact information but all were willing to provide vessel names, at a minimum. In most cases, vessel names could be matched to those on the HMS permit list to obtain contact information. This was more difficult for common vessel names that appear in the permit lists multiple times. Interviewers handed out waterproof tuna and shark identification guides to tournament operators and participating captains.

Table 11. HMS tournaments visited for pilot study dockside sampling in 2008.

Tournament	City	State	Fishing Days	Boats Registered	Interviews obtained*
Ocean City Tuna	Ocean City	MD	July 11-13	128	63
2008 Eastern Shore Marlin Club Billfish Release Tournament	Wachapreague	VA	July 24-28	22	22
Virginia Beach Invitational Marlin tournament 2008	Virginia Beach	VA	July 25-27	23	36
17th Annual Mid-Atlantic $500,000 2008	Cape May	NJ	August 17-22	141	11
Hamptons Offshore Invitational 2008	Hamptons	NY	August 15-24	72	56

(* Note that some captains were interviewed more than once over the course of the tournament)

A question was added to the 2009 LPIS to determine the number of tournament landed fish (by species) that were weighed-in at the official tournament weigh station. This question will help establish a baseline for estimating the number or relative proportion of tournament landed fish currently not included in director reports. Preliminary LPIS data from June through August were available for inclusion in this report. LPS estimated proportion of tournament landings that were weighed-in were compared with results from the pilot study dockside sampling. For landings and fish weighed-in, LPS tournament domain estimates were calculated by partitioning the full catch estimate into domain and non-domain components for each cell, each unique combination of area (VA, MD/DE, NJ, NY, CT/RI, MA, NH/ME), month, and boat type (private or charter). Partitioning was performed using the ratio of interviewed trips in the domain to the total number of interviewed trips in the cell. See section 7.1 for more details on the creation of tournament domain estimates.

5.3 Internet Data Gathering

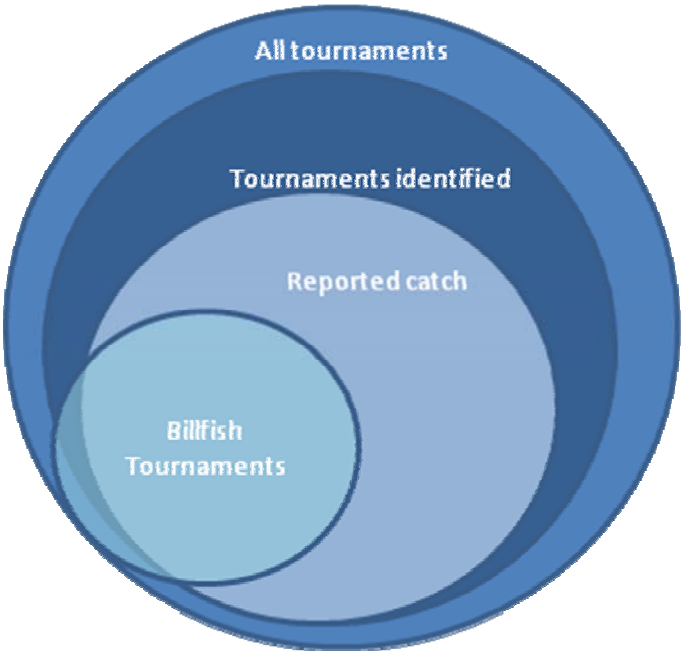
Many tournaments maintain official websites that are used to advertise the event, provide information on rules, and provide tournament results. Internet search engines were used initially to identify several HMS tournaments that were either not registered with NMFS or that registered late. Other useful Internet sources of information for identifying tournaments included recreational fishing sites, tourist sites, fishing blogs, and marina websites. When a new (unregistered) tournament was discovered it was added to the list and an attempt was made to verify details from at least two other sites. Advertised mail addresses and e-mail contact details were used to send out the introduction letter and summary reporting forms in advance of the tournament (in the same manner as described above for registered tournaments).

Tournaments websites were also explored as a supplementary source of catch and effort data. Some tournament websites included information that could be used to either validate data collected from other sources or to fill-in gaps for missing data. For each tournament with a website, data were collected on a number of information variables related to the summary form including name, date, location, number of boats, fishing hours, tournament regulations, catch data by boat/day/prizes, lay days, and target species. Each tournament was then given a 'usefulness' score based on the relative amount of information available.

6. Findings

6.1 Tournament Director Report Results

For the period June to October 2008, from Maine to Virginia, 88 HMS tournaments were identified (Appendix D). An additional seven tournaments were advertised and subsequently cancelled due to unsuitable weather or low turnout (a total of 95 planned tournaments for the year).



Of the 88 total tournaments, 63 (71.6%) registered with NOAA as an HMS tournament. Twenty-five out of an identified 33 billfish tournaments (68%) in the study area were included in the Recreational Billfish Survey.

Data were collected from 59 (67%) HMS tournaments (out of the possible 88 identified). Of these, 28 were registered billfish tournaments along with an additional 3 un-registered tournaments identifying billfish as their primary target.

The majority of HMS tournaments from Maine through Virginia are held in the summer months (June through August). Tournament director catch reports were representative of the seasonal distribution of tournaments in the study area (Table 4).

Table 4. Monthly distribution of 2008 HMS tournaments and tournaments reporting catch.

Month	Total number of tournaments	Percent	Tournaments reporting catch	Percent
June	**21**	**24**	**14**	**24**
July	**29**	**33**	**19**	**32**
August	**27**	**31**	**20**	**34**
September	**10**	**11**	**5**	**8**
October	**1**	**1**	**1**	**2**

The total number of tournaments that took place in each state and the number of tournaments reporting catch by state are shown in Table 5. New York hosted the most tournaments (21) in 2008 but also had the largest number of tournaments not reporting catch. Of those states with 5 or more tournaments, director reporting rates were highest in Maryland (92%) and Virginia (80%) and lowest in Rhode Island (40%) and New York (52%).

Table 5. Total number of 2008 HMS tournaments by state and the number of directors reporting catch for the attempted pilot census.

State	Catch reported	Total number of tournaments by state	Number of tournaments not reporting catch
CT	0	2	2
DE	0	1	1
RI	2	5	3
ME	4	6	2
MA	7	11	4
VA	8	10	2
NY	11	21	10
MD	12	13	1
NJ	15	20	5

One of the project aims was to categorize tournaments into logical groupings or strata that could be used in the design of future data collection approaches. Attributes used to characterize and potentially group tournaments for sampling were target species and measures of fishing effort including number of fishing days, number of boats entered, and total effort (boats entered x maximum allowable hours fished).

Tournaments in the different states were classified according to species groups targeted during 2008 (Figure 6). The majority of tournaments were categorized as "mixed" tournaments, meaning tournament prize categories existed for two or more species groups (e.g., tunas/billfish, tunas/sharks, tunas/sharks/billfish). Exceptions to this were New York which has a large number of tournaments targeting only sharks, as does New Jersey though to a lesser extent. A few tournaments focusing exclusively on tuna were held in Massachusetts, Maine, New Jersey and New York, and only one tournament focusing exclusively on billfish (in Maryland) was identified. Tuna and billfish are most often part of a mixed species group tournament where prizes are given for both groups.

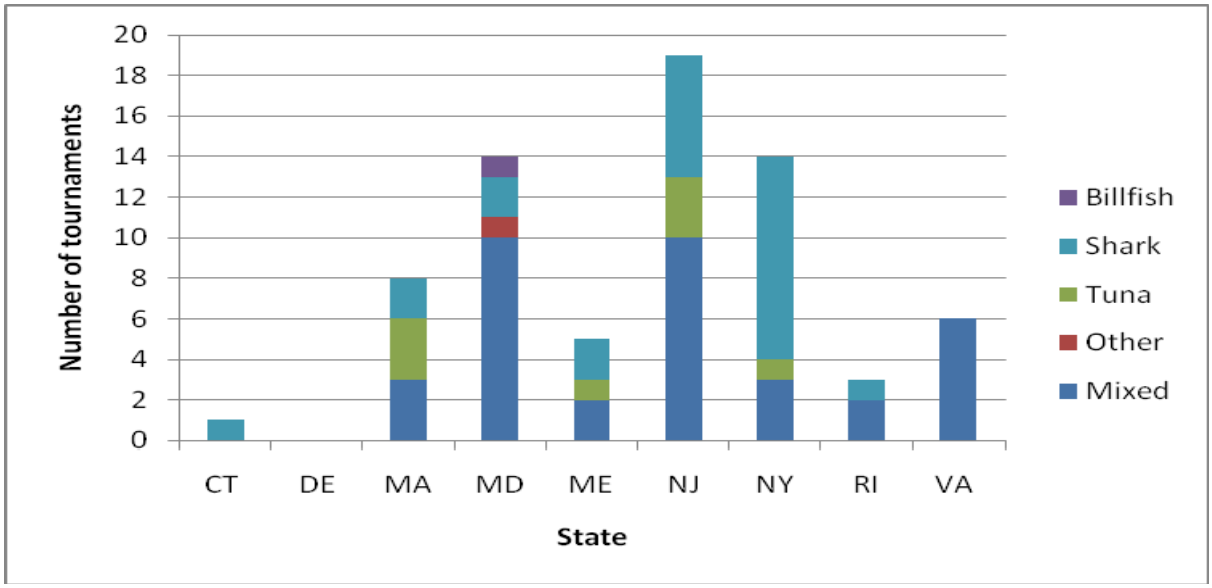


Figure 6. Number of tournaments in each state by target species group. Note: "Mixed" refers to tournaments targeting more than one of the species groups; "billfish" includes marlin, sailfish, spearfish and swordfish.

The percent of tournaments in each state that had each particular species/group as a target was also determined (Table 6). These percents do not add to 100% since, as noted above, many tournaments target more than one of these groups. Some large differences were found between states. For example, 85% of HMS tournaments in New York targeted sharks but only 1 out of 16 tournaments in Maryland and Virginia combined targeted sharks. Dolphin and wahoo were common target species for HMS tournaments in Maryland and Virginia but typically were not targeted in New York tournaments.

The percent of tournaments targeting each particular species group for all states combined was also calculated (Figure 7).

Table 6. The percent of tournaments in each state that targets each species/species group for prizes (of all tournaments we could find prize data on, n=60).

STATE	No. Tournaments in Sample	Percent Tunas	Percent Sharks	Percent Billfish	Percent Billfish release	Percent Dolphin	Percent Wahoo
CT	1	0	100	0	0	0	0
MA	7	43	29	29	29	29	29
MD	11	73	9	55	55	73	55
ME	3	67	67	33	0	0	0
NJ	17	65	53	47	47	53	18
NY	13	31	85	23	15	15	8
RI	3	67	67	67	67	67	33
VA	5	60	0	80	60	100	80

The percent of tournaments that had each particular species/group as a target was examined by month. Shark tournaments predominate in the Northeast region in June. In July and August a large majority of HMS tournaments target tunas and less than half target sharks. August is the peak month in terms of the number of tournaments targeting tunas and billfish in this region. These percents do not add to 100% since, as noted above, many tournaments target more than one of these groups.

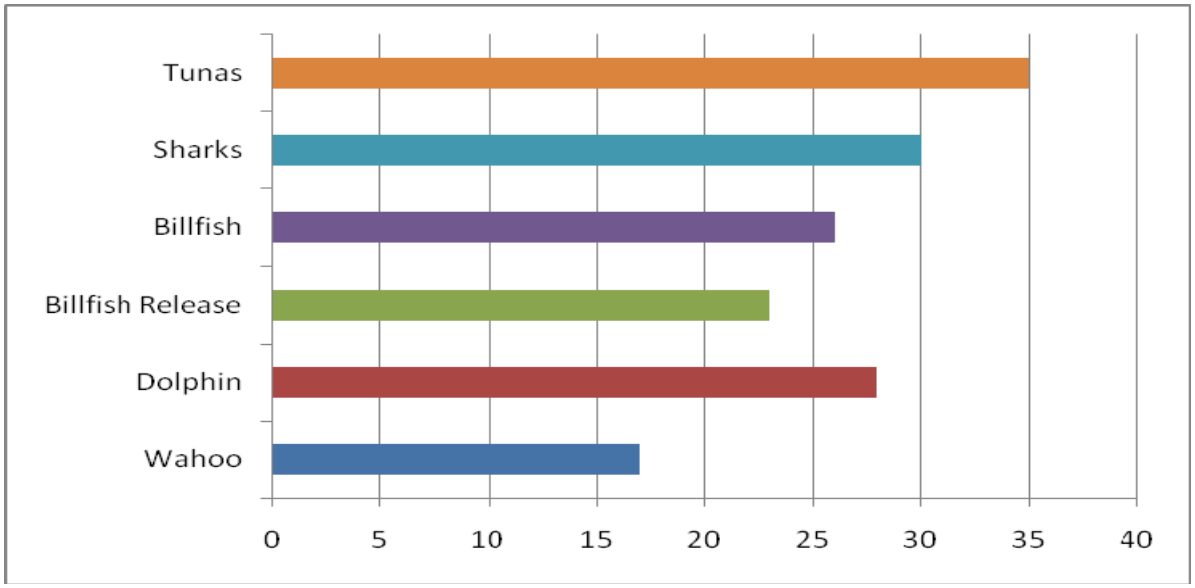


Figure 7. Percent of tournaments targeting each particular species with all states combined (n=60).

Table 7. The percent of tournaments in each month targeting each species/species group for prizes (of all tournaments we could find prize data on, n=60).

MONTH	No. Tournaments in Sample	Tunas	Sharks	Billfish	Billfish release category	Dolphin	Wahoo
JUNE	15	13	87	7	7	13	0
JULY	17	71	35	47	41	59	24
AUGUST	22	82	45	64	55	64	50
SEPTEMBER	5	60	0	60	60	40	40
OCTOBER	1	0	100	0	0	0	0

The number of boats taking part in a tournament is one indicator of fishing effort that could be used to categorize tournaments. The average tournament had about 61 boats, although the data were heavily skewed with a lot of smaller tournaments and only a few very large tournaments (Table 8, Figure 8). The median value of 34 boats per tournament may, therefore, be a more meaningful central measure.

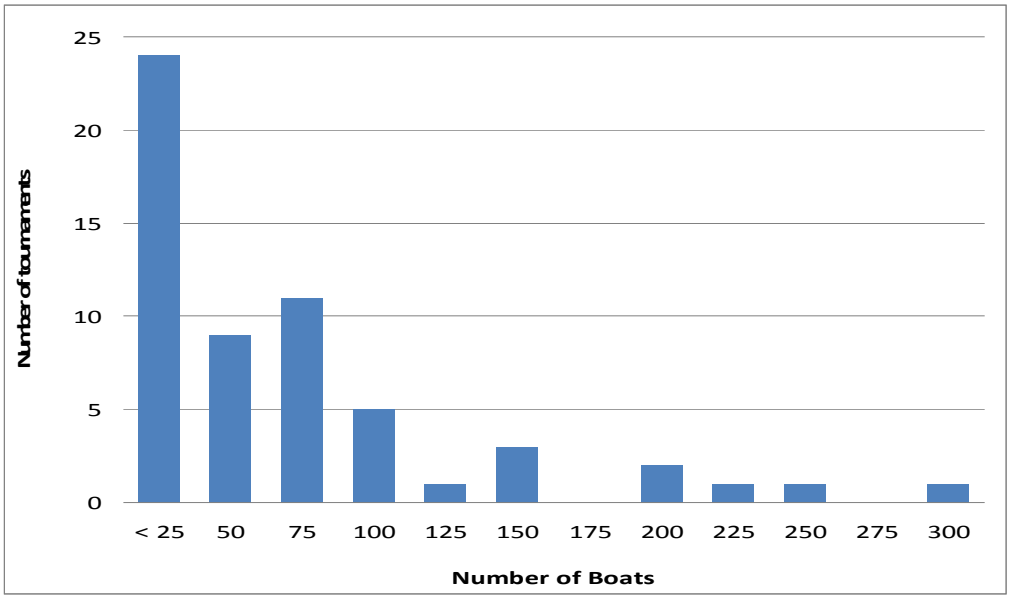


Figure 8. Frequency distribution of HMS tournament size (number of boats entered).

Table 8. Analysis of number of boats participating in HMS tournaments.

Number of boats	
N of Cases	**59**
Minimum	**3**
Maximum	**299**
Median	**34**
Arithmetic Mean	**60.9**
Standard Deviation	**63.5**

Another effort variable for categorizing tournaments is the number of allowed fishing days. The maximum number of days that could be fished by one boat over the course of the whole tournament (i.e. lay days are excluded) was obtained from director reporting forms and therefore only reflect those

59 tournaments that reported. The majority of tournaments allowed two fishing days, often with a third "lay" day scheduled in case of bad weather (Table 9). The mean number of allowable fishing days per tournament was 2.29. Only about 10% of tournaments allowed more than 3 fishing days.

Table 9. Maximum number of allowed fishing days in HMS tournaments.

Number of days	Frequency	Percent	Cumulative Percent
1	**12**	**20**	**20**
2	**32**	**54**	**74**
3	**9**	**15**	**89**
4	**4**	**6**	**96**
6	**1**	**2**	**98**
10	**1**	**2**	**100**

Overall maximum tournament effort, in terms of boat hours fished, was calculated by multiplying the number of registered boats by the maximum number of fishing hours allowed. The maximum total number of fishable hours per tournament was 24 hours. Fishing hours (for departure, return and weigh-ins) are clearly specified in the published rules of competition and were relatively easy to identify and confirm. Similar to the number of boats, total effort was heavily skewed with a lot of lower effort tournaments and a few very large effort tournaments (Figure 9). The median effort per HMS tournament was 792 hours fished (Table 10).

The average number of boats in a tournament for each fish group was calculated (Figure 10). Tournaments targeting sharks had the largest average number of boats (103), compared to billfish (70), tuna (50), and other (55).

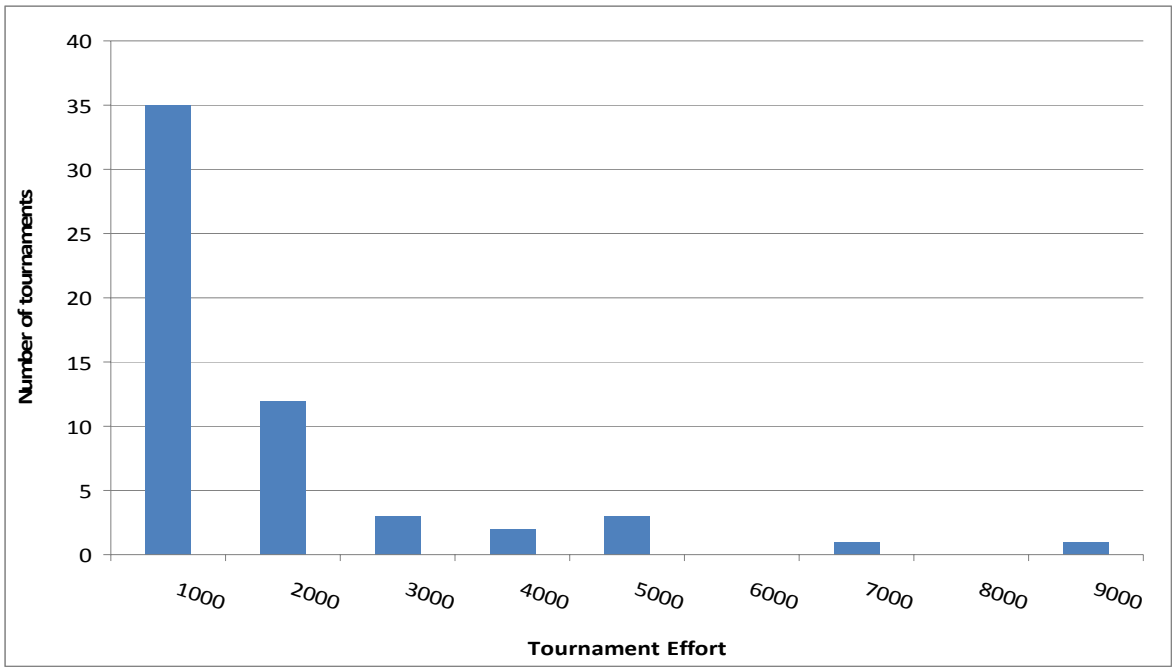


Figure 9. Frequency distribution of HMS tournament effort (hours fishing X number of boats).

Table 10. Analysis of HMS tournament effort.

EFFORT (HOURS FISHING X NUMBER OF BOATS)	
N of Cases	**57**
Minimum	**30**
Maximum	**8460**
Median	**792**
Arithmetic Mean	**1316**
Standard Deviation	**1626**

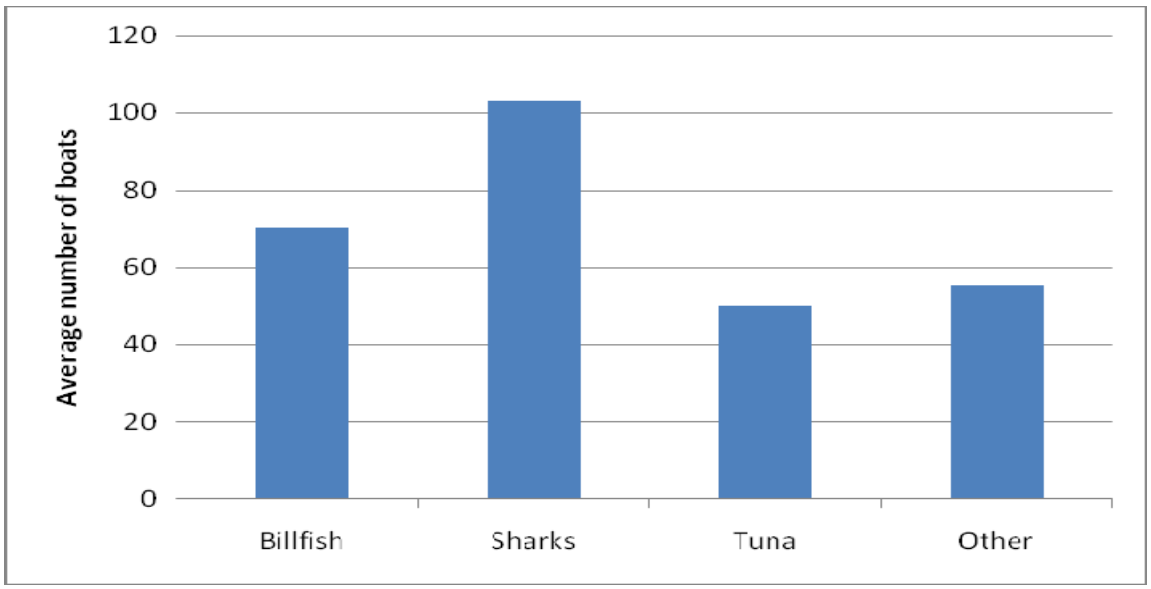


Figure 10. Average number of boats per tournament for each target fish group.

From the effort variables collected through the tournament director reports, an estimated maximum number of vessel trips targeting large pelagics in reporting tournaments was calculated as follows:

$$\text{Total maximum vessel trips} = \sum_{i}^{n} (b_i)(d_i)$$

where n = number of tournaments providing effort information (59)

b_i = number of boats in tournament i

d_i = number of allowable fishing days in tournament i

Based on the above formula, an estimated 7,731 vessel trips were taken in 59 reporting HMS tournaments from Maine through Virginia in 2008. This is an estimate of maximum vessel trips which is likely greater than actual vessel trips since it assumes that all registered boats fished the maximum number of allowable days in each tournament. By state, Maryland (26.5%) and New Jersey (26.0%) accounted for the largest proportion of reported tournament trips, followed by New York (18.8%; Table 11).

The tournament trip estimate above (7,731) only includes effort for the 59 tournaments that reported effort data, and thus the actual maximum number of tournament trips for all 88 identified tournaments

should be greater. An estimate of maximum effort for the 29 identified tournaments that effort data were not reported for was derived as follows:

Total maximum vessel trips = 29 (median number of boats) (average allowable fishing days)

= 29 (34.0) (2.29) = 2,257.9

The median was used as a more meaningful central measure for number of boats since the mean was heavily influenced by a few very large tournaments (Figure 8). This should also be considered a maximum estimate of effort since it is not confirmed that all of these non-reporting tournaments were actually held, or that they fished all days advertised. Combining the estimated trips for reporting tournaments (7,731) with the estimate for non-reporting tournaments (2,257.9) yields a total maximum vessel trip estimate for 2008 HMS tournaments (Maine through Virginia) of 9,988.9. Despite the caveats associated with this effort estimate, it does reflect the relative importance of tournaments to the HMS fisheries in the Northeast United States.

The number of fish kept and released alive by major species grouping shows a large majority of sharks (91%) and billfish (95%) reported by tournament directors were released alive, whereas tunas and others species (e.g., dolphin/wahoo) reported were almost always landed (Figure 11). The number of fish that were reported 'kept', 'released alive with a tag', 'released alive without a tag', and 'released dead' varied according to species (Table 12). There was no reported catch of swordfish, skipjack tuna, white shark, oceanic whitetip, night shark, silky shark, blacktip shark, bignose shark, or other species of shark, and thus are not included in the table.

Table 11. Estimated HMS tournament vessel trips in 2008 by state for reporting tournaments.

State	Vessel trips	Percent of total
ME	669	8.7
MA	858	11.1
RI	174	2.3
NY	1,454	18.8
NJ	2,009	26.0
MD	2,045	26.5
VA	522	6.8
All	7,731	100.0

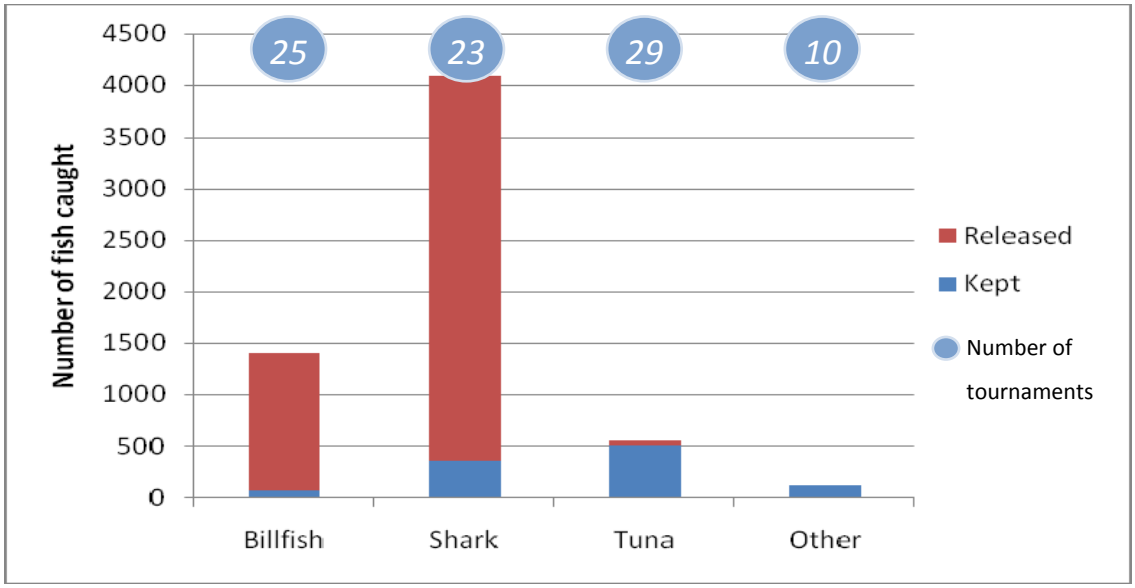


Figure 11. Number of tournament fish kept and released alive by major species grouping. Note: Number of tournaments catching at least one of these fish indicated in top circle.

Table 12. Number of fish by species that were reported by tournament directors as 'kept', 'released alive with a tag', 'released alive without a tag' , and 'released dead' in 2008 tournaments.

		Kept	Total released	Released alive tag	Released alive no tag	Released dead
Billfish	White Marlin	46	1240	3	1237	0
	Blue Marlin	6	86	1	85	0
	Sailfish	0	14	0	14	0
	Spearfish	0	3	0	3	0
Tuna	Albacore Tuna	9	0	0	0	0
	Bigeye Tuna	23	0	0	0	0
	Bluefin Tuna	258	38	1	37	0
	Skipjack Tuna	0	0	0	0	0
	Yellowfin Tuna	139	3	0	3	0
	Other Tuna	34	0	0	0	0
Other	Dolphin	125	0	0	0	0
	Wahoo	9	0	0	0	0
Shark	Blue Shark	60	3129	95	2952	0
	Brown Shark	0	5	0	5	0
	Common Thresher	64	60	0	59	1
	Dusky Shark	1	41	0	37	0
	Great hammerhead	2	2	0	2	0
	Longfin Mako	1	1	0	1	0
	Porbeagle	1	0	0	0	0
	Sandbar	2	49	0	46	0
	Scalloped Hammerhead	0	1	0	1	0
	Shortfin Mako	223	424	8	223	0
	Smooth Hammerhead	1	3	0	3	0
	Spinner Shark	0	12	0	12	0
	Tiger Shark	1	15	0	12	0
	Other Shark	0	1	0	0	0
	Hammerhead sp.	0	1	0	1	0

6.1.1 Tournament Summary Form: Suggested Improvements

The tournament summary catch form (Appendix A) filled out by tournament directors is a crucial part of the reporting process. The form needs to be easily understood, put a minimal burden on those reporting to encourage high response rates, include all of the information needed for management, and be designed to facilitate data entry. If there is any ambiguity over the form, the level of human error will likely increase, making the results less reliable. Several areas of confusion and suggested improvements were identified with the current form as part of this pilot study:

- It is difficult to tell whether 'total boats fishing' or 'boats fishing per day' was recorded by the director when only one number is shown.
- It is difficult to tell whether 'hours fished' recorded is hours fished per day or total fishable hours in the tournament.
- It would be more useful to ask for the total number of available fishing days and number of lay days (which would automatically exclude the captains meeting on the first day of a tournament).
- Tournament directors do not appear to intuitively separate the species into the groups shown.
- Some tournament directors do not recognize 'longfin' and 'shortfin' as mako species on the form and are writing in 'mako' at the bottom in the area for 'Other' species. The form should specify 'shortfin mako' and consider recording longfin mako under 'Other' to avoid confusion since this is a very rarely caught species.
- There is not enough space to record individual weights for each tournament fish weighed-in. Some directors interpret the 'size fish kept (lbs.)' column as a cumulative weight for all fish of that species, others interpret this as an average weight, or the largest fish weighed.
- May want to consider asking for fish length (if available), although this may be seen as a burden on some tournaments to collect information they typically don't record.
- Several directors were confused by the columns 'Number kept' and 'dead'. 'Dead' is underneath the super-column "number released" but this is not clear enough on the form and tournament directors who don't realize this put the number landed in the "dead" column. It was also not clear to tournament directors that 'total' is a sub-column under 'number released' as several mistook this for the total number of fish of that species caught (i.e., kept plus released).
- Data recorded in the 'alive tag' and 'alive no tag' fields are often inaccurate since many tournaments don't collect data on tagging. These column headings may also be confusing as some directors are not clear whether this refers to putting a tag on the fish or that they caught a

fish with a tag already present. Given the shortcomings with these fields, NMFS should consider removing them from the form. If tagging information is important for assessment purposes, other more accurate and reliable methods for collecting these data should be explored.

- Dusky and sandbar sharks were sometimes put under 'Other' or combined into one total. This is likely due to problems identifying these species and the various, often overlapping, local names given to these species (e.g., brown shark).
- Many tournaments did not identify tunas down to the species level – unspecified tuna species were recorded in the 'Other' column.
- Instructions state that billfish tournaments must submit radio logs or catch certificates containing detailed capture information including: tournament dates, fishing hours, name of each boat fishing that day, bait types and fight times for all billfish captured or released and weight, length, and sex of each billfish brought ashore. It appears that most billfish tournament directors are not submitting this detailed information. If this information is important for management and assessment purposes, NMFS should remind directors of their reporting requirements through targeted outreach efforts. If not, this requirement for detailed billfish capture information should be dropped.
- The form currently has a data row for 'spearfish' but does not specify what species of spearfish. Both longbill spearfish and roundscale spearfish should be specified on the form to avoid confusion.

Although some of these areas of confusion are explained in the instructions on page 2 of the form, it appears that many directors are not taking the time to carefully read these instructions. Some of the errors in filling out these forms could be reduced by working directly with directors to clarify instructions and address persistent problems. However, a well-designed form should be largely self-explanatory with minimal instructions written on the form itself, rather than on a second page that is often overlooked. Redesigning the summary catch form in collaboration with tournament directors and captains would lead to more reliable results and less room for error. As long as there is a clear contact point within NMFS, flexibility over how the information is received (e.g., mail, fax, email, posted on a website) might also increase response rates.

6.2 Dockside Sampling Results

A total of 188 HMS tournament trip interviews were conducted dockside with tournament vessel representatives (i.e., captains, mates or other identified proxy). For about 80% of these dockside surveys, respondents indicated they had caught fish during that trip. Of those trips with fish caught, 59% said they reported (or planned to report) at least one fish to the tournament from that day's trip. Over 80% of tunas (bluefin and BAYS) kept during tournament trips sampled were reported to the tournament and all (100%) of the sharks, billfish, and swordfish were reported (Table 13). Less than half (44%) of the dolphin kept during tournament trips sampled were reported to the tournament. Fish released alive were generally not reported for any of the tournaments sampled. The only exception was the Eastern Shore Marlin Club Billfish Release Tournament which gives prizes for marlin release points. All blue and white marlin releases in this tournament were radioed in to the tournament director. These results suggest that data from tournament director summary reports underestimate landings of dolphin and, perhaps to a lesser extent, landings of tunas. Summary reports may also severely underestimate the number of HMS (all species) released alive during tournament trips as many of these fish are not reported by captains. By contrast, tournament landings of sharks, billfish, and swordfish based on director's summary reports appear to be more complete.

Anecdotally, it would appear that a greater proportion of tournament caught fish are not reported in large tournament events where captains are less likely to weigh a fish not eligible for prizes compared to smaller events. This is likely due to the added hassle factor of getting to a crowded weigh station as all the boats rush in before the cut-off time at the end of each day. With smaller HMS tournaments there is less pressure to use the weigh station and more fish are likely to be weighed and recorded out of curiosity, even if the fish is not prize worthy.

Only 6% of dockside respondents indicated that their vessel would not be kept at the official tournament marina location overnight. However, this statistic does not tell us how many interviews were missed either because boats without catch to report returned to a satellite location rather than the tournament location or because access to interviewing at the weigh station was restricted. Permission to interview at the weigh station varied by tournament and was not granted by all directors. For the two smaller tournaments sampled (Eastern Shore Marlin and Virginia Beach Invitational) a complete census of registered boats was obtained. For both of these tournaments over 90% of the captains indicated that their vessel was kept at the tournament site. For the larger tournaments

sampled it is very likely that a greater proportion of interviews were missed by boats not returning to the tournament site. For example, sampling two out of three fishing days at the official tournament site of the Ocean City Tuna Tournament (i.e., O.C. Fishing Center) resulted in interviews with representatives from only 34 vessels out of a total of 128 registered vessels. Several of the same 34 vessel representatives were interviewed on both days while the majority were not interviewed at all.

Table 13. Total number of fish kept, released and reported to the tournament by species for all pilot study dockside sampling interviews conducted.

Species	Kept	Reported of kept	Percent reported	Released alive	Reported of released alive	Percent reported
Bluefin tuna (school, large school, or small medium)	38	31	82%	75	0	0%
BAYS tunas (bigeye, albacore, yellowfin, and skipjack)	33	27	82%	8	0	0%
Billfish (white marlin, blue marlin, sailfish)/ swordfish	10	10	100%	75	17	23%
Dolphin	117	51	44%	5	0	0%
Wahoo	14	11	79%	0	0	---
Shortfin mako shark	4	4	100%	1	0	0%

6.2.1 LPIS Percent Weighed-in

Starting in 2009, LPIS interviewers were instructed to ask captains the following question for all fish kept in tournaments: *How many of those that were kept were weighed-in at the tournament weigh station?* Preliminary LPIS results from June through August were compared with the results shown in Table 13 for fish kept during tournaments. For most species, the LPS estimated proportion of tournament landed fish that were weighed-in was smaller than the proportion from the pilot study. The June-August 2009 LPS tournament domain estimate for recreational bluefin tuna (i.e., school, large school, or small

medium) is 966 fish, of which an estimated 645 (67%) were weighed-in. The combined tournament domain estimate for BAYS tunas is 4,966, of which an estimated 2,398 (48%) were weighed-in. The LPS estimated proportion of dolphin weighed-in out of those landed in tournaments was 19% (1,580 weighed-in out of 8,192). The combined tournament domain estimate for sharks (thresher, shortfin mako, and blue) is 2,257, of which an estimated 1,785 (79%) were weighed-in. Although LPIS sample sizes for kept marlin were too small for meaningful analysis, only 3 out of 8 marlin landed in tournaments were reported as weighed-in.

6.3 Internet Data Results

Out of 89 identified HMS tournaments in 2008 from Maine through Virginia, 83 (93%) had some information posted on the Internet. Twenty-nine tournaments had websites that could be subjectively described as having either 'good' or 'detailed' information (Table 14).

Table 14. Characterization of HMS tournament web sites based on the availability of useful information for monitoring catch and effort.

Description	Frequency	Percent
No to very little information	24	27
Little information	36	40
Good information	21	24
Detailed information	8	9

An analysis of the specific types of information available on HMS tournament websites was also conducted (Table 15). Most commonly, tournaments would appear in advertisements with details on the rules of participation. Catch data concentrated primarily on scoreboards for prize winning fish rather than the more useful overall catch totals. There were 10 tournaments which appeared to provide enough detailed information on their websites to fill in the director summary form: Annual Ocean City Shark Tournament; Ocean City Tuna Tournament; Hamptons Offshore Invitational; White Marlin Open; 30th Annual Challenge Cup; Virginia Beach Sport Fishing Bluewater Classic; Wine, Women and Fishing;

Virginia Beach Billfish Tournament; Mid Atlantic $500,000; and Star Island Yacht Club Mako-Thresher Tournament.

Table 15. Number and proportion of HMS tournament web sites containing particular types of information (N=83 tournaments with some web information).

Information variable	Number of websites with the variable available	% of websites
Entry rules	**47**	**57**
Hours fished	**45**	**54**
Prize results	**44**	**53**
Number of fishing days	**44**	**53**
Results	**42**	**51**
Fish weights	**41**	**49**
Number of boats	**28**	**34**
Individual fish by species	**19**	**23**
Releases	**13**	**16**
Vessel list	**10**	**12**
Fish by boat	**7**	**8**
Tagged fish	**0**	**0**

7. Comparison of Tournament Director Reports with LPS Tournaments Estimates

7.1 Methods

Comparisons of 2008 total landings and total releases for select species were made between LPS tournament domain estimates and tournament director reports. Only tournaments that were represented in both the LPIS and director reports were included in the comparisons. Of the 59 tournaments with director reports, 44 were also represented in LPIS data (see **Appendix E**). There were 22 additional tournaments (many non-HMS) represented in the LPIS data that had no corresponding director's report and were not included in the comparisons.

For landings and releases, LPS tournament domain estimates were calculated by partitioning the full catch estimate into domain and non-domain components for each cell, each unique combination of area (VA, MD/DE, NJ, NY, CT/RI, MA, NH/ME), month, and boat type (private or charter). Partitioning was performed using the ratio of interviewed trips in the domain to the total number of interviewed trips in the cell:

$$y_t = y * \frac{n_t}{n}$$

where y is the full LPS catch estimate at the cell level,

y_t is the partitioned tournament domain catch estimate at the cell level,

n_t is the count of interviewed trips at the cell level in the tournament domain,

n is the total count of interviewed trips at the cell level.

Cell level LPS domain catch estimates were summed over all areas, months, and boat types to calculate total catch estimates for 2008:

$$\hat{Y}_t = \sum_a \sum_m \sum_b y_t$$

where y_t is the partitioned tournament catch estimate at the cell level that is summed over

a areas (VA, MD/DE, NJ, NY, CT/RI, MA, NH/ME),

m months (June, July – October),

b boat types (private, charter),

$\hat{Y}_t$ is the total tournament domain catch estimate for 2008.

Crude confidence limits for the tournament domain catch estimates were approximated using partitioned variance and a conservative critical *t* value:

$$\mathrm{var}(\hat{Y}_t) = \sum_a \sum_m \sum_b \mathrm{var}\left[y * \left(\frac{n_t}{n} \right) \right]$$

$$LCL = \hat{Y}_t - 2.228 * \sqrt{\mathrm{var}(\hat{Y}_t)}$$

$$UCL = \hat{Y}_t + 2.228 * \sqrt{\mathrm{var}(\hat{Y}_t)}$$

where $\mathrm{var}(\hat{Y}_t)$ is the variance of the total tournament catch estimate for 2008,

var(*y*) is the variance of the full catch estimate at the cell level,

LCL is the lower confidence limit for the total tournament catch estimate,

UCL is the upper confidence limit for the total tournament catch estimate,

2.228 is the critical *t* value for alpha of 0.05 (two tail) and 10 degrees of freedom.

Corresponding totals were calculated from director's reports by summing landings and releases over the 44 reports for each species.

7.2 Results

The LPIS included interview data from 68 tournaments in 2008. Sixteen of these tournaments were newly identified through the LPIS and added to the master tournament spreadsheet. Figure 12 below shows all tournaments for which data on number of boats was available arranged by number of boats participating (from least to most). The graph is color-coded with the tan bars representing tournaments

not sampled by LPIS interviewers in 2008 and the blue bars representing tournaments with at least one LPIS interview conducted. In general, the smaller tournaments with fewer registered boats were less likely to be sampled through LPIS than the larger tournaments. Of those tournaments with more than 30 registered boats, only 2 were not sampled by the LPIS. This suggests that LPIS tournament data may be over-representing large HMS tournaments and under-representing smaller tournaments. However, if a small tournament is sampled, it is likely that a greater proportion of the tournament trips will be sampled, compared to a large tournament, since: 1) boats fishing in a small tournament are more likely to dock at the official tournament site; and 2) fewer interviews will be missed at a small tournament.

Comparisons of resulting catch totals indicated a systematic difference between director reports and LPS domain estimates. For all species, LPS tournament domain estimates of total landings and total releases were larger than corresponding totals from director reports (Table 16, Figures 13 & 14). The magnitude of these differences varied by species and by catch disposition. Blue shark releases and dolphin landings showed the greatest differences. Differences in landings estimates were also large for yellowfin tuna, bluefin tuna, and shortfin mako. Although director report totals fell within the LPS tournament domain estimate 95% confidence interval in about half of the comparisons, this was largely due to the imprecision of the LPS estimates for several species. Lower confidence limits were zero for five landings estimates and five release estimates and, in these cases, director report totals were usually near the lower end of these confidence intervals.

While differences were large in general, comparisons for blue and white marlin were somewhat closer. White marlin landings and releases estimates and report totals were surprisingly close. LPS point estimates were larger for both landings and releases, but report totals fell well within estimate confidence intervals (Figures 13 and 14, panel c) and were greater than 75% of the corresponding estimates. Blue marlin comparisons were not as close, but report totals for landings were still slightly greater than 50% of the LPS estimate, the highest percentage after white marlin.

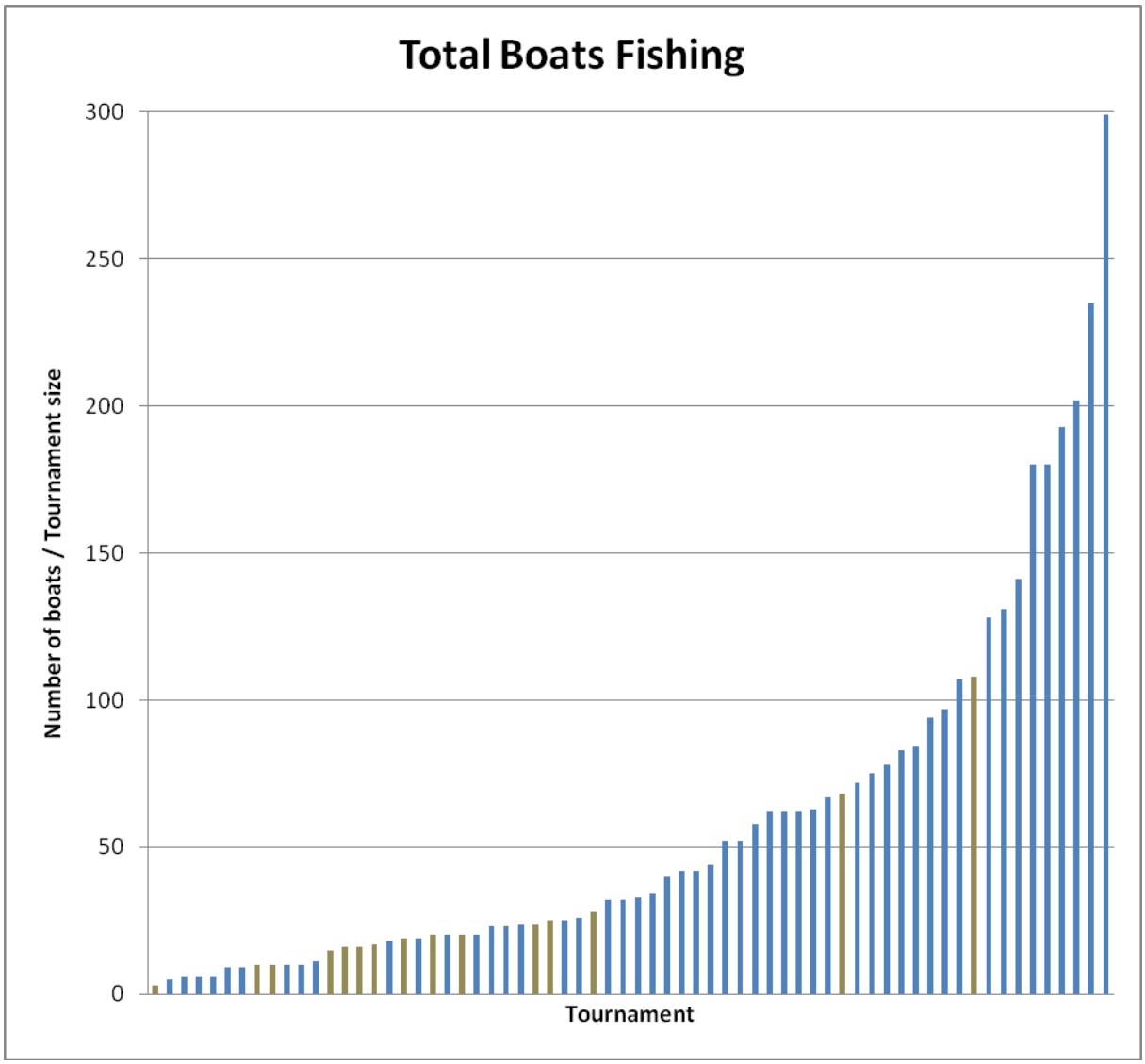


Figure 12. Tournaments arranged by number of boats participating (from least to most). Tan bars represent tournaments not sampled by LPIS interviewers in 2008. Blue bars represent tournaments with at least one LPIS interview conducted.

LPS tournament domain landings estimates were very imprecise for several species including blue and white marlin, swordfish, albacore, skipjack, and bigeye tuna. Given the poor precision, it was not possible to make definitive inferences about the differences between LPS estimates and totals from tournament director reports for all species. LPS samples sizes would have to increase considerably, by a factor of four or more in most cases, to achieve precision needed for reasonable comparisons. Although definitive inferences could not be made, it should be noted that one factor likely contributing to the

systematic difference between LPS tournament domain estimates and totals from tournament director reports was the inability to identify reported, or weighed-in, fish in LPS catch data. In LPS dockside sampling, numbers of landed or released fish were recorded with no distinction as to tournament reporting. As such, the LPS domain estimates, landings and releases, would include both reported and unreported catch for tournament target, prize, species, as well as any non-target species. For species that were rarely caught or commonly reported, potential differences would be minimal, which could partly explain the relatively small differences for white marlin, despite the lack of precision in LPS estimates. Conversely, differences would tend to increase for species frequently caught and not reported. This relationship could account for some portion of the large differences seen in dolphin landings and blue shark releases.

Another consideration in the systematic difference is the possibility of positive catch bias in LPS dockside sampling. As the LPS was not designed to provide estimates for tournaments, it is possible that unknown biases, including positive catch, exist in the tournament domain estimates. However, it would only be possible to fully evaluate a positive catch bias if complete catch data were available from all boats participating in the HMS tournaments. At this time, boat level data are only available from a small subset of HMS tournaments located, primarily, in Massachusetts.

Table 16. 2008 total landings and total releases from director reports and LPS tournament domain estimates.

Species	Director Reports				LPS Tournament Domain Estimates							
	Landed	% of LPS	Released	% of LPS	Landed	PSE	LCL Landed	UCL Landed	Released	PSE	LCL Released	UCL Released
bluefin tuna	227	18.7	20	2.1	1215.6	16.4	770.2	1660.9	957.0	42.4	53.6	1860.3
bigeye tuna	15	10	0		149.4	44.2	2.4	296.4	0		0	0
Albacore tuna	5	6.5	0	0	76.8	142.7	0	321.0	4.9	150.6	0	21.5
yellowfin tuna	142	4.6	3	0.2	3114.8	21.7	1606.6	4623.0	1500.7	37.8	237.3	2764.2
Skipjack tuna	0	0	0	0	250.7	58.4	0	576.8	881.3	46	0	1784.4
blue shark	57	2.2	2842	16.7	255.2	28.7	92.3	418.1	16993.6	17.7	10289.1	23698.2
com. thresher	57	19.9	60	26.2	286.2	28.3	105.9	466.5	228.8	82.2	0	647.9
shortfin mako	188	23.6	402	43.3	798.2	17.9	480.5	1115.9	929.1	21.9	475.1	1383.2
blue marlin	6	52.1	79	33.2	11.5	137.5	0	46.8	238.3	40.4	23.8	452.8
white marlin	46	76.1	1165	79	60.5	84.1	0	173.7	1473.8	25.9	623.9	2323.8
swordfish	0	0	0	0	51.6	72.1	0	134.4	97.7	72	0	254.5
Dolphin	119	1.3	0	0	9359.2	23.1	4549.0	14169.4	925.9	43.4	30.4	1821.5
Wahoo	9	5.4	0	0	167.1	34.7	37.81	296.4	14.2	112.7	0	49.9

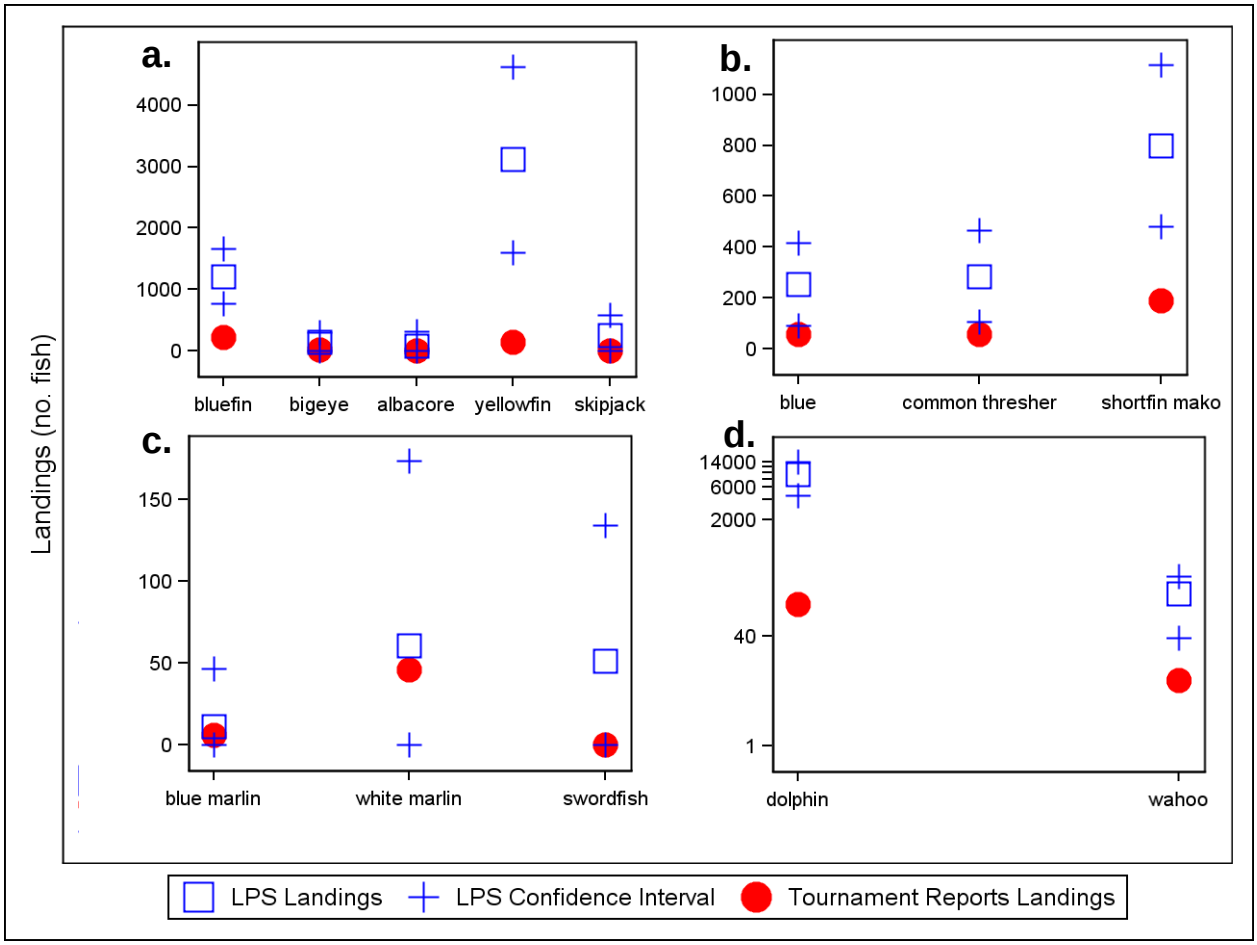


Figure 13. 2008 Total Landings in numbers from Tournament Director Reports and LPS Tournament Domain Estimates by species groups: a) Tunas, b) Sharks, c) Billfish/Swordfish, d) Other Large Pelagic Species (Note: Landings of Other (d) are plotted on log scale due to the LPS estimate and confidence interval for dolphin).

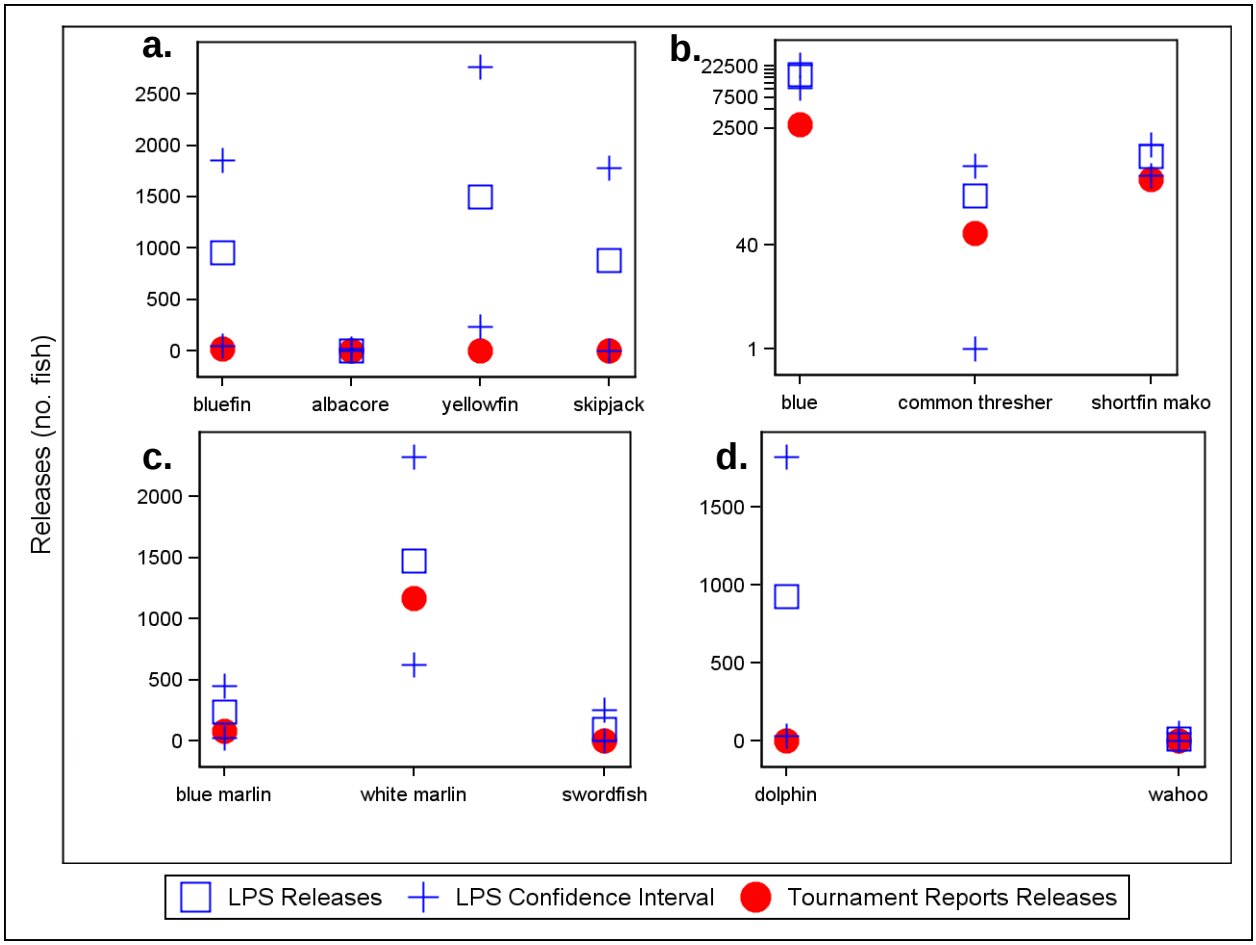


Figure 14. 2008 Total Releases in numbers from Tournament Director Reports and LPS Tournament Domain Estimates by species groups: a) Tunas, b) Sharks, c) Billfish/Swordfish, d) Other Large Pelagic Species (Note: Releases for Sharks (b) is plotted on log scale due to the LPS estimate and confidence interval for blue sharks).

8. LPIS Tournament Sampling Sensitivity Analysis

8.1 Methods

To explore the effects of potential over-representation of tournaments in LPIS data, LPS total catch estimates (landings and releases) were calculated by year, 2006-2008, with all tournament trips down-weighted by fixed percentages. In separate estimation runs tournament trips were down-weighted by 0 (base case), 5, 15, 25, and 50 percent. Selected percentages were based on the range of percent differences between LPIS and LPTS tournament trip proportions of total trips (as described in Section 5 of this report).

Re-weighting was done at the survey cell level, that is for each unique combination of month, area (VA, MD/DE, NJ, NY, CT/RI, MA, NH/ME), and boat type (private, charter) in a single year. Starting from an initial weight of 1, all tournament trips were down-weighted by the fixed percentage. For example, in the 5% case, the tournament weight would decrease from 1 to 0.95. In addition to down-weighting the LPIS tournament trips, the non-tournament trips were correspondingly up-weighted such that the sum of weights for all trips equalled the observed LPIS cell sample size. The non-tournament trip weights increased by an amount that varied based on the difference in numbers of tournament and non-tournament trips in a given cell. In a cell with equal numbers of tournament and non-tournament trips, the up-weighting would be the same percentage, so in the 5% case, non-tournament trip weight would change from 1 to 1.05. In cells with different numbers of tournament and non-tournament trips, non-tournament trips weights were calculated as

$$w_{nt} = 1 + \frac{p * n_t}{n_{nt}}$$

where w_{nt} is the weight for non-tournament trips at the cell level,

p is the re-weighting percentage (as a proportion 0, 0.05, 0.15, 0.25, 0.50),

n_t is the number of tournament trips in the cell,

n_{nt} is the number of non-tournament trips in the cell.

The new weights were incorporated in two separate cell level calculations: mean catch rate by species and off-frame effort expansion factors. Weighted mean catch rates were calculated using the general formula:

$$\bar{y} = \frac{\sum_{i=1}^{n} y_i w_i}{\sum_{i=1}^{n} w_i}$$

where $\bar{y}$ is the weighted mean catch rate at the cell level,

n is the number of LPIS intercepted trips in the cell,

y_i is the catch, in numbers, for trip i,

w_i is the weight for trip i.

Mean catch rates were calculated for select species based on management priority and estimate usage. Catch rates for landings were calculated for Atlantic bluefin, yellowfin, albacore, and skipjack tunas, shortfin mako, common thresher, and blue sharks, and dolphin. Mean catch rates for releases were calculated for shortfin mako and blue sharks, and blue and white marlins.

Off-frame effort expansion factors adjusted on-frame effort calculated from the LPTS to account for trips taken by un-permitted vessels and permitted vessels fishing out of their principal port state. The weights were incorporated into the expansion factor using the formula:

$$x = \frac{\sum_{i=1}^{n} w_i}{\sum_{i=1}^{n} I_i w_i}$$

where x is the weighted effort expansion factor for the cell,

I_i is an indicator variable, 1 if trip i is on-frame, 0 otherwise.

Total catch was calculated for each year by summing over all cell level catch estimates:

$$\hat{y} = \sum \left(t * x * \bar{y} \right)$$

where t is the cell level on-frame effort estimate, in vessel trips, from LPTS,

$\hat{y}$ is the total catch estimate in a given year.

8.2 Results

Results for landed fish were generally consistent over the three years, 2006-2008. Estimates for tunas tended to increase with increased tournament trip down-weighting (Figures 15 & 16). By contrast, shark landings generally decreased markedly with increased down-weighting (Figure 17). For many species, however, changes were minimal, less than 5% even when applying the 25% down-weighting of tournament trips, and fell well within the confidence interval of the corresponding LPS estimate.

Estimates of bluefin tuna landings in the angling size classes (school, large school, and small medium) were robust to LPIS tournament trip down-weighting. In only one case out of thirty-six (i.e., 2006 large school at 50% down-weighting), did a percent change exceed 10%. At 25% down-weighting, which exceeded all annual differences in LPIS and LPTS tournament trip percentages from 2006-2008, no cases exceeded 10% and only one case (i.e., 2006 large school) exceeded 5% change from the LPS estimate. Further, all cases were well within the confidence intervals for the corresponding LPS landings estimate. While all changes were minimal and not significantly different from the LPS estimate, they were consistently positive, excluding 2007 small medium cases, suggesting a weak inverse relationship between disproportionate tournament sampling in the LPIS and LPS bluefin landings estimates.

Like bluefin, landings estimates for the BAYS tunas (bigeye, albacore, yellowfin, and skipjack) and dolphin were generally robust to down-weighting. Percent changes from the LPS estimates did not exceed 10% until tournament trips were down-weighted by 50%, and then in only three cases (Figure 16). At 25% down-weighting, most changes did not exceed 5% and none exceeded 9%. Dolphin landings were exceptionally robust to tournament down-weighting, with percent changes not exceeding 3% in any case including those with 50% down-weighting. For bigeye and albacore tunas, changes were positive in some years and negative in others suggesting little to no systematic temporal trend between their estimates and disproportionate tournament sampling. For yellowfin tuna, skipjack tuna, and dolphin, changes were consistently positive suggesting a weak inverse relationship between possible tournament trip oversampling and their LPS landings estimates. However, percent differences were generally minimal and all were well within the corresponding LPS estimate confidence interval.

Landings estimates for blue, common thresher, and shortfin mako sharks were very sensitive to tournament trip down-weighting compared to the tunas. Twenty-one of thirty-six cases exceeded a 10% change, including five cases where tournament trips were down-weighted by just 15% (Figure 17). At 25% down-weighting, all but one case exceeded 10% and almost half exceeded a 20% change from the corresponding LPS estimate. At 50% down-weighting, percent changes fell outside of the LPS landings estimate confidence intervals in most cases. Blue

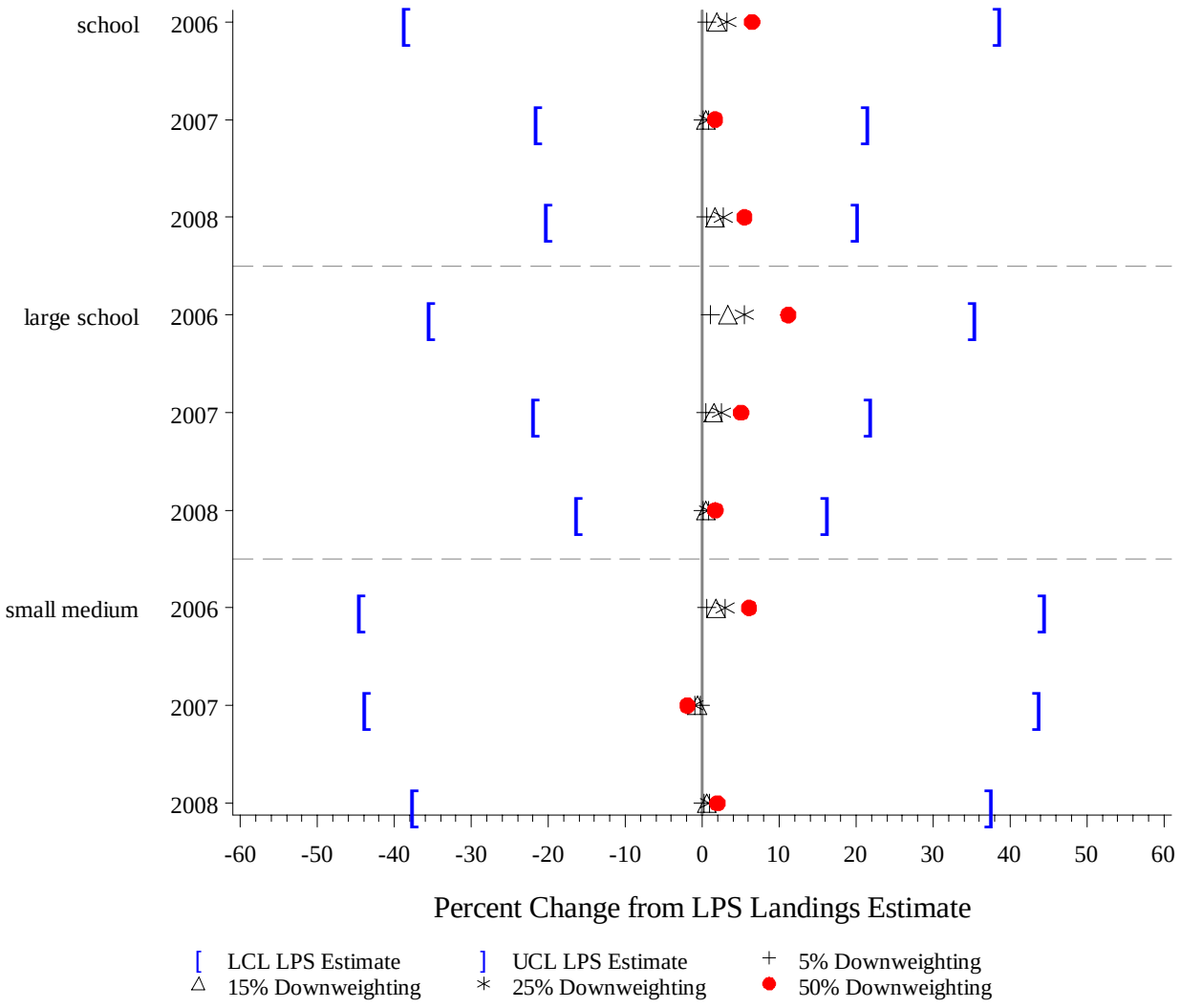


Figure 15. Bluefin tuna (School, Large School, Small Medium) landings estimates calculated at 5, 15, 25, and 50 percent down weighting of tournament trips, expressed as percent change from the corresponding LPS landings estimate, 2006-2008. Ninety-five percent confidence intervals (LCL, UCL) are given for the LPS landings estimates.

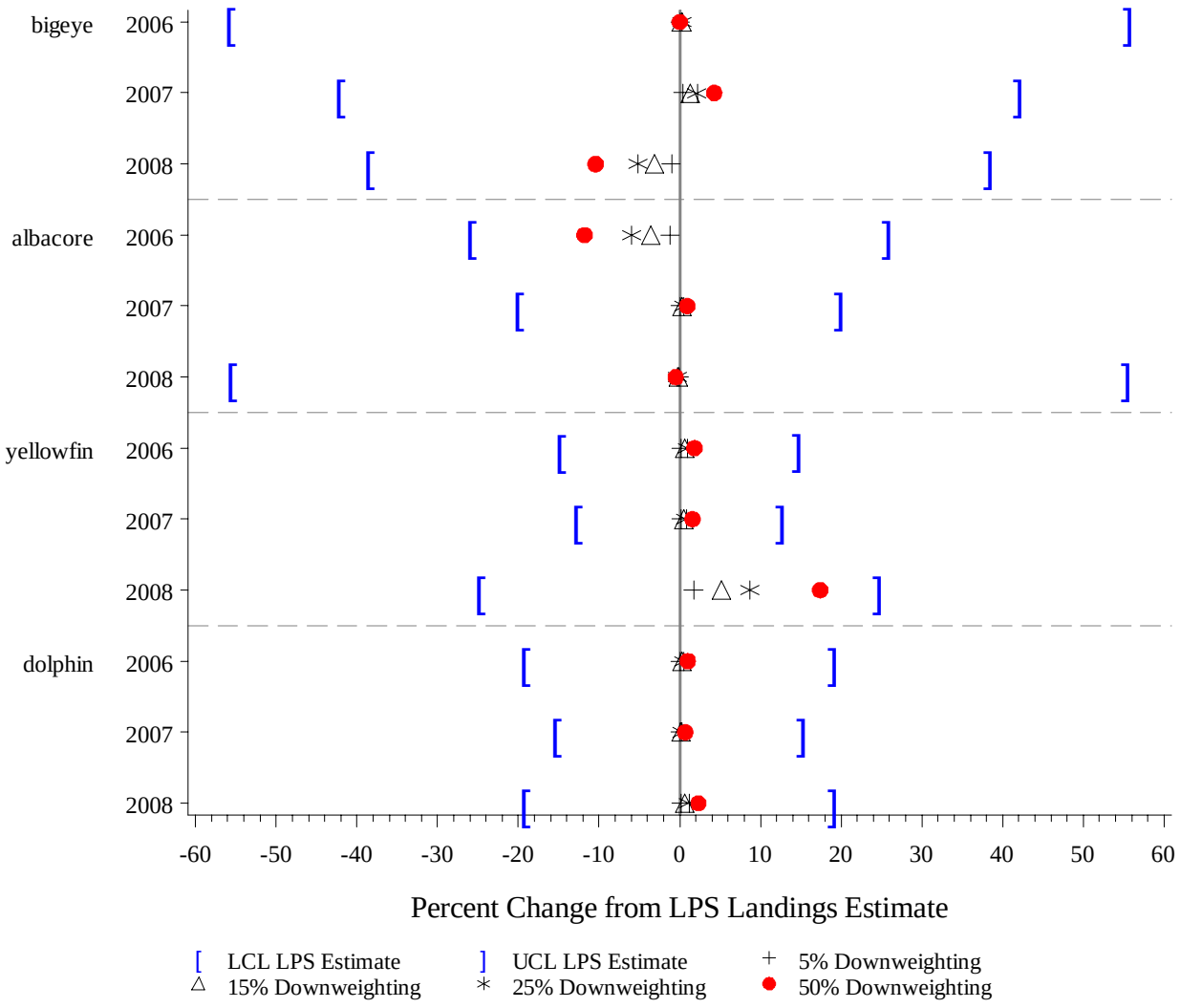


Figure 16. Bigeye, albacore, yellowfin, skipjack tuna and dolphin landings estimates calculated at 5, 15, 25, and 50 percent down weighting of tournament trips, expressed as percent change from the corresponding LPS landings estimate, 2006-2008. Ninety-five percent confidence intervals (LCL, UCL) are given for the LPS landings estimates.

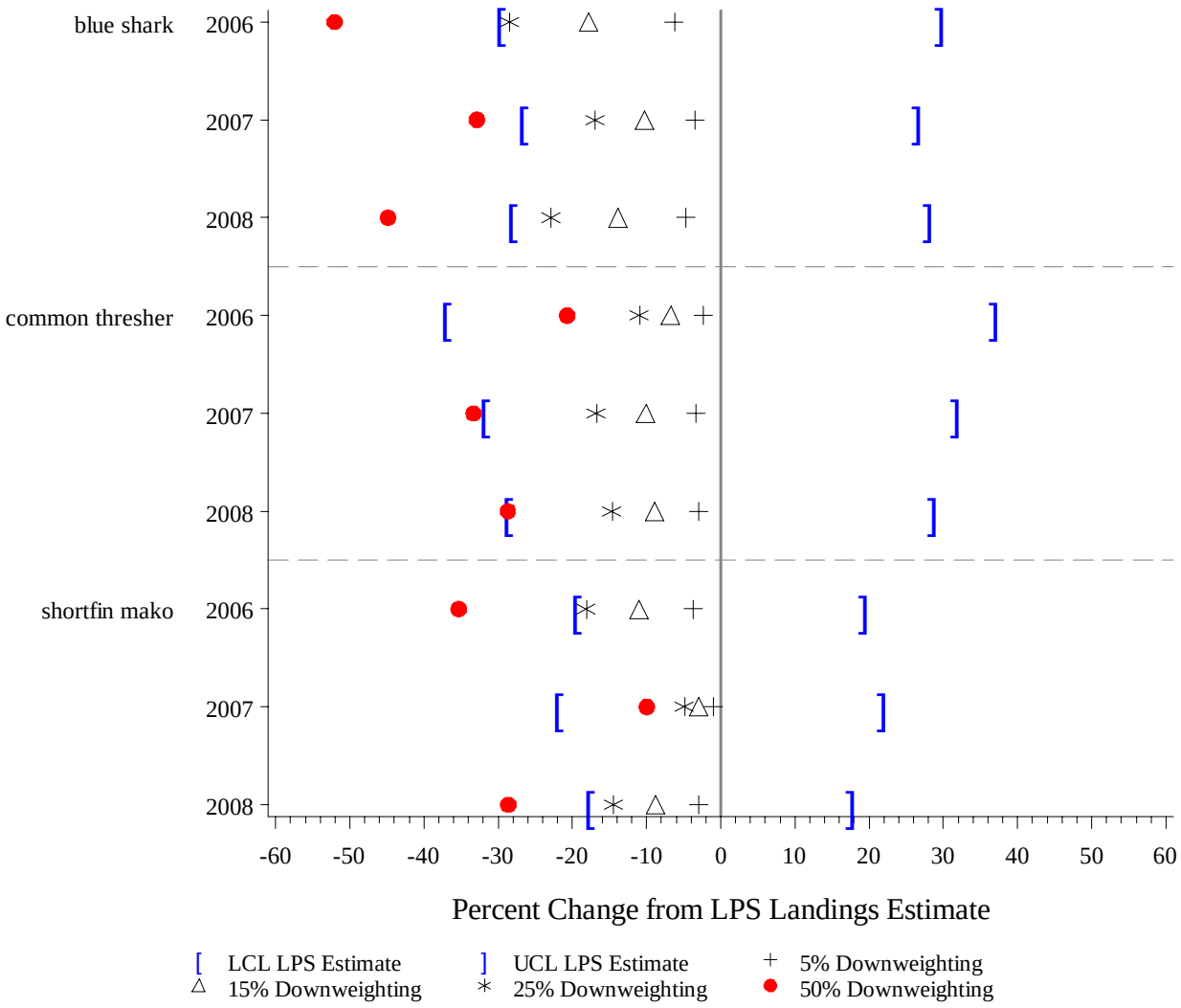


Figure 17. Blue, common thresher, and shortfin mako shark landings estimates calculated at 5, 15, 25, and 50 percent down weighting of tournament trips, expressed as percent change from the corresponding LPS landings estimate, 2006-2008. Ninety-five percent confidence intervals (LCL, UCL) are given for the LPS landings estimates.

shark landings were especially sensitive. In 2006, percent changes in blue shark estimates actually exceeded the tournament trip down-weighting percentages (e.g., 50% tournament down-weighting reduced the landings estimate by over 52%). Shortfin mako and common thresher estimates were only slightly less sensitive. However, percent changes for 2007 shortfin mako landings were much smaller and comparable to those seen in the more robust estimates for tunas and dolphin. For shark landings in general, changes were negative and sizeable in most years suggesting a systematic temporal trend and strong direct relationship between landings estimates and disproportionate tournament sampling.

Releases of sharks and marlin were also sensitive to down-weighting, but noticeably less so compared to shark landings. Most cases did not exceed a 10% change from the LPS estimate (Figure 18). Of those cases that did exceed 10%, two-thirds were the extreme cases down-weighted by 50%. Fewer cases fell outside of the LPS estimate confidence intervals as well. In some years, percent changes for shortfin mako and marlins were similar in absolute values to those seen in the more robust tuna estimates. Even so, changes were negative in all years suggesting a systematic temporal trend and direct relationship between shark and marlin release estimates and disproportionate tournament sampling.

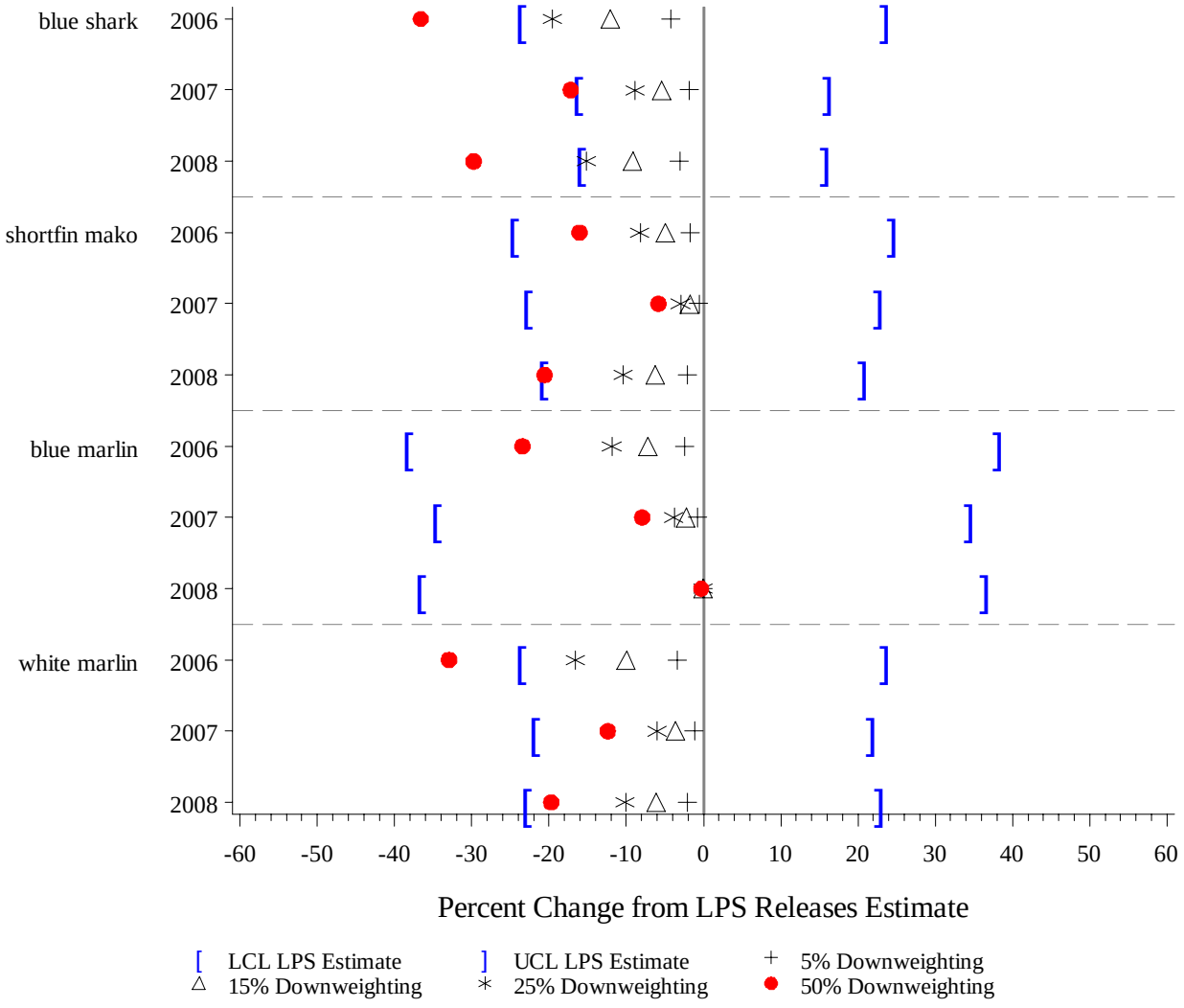


Figure 18. Blue shark, shortfin mako shark, blue marlin, and white marlin release estimates calculated at 5, 15, 25, and 50 percent down weighting of tournament trips, expressed as percent change from the corresponding LPS releases estimate, 2006-2008. Ninety-five percent confidence intervals (LCL, UCL) are given for the LPS landings estimates.

9. Discussion

The study results suggest that tournaments are being oversampled in the dockside LPIS compared to rates of tournament trip reporting on the complementary phone survey (LPTS). Only a small part of this difference can be explained by the fact that the LPTS include trips from private access sites and other sites not on the LPIS frame. Most of this difference is due to the relative distribution of tournament versus non-tournament trips and the fact that a disproportionate number of tournament interviews can be obtained if a tournament site is selected for LPIS sampling. Currently there is no upper limit on the number of interviews that can be obtained during an LPIS assignment, and all interviews within a given year/month/area/mode cell are weighted evenly for estimation purposes (i.e., there is not down-weighting or up-weighting to account for varying selection probabilities). Oversampling of tournaments in the LPIS, and the potential for biased estimates associated with oversampling, is significantly more prevalent in LPS states north of Delaware (i.e., New Jersey through Maine) and in the private boat mode than charter boat mode. While the overall potential bias associated with disproportionately sampling tournaments is less for the charterboat mode compared to the private boat mode, this potential bias can still be quite large for the charterboat mode within some individual year/month/area cells.

Results from the attempted census of all HMS tournaments support the notion that the LPTS (phone surveys) do a better job of representing HMS tournaments in proportion to their occurrence compared to the dockside LPIS. An estimated of 9,989 HMS tournament vessel trips were taken from Maine through Virginia in 2008. This estimate is 14.6% of the estimated total number of LPS vessel trips for 2008 (68,339). Overall, 10.9% of all 2008 reported LPTS trips were tournaments trips (weighted by on-frame LPS boats trips with both modes combined). By comparison, 24.5% of all dockside LPIS interviews in 2008 were tournament trips (weighted by all LPS boats trips with both modes combined). Based on these results, phone survey proportional coverage of tournament trips is more in line with the proportion based on the attempted census estimate of HMS tournament effort. As noted, the attempted census estimate of effort is a maximum estimate since it assumes that all boats fished all fishable days, and that all non-reporting tournaments were actually held. Therefore, LPTS tournament proportions may be even closer to the actual proportion of LPS trips associated with tournaments since the true number of HMS tournaments trips is likely smaller than 9,989.

Comparisons of cumulative tournament director reported catches and LPS tournament domain estimates showed a systematic difference, i.e., LPS estimates were consistently higher than director reports. This trend was evident for all species and for landings as well as total catch. Among the greatest significant differences were blue shark releases and dolphin landings. Yellowfin tuna, bluefin tuna, and mako shark landings also differed significantly (i.e., tournament director estimates fell outside 95% LPS estimate confidence intervals). Comparison between LPIS and LPTS sampling rates suggest that LPS estimates may be biased high for species more commonly caught

during tournaments due to a positive catch rate bias resulting from dockside oversampling of HMS tournaments. Findings from the pilot study dockside sampling comparison and preliminary 2009 LPIS data also showed that landings of some species and releases of many species are under-reported in tournament director reports. The systematic differences found when comparing LPS estimates and director reported catches support these findings and are likely due to a combination of these two identified biases.

Captains may not bother to bring fish that are not prize-worthy to the weigh station, particularly if the weigh station is crowded or if the vessel is kept at a different marina or private dock. Analysis of LPS weighed-in tournament domain estimates indicated that an even smaller percent of tournament landed fish are reported to the directors than suggested from the pilot study dockside sampling. This difference could reflect the fact that pilot dockside sampling was only conducted at official tournament weigh station sites whereas LPIS includes tournament interviews conducted both at the official site and at satellite marinas. The assumption here is that vessels returning to satellite sites are less likely to weigh-in their fish, particularly if they know they are not prize-worthy. Since tournament weigh stations often attract crowds there may also be an "embarrassment factor" preventing some captains from weighing in or reporting small fish.

A sensitivity analysis on LPS estimates was conducted to determine 1) which particular species are more sensitive to the potential bias associated with LPIS tournament representation, and 2) the relative magnitude of the catch estimation bias resulting from differing hypothetical rates of oversampling tournaments in the LPIS. For many species, including bluefin tuna, BAYS tunas (bigeye, albacore, yellowfin, skipjack), and dolphin, down-weighting of tournament trips by as much as 25% or 50% still resulted in fairly insignificant changes to LPS landings estimates. These species appear to be fairly robust to oversampling of tournaments, indicating that catch rates (i.e., catch per LPS intercepted vessel trip) do not differ greatly between tournament and non-tournament trips within a given month/area/mode cell. By contrast, landings estimates for commonly targeted shark species (i.e., blue, common thresher, and shortfin mako) were particularly sensitive to tournament trip down-weighting. These shark species are more likely to be landed during an intercepted tournament trip than a non-tournament trip within a given cell. Results suggest a strong positive bias in LPS shark landings estimates due to LPIS disproportionate sampling of tournaments. The potential for biased LPS shark estimates is high considering the large discrepancies between LPIS and LPTS tournament rates found in several states that host large shark tournaments (e.g., New Jersey, New York, and Massachusetts). LPS estimated releases of sharks and billfish were also sensitive to down-weighting (i.e., positively biased LPS estimates), but less so compared to shark landings. These findings suggest that either changes in the current LPS design should be implemented or a new data collection methodology is required to improve on the accuracy of recreational shark landings/releases estimates and billfish releases estimates. The accuracy of catch estimates for other species (i.e., tunas, dolphin, wahoo) will

also likely improve, although to a lesser extent, if this potential bias is addressed. Making these changes in partnership with captains, tournament directors, and other affected stakeholders would be a sensible approach to build trust and cooperation.

This pilot study collected tournament data from three different sources: 1) an attempted census of all HMS tournaments from Maine through Virginia based on tournament director summary reports, 2) dockside interviews of captains/mates at selected tournaments, and 3) Internet data searches from official tournament web sites. Valuable lessons were learned that can be used to inform decisions regarding future data collection approaches. In developing a master tournament list from which to conduct the census, it was discovered that about 30% of identified tournaments were not registered with NMFS, and several of these were billfish tournaments. Results from other MRIP projects characterizing HMS recreational fisheries in the South Atlantic and Gulf of Mexico also suggested a large number of HMS tournaments do not register with NMFS[2,3]. The Internet proved to be a reasonably good source for tracking down unregistered tournaments, although it is unknown exactly how many tournaments still went undetected. NMFS should routinely conduct Internet searches and use other sources (fishing magazines, survey databases, and personal communications) to identify and contact unregistered HMS tournaments. Non-registered billfish tournaments that are not fulfilling their RBS reporting requirements represent a data gap that should be addressed primarily through increased targeted outreach efforts. One component of the outreach message should educate tournament directors, staff, and captains regarding how the data they provide are used and why it is important for the management and long-term sustainability of highly migratory fish stocks. NMFS currently sends out an annual email reminder to register HMS tournaments through its Atlantic HMS electronic newsletter. All HMS tournament directors should be encouraged to subscribe to the newsletter, and NMFS should consider emailing more frequent registration reminders throughout the year.

If outreach does not prove effective for increasing compliance, NMFS may also want to consider options for increasing the enforceability of the tournament registration requirement. One such option would be to issue an actual permit to the tournament director that legally allows them to hold the tournament. HMS tournaments operating without a valid NMFS permit would be considered in violation of the permit requirement. Tournaments not fulfilling their mandatory reporting requirements will not be issued a permit for the following year. While increased enforcement, or the real threat of enforcement, will likely improve compliance rates, this option should

[2] Marine Recreational Information Program (MRIP). 2009. Characterization of Rod and Reel Highly Migratory Species Fisheries in the U.S. South Atlantic and Gulf of Mexico. Highly Migratory Species Work Group report.

[3] Marine Recreational Information Program (MRIP). 2009. Florida Highly Migratory Species Private Angler Telephone Survey. Highly Migratory Species Work Group report.

only be exercised as a last resort given the social and economic importance of HMS tournaments, and the fact that many tournaments are run as either charity events or memorials.

Regardless of the data collection method used, self-reported fishery dependent data is only as good as the captain's or angler's ability to correctly identify what species were caught. Species misidentification and improper use of common names can result in the reporting of erroneous catch data. In particular, roundscale spearfish (*Tetrapturus Georgii*) have only recently been differentiated from white marlin (*Tetrapturus albidus*)[4] and the morphological differences are probably not widely known among recreational anglers. For this pilot study, NMFS mailed waterproof tuna identification guides and shark placards to any tournament director who requested them. LPIS interviewers also routinely distributed these outreach materials to HMS anglers and captains at the docks. It is strongly recommended that NMFS continue to provide species identification materials to tournament directors and captains in an effort to improve the quality of HMS tournament data collected. NMFS should also develop an easy to use billfish identification guide for differentiating among similar billfish species. Species identification materials can be provided as separate handouts or incorporated into the data collection form if space allows.

The focus of this study was to identify alternative sampling designs for accurately assessing catch and effort from HMS tournaments in an effort to improve the information available for fishery management decisions. Choosing the right sampling strategy is critical to the success of any tournament data collection effort. In addition to catch and effort data, responsible fisheries management decision making requires information about the fishery participants themselves, or what is commonly referred to as the "human dimensions" of the fishery. Human dimensions of fisheries research includes investigation into such areas as demographics, fishing constraints and motivations, recreation specialization, attitude formation, economic expenditures and impacts, outreach and communication strategies, and management preferences. In addition to informing fisheries management decisions, human dimensions information can be used to improve the accuracy and reliability of catch and effort data through increased cooperation and compliance on the part of fishery participants. For example, greater compliance with tournament reporting requirements is likely to be achieved through increased transparency and better communication between fisheries scientists, anglers, and tournament directors. Social science theories and techniques can give direction to this kind of relationship building, which has the potential to lead to more effective, efficient, and innovative ways to collect catch and effort data in the future. Despite their socioeconomic importance for many coastal communities, only a small number of studies have addressed the human dimensions of HMS tournaments, and the majority of these were either focused on one particular tournament or covered a

[4] Shivji, M.S., Magnussen, J.E., Beerkircher, L.R., Hinteregger, G., Lee, D.W., Serafy, J.E., and Prince, E.D. 2006. Validity, identification, and distribution of the roundscale spearfish, *Tetrapturus Georgii*: Morphological and molecular evidence. Bulletin of Marine Science, 79(3): 483-491.

small geographic area. A more comprehensive, wide-scale research effort is needed to gain a better understanding of the human dimensions of HMS tournaments. Such knowledge will likely improve on-going tournament data collection efforts and management decisions affecting this unique segment of the HMS recreational fishery.

9.1 Next Steps: Identified Alternatives

Based on the results of this pilot study, four alternative approaches for future sampling of HMS tournaments were identified: 1) Status quo, 2) Full tournament census, 3) Modified survey design, and 4) Hybrid design using census for effort and survey for catch rates. Each alternative is discussed and the relative advantages and disadvantages are summarized below.

Alternative 1: Status Quo

HMS tournament trips are currently included in both the Large Pelagics Telephone Survey and Large Pelagics (dockside) Intercept Surveys. However, results of this study suggest that tournaments are being oversampled in the LPIS. Without changes to the LPS design, tournaments will continue to be oversampled in the dockside component and LPS catch estimates for certain species will likely be biased as a result. In particular, landings estimates for recreational shark species (e.g., shortfin mako, thresher, and blue) will continue to be prone to a potentially large positive bias. LPS estimated releases of sharks and marlin will also continue to be susceptible to a positive bias if no survey design changes are made to correct for LPIS tournament oversampling. Biased recreational catch estimates could negatively affect stock assessments, monitoring efforts, and management decisions for these particular species. By contrast, the sensitivity analysis suggested that LPS estimated recreational landings and releases of most other HMS species including bluefin tuna, BAYS tunas, and dolphin are fairly robust and only minimally impacted by tournament oversampling. Under the status quo alternative, even at high levels of tournament oversampling, LPS estimates for these species should continue to remain relatively unbiased due to this factor.

One advantage of the status quo alternative is that it will result in no additional reporting burden on either HMS captains or tournament directors. Another advantage is that, unlike the other alternatives discussed below, the status quo alternative will not result in any additional cost.

Alternative 2: Full tournament census

One possible alternative sampling approach that was tested as part of this pilot study is an attempted census of all HMS tournaments based on director reports. However, this study identified several challenges and potential data gaps associated with an attempted census based solely on tournament director summary reports. These include

non-compliance with the registration requirement, non-compliance with the reporting requirement, and unreported tournament catches. If the full tournament census alternative is selected, measures will need to be taken to address these shortcomings. This study highlighted the tremendous diversity that exists among HMS tournaments. If a census program is implemented, a "one-size-fits-all" approach to data collection may not be optimal and different sampling strategies may be needed depending on tournament size, duration, target species, rules, and other characteristics. To attain the goal of an accurate and complete census of HMS tournaments, NMFS may need to be flexible and collaborate with individual directors to find creative data collection solutions that work for all.

Non-compliance with the NMFS HMS tournament registration requirement makes it difficult to identify the universe of tournaments to be included in the census. For those tournaments that are identified, either through registration or other sources, additional non-compliance associated with the reporting requirement (34% in the pilot study) can further negatively bias census catch totals. If a census approach is used, adjustment factors will be needed to account for missing tournaments, potentially impacting the accuracy and reliability of tournament catch estimates. As discussed above, increased outreach and enforcement measures may be needed to remind and encourage directors to meet their mandatory registration and reporting requirements.

Even if a complete census of HMS tournaments could be obtained, in their present form director reports alone are not sufficient as many tournament caught fish are never weighed-in or reported by captains. LPS data on proportion of tournament fish actually weighed-in suggest that director reports underestimate tuna landings by between 25-50% and dolphin landing by nearly 80%. Pilot study dockside sampling showed that director reported counts of fish released alive are also significantly underestimated for many tournaments. Directors should be encouraged to collect comprehensive catch and effort data from all vessels participating in their tournaments. However, this may not always be feasible since most directors are extremely busy during the tournament. Given the time and resource constraints (i.e., limited budget and available personnel) that many tournament directors operate under, detailed data collection may not be feasible during the event. Comprehensive data collection from all vessels is particularly difficult at large tournament events with many boats returning around the same time of day and also many returning to satellite locations. The current director summary reporting form will need to be modified to address some of the problems encountered in the pilot study. A different form to be filled out by captains and turned into directors may also be needed for the collection of boat level catch and effort data.

To facilitate a complete census, trained samplers will be needed at some tournaments to make sure all vessels report their catches and to track down missed vessels after the event is over. Using trained samplers to collect data directly from the captains effectively shifts the reporting burden from the directors to the captains. Tournament directors will still need to work closely with the samplers to avoid overlap or double counting and to

determine which captains still need to be contacted. Double counting can also be an issue if captains are fishing in more than one tournament on the same fishing trip and their catch shows up more than once in the database. This practice was reported anecdotally by a New Jersey tournament director as being fairly common for shark tournaments, as several can take place over the same weekend in his area. More information is needed to determine how widespread the practice of fishing in more than one HMS tournament on the same trip is throughout the LPS geographic area.

Tournament samplers could be hired by NMFS as contractors or could be state natural resource agency personnel. In some cases the tournament may be able to supply a sampler, or for smaller events the director may be able to collect data from all vessels. NMFS should work with its state partners to try to involve more of them in tournament data collection programs. Although states are not directly responsible for the management of HMS, they should be encouraged to become more proactive in HMS data collections considering the social and economic importance of these fisheries to their constituents. The Massachusetts Sportfishing Tournament Monitoring Program (MSTMP) provides an excellent model of a state agency working cooperatively with tournament directors, captains, NMFS biologists, and the RBS program manager. Similar programs could be implemented in other states. If a tournament census program is implemented, NMFS may consider providing funding for state involvement with HMS tournament data collections similar to the administration of HMS Catch Card programs in North Carolina and Maryland.

Since dockside sampling may not be able to account for vessels not kept at the tournament site, samplers will need to conduct follow-up (post-tournament) phone interviews to supplement dockside sampling. Directors should be able to provide a list of all registered vessels with captain contact information. Any vessel on the list whose fishing activity is not accounted for should be contacted for a phone interview as soon as possible to minimize recall bias. Other innovative methods for collecting tournament data from captains and generally improving communications between tournament directors and participants should also be explored. The MSTMP provides all captains with a simplified data collection form to be filled out each fishing day and collected by samplers at the dock. A recent article in *Marine and Coastal Fisheries* describes a text message based reporting method using standard cell phones[5]. The authors suggest that this approach be tested for tournament data collections "as the real-time nature of reporting and the organized structure of tournaments may provide a mechanism to both interact with all registered anglers and facilitate design of an unbiased sampling protocol for validating self-reported data." Another method that could be tested is the use of email and Internet surveys to

[5] Baker, Scott M. Jr. and Ian Oeschger. 2009. Description and initial evaluation of a text message based reporting method for marine recreational anglers. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science*, 1:143-154.

contact tournament captains for reporting. If email addresses are collected by the directors, captains can be emailed a reminder to report after each fishing day with a survey Internet link in the body of the email. This may be a cost effective method for tracking down captains after the tournament has ended.

Several tournaments currently post catch data on their official websites. It is anticipated that more tournaments will make use of websites for this purpose in the future. If the full census alternative is selected, NMFS should work with directors to develop a standard web-based tournament reporting form to encourage posting and reporting of data on the Internet. A standard web-based form would provide NMFS with all the information needed in a usable format that assures consistency of Internet reports across tournaments and over time. Directors could use the web tool designed and maintained by NMFS to both fulfill the tournaments' reporting requirements (i.e. no need to fill out paper forms and mail/fax), and to keep tournament participants posted regarding results. NMFS can also maintain a web site with logistical information and summary results (current year and/or past years) from all registered/reporting tournaments (with director's permission). Such a web site would help captains learn about upcoming tournaments in their area, query summary results of past events, and may even provide incentive for tournament directors to both register and report their results to NMFS as a form of advertising. The web site could also be used by captains to determine if a tournament has officially registered. As a form of "self policing" some captains may intentionally chose not to enter any tournament that is operating illegally without registering. NMFS currently maintains a password protected web site for accessing Recreational Billfish Survey databases. A NMFS tournament web site covering all HMS tournaments (billfish and non-billfish) could be integrated with the RBS site to provide a "one stop shop" for tournament information. The site could include both areas that are accessible to the public and password protected areas containing privileged or confidential information.

Currently, tournament directors are asked to fill-out a hardcopy registration form and either mail or fax it to the Southeast Regional Office. NMFS should consider creating an online tournament registration tool similar to the system in place for HMS permits. Allowing directors to register tournaments online would greatly improve efficiency and enhance the utility of the registration list as a sampling frame. Online registration will also reduce the administrative burden associated with manual data entry of hardcopy registration forms.

The Recreational Billfish Survey (RBS) is an attempted census of all U.S. tournaments targeting billfish along the Atlantic, Gulf of Mexico, and Caribbean. NMFS utilizes data from the RBS to monitor tournament landed blue marlin and white marlin as part of the U.S. reporting requirement to ICCAT. About one-half of federally registered HMS tournaments in LPS states from Maine through Virginia are included in the RBS. If a full census of all HMS tournaments (billfish and non-billfish) is implemented, this new program will need to be integrated with the RBS in such a way as to assure that the integrity of the time series and the ability of RBS to continue to meet ICCAT

and domestic reporting requirements are maintained. Even if this alternative is not selected by NMFS, the RBS census program may benefit from some of the recommendations provided here for improving the accuracy of billfish tournament catch data.

The RBS is currently run out of the NMFS Southeast Fisheries Science Center in Miami and most HMS tournaments are expected to report directly to this office. Exceptions to this are Gulf of Mexico tournaments which report to a regional RBS coordinator in the NMFS Panama City Laboratory, and Massachusetts tournaments which report through the state's tournament sampling program. Dockside sampling of HMS tournaments is conducted in both the Gulf of Mexico and Massachusetts through these tournament programs. The coordinators for Panama City RBS and Massachusetts' tournament program then send their data to the RBS program manager in Miami. Conducting a complete census of total catch and effort from over 200 tournaments occurring from Maine through Texas, and the U.S. Caribbean, may be an extremely difficult task to accomplish from a centralized location. Advantages of having regional tournament data collection coordinators include: 1) greater familiarity with the cultural traditions, customs, and idiosyncrasies associated with HMS tournaments in their particular region, 2) ability to conduct outreach with tournament directors, staff, and captains in person, and 3) logistically easier for coordinator to recruit, train, and supervise tournament samplers where needed to obtain complete census of catch and effort. If the full tournament census alternative is selected, it is recommended that NMFS explore the feasibility of designating regional coordinators responsible for collecting HMS tournament data in their region. In states that conduct their own HMS tournament sampling programs (e.g., Massachusetts and Puerto Rico) the role of regional coordinator can be filled the person in charge of the state-run program.

For the pilot study, non-billfish tournament forms were requested to be sent to NMFS headquarters and billfish tournament forms to the SEFSC for inclusion in the RBS. However, some forms ended up getting sent to the wrong place, creating some confusion among directors and project managers regarding which tournaments already reported and which needed follow-up reminders. If the mandatory HMS tournament reporting requirement, currently in place only for billfish tournaments, is expanded to include non-billfish HMS tournaments as well, it is strongly recommended that all HMS tournaments (billfish and non-billfish) within a particular region report to the same regional coordinator. This would eliminate any confusion regarding where forms should be sent and who the primary contact person is.

Although the two programs are co-dependent, the HMS tournament registration program and the RBS are currently run out of different NMFS offices (registration from the Southeast Regional Office; RBS from the Southeast Fisheries Science Center). This was not always the case as only recently the tournament registration component was given to SERO to bring all permitting and registration related activities in the Southeast region under one roof. However, given how closely the tournament registration and data collection tasks are linked,

NMFS should consider giving one office the responsibility for both tasks again. The RBS program manager routinely conducts outreach with billfish tournament directors and has established positive relationships and trust with many of them. Through regular interactions with directors, the program manager is likely to hear about upcoming tournaments (both new and ongoing annual events) and can continue to remind them to both register and report in a timely manner. If the full tournament census alternative is selected, it is recommended that a single NMFS office have responsibility for both registering HMS tournaments and compiling (billfish and non-billfish) tournament data sent in by the regional tournament coordinators. Online registration and reporting options (recommended above) should help improve compliance rates and reduce the administrative burden associated with running these programs.

Tournament specific catch estimates obtained from the census would need to be combined with LPS catch estimates for total estimated catch of large pelagic species. To avoid double counting and redundant sampling effort, catch data from tournament trips would no longer need to be collected through the LPS. For the LPIS a screener question could be added to establish if the trip was part of a tournament, in which case there would be no need to conduct the interview. The screener should also ask the name of the tournament as a way to identify new tournaments not already on the master tournament census list. Interviewers can collect names and contact information (if available) of any tournaments they identify in the field that are not on the census list. This information will be routinely forwarded to the tournament census project manager for follow-up with the tournament directors. Directors on un-registered tournaments will be encouraged to register, report complete catch and effort information, and, if needed, provide a list of participants with contact information for follow-up surveys with captains.

The census alternative would not entirely eliminate the need to conduct assignments at official tournament sites since non-tournament LPS trips could also return to those sites on tournament days. Adjustments to the LPIS site register and possibly site clustering strategy would be needed to account for lower fishing pressures for non-tournament LPS trips on tournament days. Tournament LPS trips could still be profiled through the phone surveys (LPTS and FHS add-on) but these trips would not be used in effort estimation calculations.

A properly implemented tournament census program with identification of the universe of HMS tournaments, high rates of reporting compliance, and adequate follow-through with all captains could result in highly accurate and precise tournament catch estimates. A reliable time series of detailed catch and effort data from HMS tournaments can be used to analyze long-term trends and possibly to develop a CPUE index of abundance for certain species. Although catch and effort would be the primary goal, a tournament census program would likely collect large quantities of biological data that can be used in assessments. In addition, if tournament sampling is

removed from the LPS design, the accuracy of LPS catch estimates, particularly for sharks and billfish, will likely improve since the bias resulting from oversampling tournaments in the LPIS will no longer be a factor.

Potential disadvantages of a full census approach include cost, reporting burden, and feasibility. Additional funding will be needed for program administration, tournament identification and database maintenance, tournament dockside sampling, post-tournament follow-up interviews, additional data quality control measures, outreach, and possibly increased enforcement. In addition, if tournament trips are no longer considered eligible for LPIS sampling, interviewer productivity (i.e., number of interviews per assignment) will decrease and the average cost of an LPIS interview will likely increase. A complete census of all HMS tournaments every year will increase overall reporting burden. Burden will increase for captains who will be expected to report detailed catch and effort information to either the director or a hired sampler for every tournament day fished. Tournament director reporting burden may also increase but this will depend on how much time they currently spend on data collection (i.e., for RBS or other) and how much assistance they receive from NMFS or state agency samplers. The feasibility of conducting a complete census of HMS tournament caught fish may be questioned considering the difficulties encountered during the pilot study attempted census. To be successful, this alternative requires a high level of cooperation from and coordination with tournament directors. Any non-compliance with the full census approach (i.e., compliance less than 100%) represents a data gap that would need to be addressed. Many tournament directors were difficult to contact during the pilot and did not respond to numerous emails and phone calls. Establishing good lines of communication with tournament directors is a key factor for collecting complete and accurate census data. Some directors may object to having NMFS contracted samplers or even state biologists at their tournaments. Some directors may also refuse to provide NMFS with a list of tournament participants for follow-up interviews. Maintaining an accurate and complete tournament sample frame is a difficult task since tournaments are frequently cancelled or rescheduled, and new, un-registered tournaments can go undetected.

Alternative 3: Modified survey design

Another approach to addressing potential biases resulting from tournament oversampling entails weighting the LPIS data. Current estimation procedures assume that LPIS data are self-weighting and representative of LPS effort due to the differential selection probabilities of site cluster-day assignments based on fishing effort proxies. It is assumed that the current LPIS multistage cluster design samples trips in a manner equivalent to simple random sampling. As such, no weights are applied to the intercept data for estimation of catch rates and off-frame effort adjustments. A similar approach used in general MRFSS estimation has been criticized by the National Research Council since the assumption of simple random sampling equivalence has not been tested and

it is rarely, if ever, the case that un-weighted multistage cluster samples are equivalent to simple random samples at least with respect to variance[6].

Alternatives to current MRFSS estimation incorporating weights are being developed in an on-going MRIP sample design and estimation pilot project that will provide a partly model-based approach to generating weights for the intercept data. Weighting will incorporate known intercept sample site-day selection probabilities along with model estimated trip cluster sizes for the selected site-day sample unit. Models used to estimate cluster sizes are being developed from available effort data collected in the random digit dial Coastal Household Telephone Survey and list frame For Hire Survey. These models will estimate cluster sizes from multidimensional trip distributions developed using effort characteristics such as month or two-month wave, state, fishing mode, trip return time, and possibly access site, access site-cluster, or some other small geographic unit. Combining known first stage selection probabilities and model estimated second stage cluster sizes should produce weights for the intercept data that minimize biases associated with either over-sampling or under-sampling, resulting in improved estimation.

It is anticipated that LPS will be included in a subsequent phase of the MRIP sample design and estimation project. If so, a similar weighting approach will be developed for LPIS data. The approach will also combine known selection probabilities from the first stage of selection (site cluster-day units) with model-based trip cluster sizes. Models used for LPIS will be built using effort data from the list frame LPTS and LPTS Add-on to the For Hire Survey. Effort characteristics similar to those used in MRFSS models will be considered as well as others including tournament participation or trip type (tournament, non-tournament). In this way, tournament trips intercepted in the LPIS could be weighted, in part, based on the proportion of tournament trips estimated from the LPTS and LPTS Add-on. This approach would apply something of a mean or pooled weighting to LPIS tournament trips, as opposed to using more granular effort data (trip counts) from tournament director reports.

There are several potential advantages to this approach. Primary advantages are the avoidance of additional reporting burden on tournament directors or captains and additional costs associated with creating new programs or expanding existing ones. As all information needed comes from existing LPS component surveys, no new reporting is required from directors or captains for detailed effort, unreported catch, and non-billfish tournaments. Additionally, weighting is needed and will be developed for LPS estimation irrespective of the tournament issue. Adding tournaments as a consideration should not add appreciably to the overall weighting

[6] National Research Council of the National Academies. 2006. Review of Recreational Fisheries Survey Methods. The National Academies Press, Washington, D.C.

development effort. Lastly, as the weighting is pooled, in a sense, it should be robust to outliers in terms of number of trips intercepted or unusual catch observations.

Likewise, there are disadvantages to the approach. First, there may not be sufficient sample from the LPTS and Add-on to build representative models. Telephone survey sample sizes may need to be increased to assure robustness of weighting factors. If so, this will require additional funding, although the additional cost associated with adding samples to the phone surveys is expected to be less than additional funding required for the full tournament census alternative described above. Even if effort data are sufficient regarding tournaments, models built from pooled data may still do a poor job at predicting tournament trip cluster sizes in any given year if tournament participation is highly variable. Finally, the advantage of being robust to outliers can also be thought of as a negative if real changes are masked or overly smoothed by the weights.

Alternative 4: Hybrid census-survey design

The hybrid approach calculates tournament catch estimates by combining elements of the census alternative for determining tournament effort (vessel trips) with elements of the survey alternative for tournament catch per unit effort. Under this alternative, tournament directors would be required to collect and report accurate effort data recorded as the number of vessel trips taken each day. An accurate census of tournament effort can be combined with catch rate (CPUE) data obtained from captains during LPIS assignments to produce tournament catch estimates. Census derived effort data (number of vessel trips) will be used to weight LPIS catch rate data. The hybrid census-survey alternative would result in separate tournament catch estimates for large pelagic species that would need to be combined with the LPS non-tournament catch estimates for total catch. Since tournament effort, defined as number of vessel trips, will be derived entirely from census data, phone reported LPS tournament trips will not be used in the calculation of LPS non-tournament effort estimates under the hybrid alternative.

For small tournaments, directors should be able to provide an accurate count of total vessel trips taken. As discussed above for Alternative 2, for some events directors will need to improve communications with captains to know who fished on which tournament days. In addition to improving the accuracy of effort data, requiring all captains to report when they leave the dock and when they return provides an added safety benefit for tournament participants. For very large tournaments or ones with multiple weigh stations and/or satellite marinas, directors may be too busy during fishing days to keep tabs on all vessels. A dedicated sampler may be needed to accurately record fishing effort or follow-up with captains after the tournament in some cases.

It may be necessary to increase LPIS sample sizes to achieve robust and relatively precise tournament catch estimates using the hybrid census-survey approach. Sample size increases can be implemented in LPIS

state/month cells proportional to the prevalence of HMS tournaments. Another approach for increasing sample of tournament intercepts would be to assign a "tournament pressure," equal to the average number of interviews obtained at the site on a tournament day, to each site on master site register. For purposes of the assignment draw, the tournament pressure would be invoked instead of the usual non-tournament pressure on days when a known tournament is scheduled for a particular site. This will results in a higher probability of tournament site/day combinations being selected for LPIS sampling. A potential drawback of this approach is if tournaments register after the draw is conducted, don't register at all, or change dates due to weather or low turnout, will not be properly accounted for in the draw selection probabilities.

Post-stratification of tournament catch estimates should also be considered as a means to improve precision since variability in catch rates will be less for similar tournament grouping. Tournaments could be post-stratified by logical groupings based on target species. Results from this pilot suggest the following three groups: "shark only," "tuna only," and "mixed (i.e. shark, tuna, billfish, other)." Catch rates of particular species within these groupings are expected to be more similar than catch rates between groupings. Tournaments catch rates could also be analyzed by tournament size in terms of numbers of registered boats. Since catch rates will likely be more affected by target species than tournament size, size could be a sub-stratum within species group by which to post-stratify tournaments. Based on results of the pilot, logical groupings for tournament size are "small (3-25 boats)", "medium (26-75 boats)", and "large (greater than 75 boats)." Post-stratification will require large sample sizes to assure a representative sample with each strata or sub-strata. In addition to conducting more assignments, LPIS intercept sample sizes can be increased within a stratum by combining LPS strata for tournament estimation. That is, LPIS tournament trip catch rates can be pooled across states, months, or modes prior to combining with census effort totals. Further analysis is needed to assess the variability in catch rates across LPIS cells to determine if pooling will improve the overall precision of catch estimates.

A properly implemented hybrid census-survey approach with identification of the universe of HMS tournaments, high director compliance rates for reporting effort, and adequate LPIS sample sizes for producing robust and representative tournament catch rates, could result in highly accurate and precise tournament catch estimates. As with the full census alternative, high compliance rates are a key to the success of this approach. Any non-compliance in reporting effort (i.e., compliance less than 100%) represents a data gap that would need to be addressed. The hybrid census-survey can be seen as a middle ground alternative that balances cost, reporting burden, and precision. Since the catch component is still estimated through a survey, catch estimates from this alternative will be less precise compared to the full census alternative. However, compared to the full census of catch and effort, the hybrid approach should be significantly less costly and result in less reporting burden since only effort will be reported by directors and/or captains. Results from the pilot study indicate that recording a

complete census of tournament caught fish from all vessels, including releases and landed fish not weighed-in, will require a considerable amount of additional effort compared to what is already collected. However, it is anticipated that most tournament directors already routinely keep track of effort in terms of vessel trips taken. Some additional data collection effort will be needed for those tournaments that do not currently have an accurate account of fishing effort, although this should be small compared to the full census of catch. Compared to the modified survey design alternative, the hybrid census-survey alternative should produce more precise catch estimates since there is no variance associated with the effort component (i.e., complete census). The additional cost associated with the hybrid-census alternative is expected to be moderately higher that that associated with the modified survey design alternative. As discussed above, the modified survey design will likely require phone survey sample size increases, whereas the hybrid approach will likely require increased dockside (LPIS) sample sizes plus some additional sampling for accurate effort counts from those tournaments not currently collecting that information. Burden on tournament directors and captains is also expected to be slightly greater under the hybrid approach compared to the modified survey design.

Summary Comparison Table of Alternatives Based on Selected Criteria

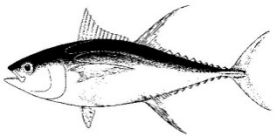
	Alternative			
Criteria	**1. Status Quo**	**2. Full tournament census**	**3. Modified survey design**	**4. Hybrid census-survey**
Additional Cost	None	High	Low	Moderate
LPIS tournament oversampling bias	Not addressed	Eliminated since LPIS not used for tournament catch estimates	Adjusted for through proper weighting of LPIS data based on known selection probabilities	Adjusted for through proper weighting of LPIS data based on census effort data
LPS catch estimate variances	No change	No variances with complete census (100% precision)	Potentially larger variances associated with weighting. Could be offset somewhat through sample sizes enhancements	Improved precision (lower variances) expected due to effort census component
Reporting burden	No additional burden	a) Moderately increased operator burden associated with non-RBS reporting and more complete reporting of catch and effort b) Significantly increased tournament captain burden associated with captain reporting of all tournament catch	Very small additional burden per captain on LPTS and FHS sample frames due to anticipated need for increased sample sizes. Additional burden spread out over all HMS Angling, Atlantic Tunas General, and For-hire directory captains in LPS survey states.	a) Slightly increased operator burden associated with non-RBS reporting and more complete reporting of effort b) Slightly increased tournament captain burden associated with captain reporting of effort c) Small additional burden on large pelagic captains due to anticipated need for increased LPIS sample sizes
Major assumptions and/or constraints	None	a) High level of compliance and cooperation required from directors and captains b) Seamless merger of RBS with new full tournament census program such that the needs of both programs are met	a) Contingent on successful completion of MRIP project to develop weighting approach for LPIS data b) Assumes representative models that predict tournament trip cluster sizes and assure robustness of weighting factors can be developed considering available sample sizes and unknown variability	a) High level of compliance and cooperation required from directors and captains b) Seamless merger of RBS with complete census of effort such that the needs of both programs are met

Appendices

Appendix A: HMS non-billfish tournament summary form.

Atlantic Highly Migratory Species

Tournament Summary Report



Tournament Name:	
Fishing Date(s):	
Tournament Location (city & state):	
Total Boats Fishing or # Boats Fishing Per Day:	Hours Fished (Lines in-Lines
Recorder's Name:	Phone:

ATLANTIC BILLFISHES							OTHER SPECIES						
		Number Released							Number Released				
	No. Kept	Alive Tag	Alive No Tag	Dead	Total	Size Fish Kept		No. Kept	Alive Tag	Alive No	Dead	Total	Size Fish
Blue							Swordfish						
White							Dolphin						
Sailfish							Wahoo						
Spearfish							OTHER						

ATLANTIC PELAGIC SHARKS							ATLANTIC COASTAL SHARKS						
		Number Released							Number Released				
	No. Kept	Alive Tag	Alive No Tag	Dead	Total	Size Fish		No. Kept	Alive Tag	Alive No Tag	Dead	Total	Size Fish
Blue							Bignose	N/A					N/A
Longfin	N/A					N/A	Blacktip						
Shortfin							Dusky	N/A					N/A
Oceanic Whitetip							Great Hammerhead						
Common Thresher							Scalloped Hammerhead						
Bigeye Thresher	N/A					N/A	Smooth Hammerhead						
Porbeagle							Night	N/A					N/A
OTHER							Sandbar	N/A					N/A
							Silky	N/A					N/A
							Spinner						
							Tiger						
							White	N/A					N/A
							OTHER						

ATLANTIC TUNAS													
		Number Released							Number Released				
	No. Kept	Alive Tag +	Alive No Tag	Dead	Total	Size Fish		No. Kept	Alive Tag +	Alive No Tag	Dead	Total	Size Fish
Yellowfin Tuna							Albacore Tuna						
Bluefin Tuna							OTHER TUNA						
Skipjack													
Bigeye													

Please send completed report form via: FAX: (301) 713-4137; email: Ron.Salz@noaa.gov or mail to: NOAA Fisheries, Fisheries Statistics Division (ST1), 1315 East West Highway, Silver Spring, MD 20910.

Under Federal Regulations at 50 CFR part 644, persons conducting fishing tournaments for Atlantic highly migratory species are **REQUIRED** to do the following:

- All Atlantic Highly Migratory Species Tournaments **MUST** register using form (OMB # 0648-0323) at least four weeks prior to commencement of the tournament;
- If selected, tournament operators **MUST** submit an Atlantic Highly Migratory Species Tournament Summary Report (OMB # 0648-0323) postmarked not later than the seventh day after the final day of tournament fishing;
- If selected, billfish tournament operators **MUST** submit radio logs or catch certificates containing detailed capture information including: tournament dates, fishing hours, name of each boat fishing that day, bait types and fight times for all billfish captured or released and weight, length, and sex of each billfish brought ashore.

INSTRUCTIONS - Atlantic Highly Migratory Species Tournament Summary Report OMB#0648-0323

Tournament Name: Record the entire name of the fishing tournament as it was reported on the tournament registration form.

Fishing Date(s): Record the actual fishing dates of the tournament (don't include days or days canceled due to bad weather.

Tournament Location (city & state): Record the city and state of the fishing tournament.

Total Boats Fishing: Record the number of boats fishing (Please note if this number changes each day).

Hours Fished (Lines in-Lines Out): Record tournament start times and ending times (please note if different days have different hours).

Recorder's Name: Record the name of the person who completes this form.

Phone: Record the phone number of the recorder.

No. Kept: Record the total number of fish kept for each species.

Number Released:

-Alive, No Tag: Record the total number of fish released alive (no tag) for each species.
-Alive, Tag: Record the total number of fish released (with tags) for each species.
-Dead: Record the total number of fish thrown back dead for each species.
-Total: Record the total number of fish released for each species.

Size of Fish Kept (lbs.): Record the weights (lbs.) of each individual fish kept for each species (If you need more space, please attach additional pages).

_____Attach Forms, Tri-Fold Here and Mail_____

NOAA Fisheries, 1315 E-W Highway, Silver Spring, MD 20910: Fisheries Statistics Division (ST1)

Appendix B: Sample notification letter sent to operators of non-billfish HMS tournaments.

National Marine Fisheries Service
Fisheries Statistics Division (ST1)
1315 East West Highway
Silver Spring, MD 20910

Date

Address1

Dear Mr. Last Name:

YOUR HIGHLY MIGRATORY SPECES (HMS) TOURNAMENT (INSERT TOURNAMENT NAME) HAS BEEN SELECTED to report catch and effort information to the National Marine Fisheries Service (NMFS). HMS tournament directors are required to submit a fishing record of the tournament on the enclosed Atlantic Highly Migratory Species Tournament Summary Report form. Regulations require that the completed form, as well as a copy of the tournament rules and radio logs (if they exist) be submitted and postmarked no later than the seventh day after the conclusion of the tournament. Please read the back of the form for detailed instructions on how to complete it.

The following summarizes what information must be included on each Summary Form: (1) tournament name; (2) recorder name and telephone number; (3) fishing dates for which the information is recorded; (4) number of boats participating and total hours fished; (5) the number of billfish, sharks, tunas, and other HMS by species that were kept, released alive or released dead; and (6) the weight of each fish boated and measured.

If the tournament does not take place, please return the form indicating cancellation or termination of the event. If you have any questions concerning your reporting requirements, please contact me at (301) 713-2328 or by email at: **Ron.Salz@noaa.gov.**

Thank you for your prompt attention to this matter.

Sincerely,

Ron Salz

Appendix C: Follow-up telephone questionnaire for HMS tournament operators.

Tournament Name _____ Date called _____

Director Name _____ Tournament Dates _____ to _____

Q1. Did you receive the notification letter and reporting form (from Arietta in Miami for billfish; from Ron for non-billfish)? Y / N

Q2. Do you have any questions about the reporting requirement or the form?

Q3. How many boats are registered or do you expect to fish in the tournament? _____

Q4. What is the location of the official weigh station (s) ? _____

Q5. Do captains report all fish that are landed in the tournament? Y / N

If No, ask "What landings and releases do you think you are missing?"

Or "Are only tournament fish reported?"

Q6. Is there a prize category for releases? Y / N

If no ask "Do you collect information on releases?" Y / N

If yes ask "Is this done for all species or only certain species?"

ALL only some species (list) _____

Q7. Do you keep detailed catch/release records for each vessel in the tournament? Y / N

If yes, "Would you be willing to provide us with this data when you fax in you summary reporting form? " Y/ N

Q8. Would you be willing to send us a list of vessels in the tournament so that we may follow-up with them for more detailed catch and trip data? Y / N

Q9. (ask only if tournament has been selected for dockside sampling) Would it be OK if we had an interviewer sample at your tournament? Y / N

Q10. Could we attend the captains meeting? Y / N

If yes, ask where and when it will be held.

Q11. That's all the questions about your tournament that I have for you. Would you like me to send you some waterproof fish ID guides (for tunas and sharks) to hand out to captains? Y / N If yes, about how many of each (tuna/shark) would you like? # shark _____ #tuna _____

COMMENTS: _____

Appendix D: List of HMS Tournaments, June-October, Maine-Virginia, 2008.

State	Tournament Name	Start date	End date	Used for LPIS-Director Comparison
CT	THAMES RIVER SHARK TOURNAMENT 2008	7/28/2008	7/30/2008	
CT	South Norwalk Tournament	7/18/2008	7/19/2008	
DE	2008 IRBA WHITE MARLIN WARM UP	7/25/2008	7/27/2008	
MA	14TH ANN. TOP GUN MARLIN & TUNA SHOOTOUT	8/14/2008	8/16/2008	X
MA	22ND ANN. OAK BLUFFS MONSTER SHARK TOURNAMENT	7/17/2008	7/19/2008	X
MA	BIG GAME BATTLE 2008	8/15/2008	8/16/2008	
MA	Falmouth Offshore Grand Prix	8/14/2008	8/16/2008	
MA	MADDIES TUNA TOURNAMENT 2008	9/6/2008	9/6/2008	
MA	Nantucket Shark Tournament	8/23/2008	8/24/2008	
MA	NSCTA TAG A TINY TUNA TOURNAMENT 2008	8/21/2008	8/24/2008	X
MA	SOUTH SHORE TUNA TOURNAMENT 2008	9/20/2008	9/21/2008	X
MA	GREEN HARBOR TUNA TOURNAMENT	8/8/2008	8/10/2008	
MA	CONTENDER REGULATOR	9/4/2008	6/9/2008	
MD	Wahoo Rodeo and Flounder Round-up	9/12/2008	9/14/2008	X
MD	2008 CAPT. STEVE HARMAN"S POOR GIRLS OPEN	8/14/2008	8/16/2008	X
MD	21ST ANN. OCEAN CITY TUNA TOURNAMENT	7/11/2008	7/13/2008	X
MD	CANYON KICK OFF 2008 MD	7/4/2008	7/6/2008	X
MD	CHALLENGE CUP 2008	9/12/2008	9/13/2008	X
MD	KIDS CLASSIC 2008 MD	7/26/2008	7/27/2008	X
MD	LABOR DAY WHITE MARLIN TOURNAMENT 2008	8/29/2008	8/31/2008	
MD	MAKO MANIA 2008	6/6/2008	6/8/2008	X
MD	MARINA SHOOTOUT 2008	7/19/2008	7/20/2008	
MD	MSSA MAR-VA 2008	8/22/2008	8/24/2008	X
MD	MSSA TUNAMENT 2008	6/20/2008	6/22/2008	X
MD	OCEAN CITY SHARK TOURNAMENT 2008	6/12/2008	6/14/2008	X
MD	SMALL BOAT TOURNAMENT 2008	6/21/2008	6/22/2008	X

State	Tournament Name	Start date	End date	Used for LPIS-Director Comparison
MD	WHITE MARLIN OPEN 2008	8/4/2008	8/8/2008	X
ME	11th Annual Sturdivant Island Tuna Tournament	8/5/2008	8/8/2008	
ME	70th annual Bailey Island Fishing Tournament	7/21/2008	7/26/2008	X
ME	CASCO BAY CLASSIC 2008	9/4/2008	9/6/2008	X
ME	DOWNEAST MAINE SHARK TOURNAMENT 2008	8/22/2008	8/23/2008	X
ME	SPORTFISHING OPEN 2008 (MDA & AGENCY)	8/15/2008	8/17/2008	X
ME	TWO TIDE CHALLENGE	8/23/2008	.	
NJ	17TH ANNUAL MID-ATLANTIC $500,000 2008	8/17/2008	8/22/2008	X
NJ	19TH ANNUAL VIKING - OCEAN SHOWDOWN 2008	7/9/2008	7/13/2008	X
NJ	28TH ANN. SOUTH JERSEY SHARK TOURNAMENT 2008	6/12/2008	6/15/2008	X
NJ	7TH ANNUAL S. JERSEY MID-ATLANTIC TUNA TOURNAMENT	7/16/2008	7/19/2008	
NJ	ANNUAL JACK MEYER MEMORIAL 2008 (Manasquan River Tuna)	7/18/2008	7/21/2008	
NJ	AVALON OFFSHORE 2008	7/17/2008	7/19/2008	
NJ	BEACH HAVEN WHITE MARLIN INV. 2008	7/30/2008	8/2/2008	X
NJ	BHMTC 1ST OFFSHORE TOURNAMENT 2008	7/12/2008	7/12/2008	
NJ	BHMTC 2ND OFFSHORE TOURNAMENT 2008	9/12/2008	9/14/2008	X
NJ	BHMTC FAMILY OFFSHORE TOURNAMENT 2008	7/19/2008	7/19/2008	
NJ	BHMTC MAKO SHARK TOURNAMENT	6/14/2008	6/14/2008	
NJ	BHMTC TUNA TOURNAMENT 2008	8/16/2008	.	X
NJ	CAPE MAY SHARK TOURNAMENT 2008	6/19/2008	6/22/2008	X
NJ	JCSA HIGHROLLERS TOURNAMENT 2008	7/12/2008	7/12/2008	
NJ	MAKO FEVER - CATCH IT 2008	6/20/2008	6/22/2008	
NJ	MAKO MANIA 2008	6/21/2008	6/22/2008	X
NJ	MRMTC OFFSHORE OPEN 2008	8/29/2008	9/7/2008	
NJ	Ocean City Marlin	8/10/2008	8/16/2008	
NJ	JERSEY SHORE CLASSIC	7/25/2008	7/26/2008	
NJ	BRET BAILEY MAKO	6/13/2008	6/14/2008	
NY	16TH ANN. STAR ISLAND MAKO THRESHER	8/7/2008	8/9/2008	X

State	Tournament Name	Start date	End date	Used for LPIS-Director Comparison
NY	22ND ANNUAL STAR ISLAND SHARK TOURNAMENT	6/12/2008	6/14/2008	X
NY	38TH ANNUAL SHARK TAG TOURNAMENT	6/26/2008	6/28/2008	X
NY	BAY SHORE MAKO TOURNAMENT	6/28/2008	.	
NY	Blue Water Billfish Tournament Hyannis Anglers Club	8/24/2008	.	
NY	FREEPORT HUDSON ANGLERS 36TH ANN. SHARK	6/21/2008	6/21/2008	X
NY	Giant Bluefin Tuna Tournament Hyannis Anglers Club	.	.	
NY	GREAT GUN ANGLERS 32ND SHARK TOURNAMENT	6/21/2008	6/21/2008	
NY	HAMPTONS OFFSHORE INVITATIONAL 2008	8/15/2008	8/24/2008	X
NY	JONES INLET INVITATIONAL TUNA TOURNAMENT 2008	7/31/2008	8/3/2008	
NY	MBCA CHARITY SHARK TOURNAMENT 2008	7/12/2008	7/13/2008	X
NY	O.H.O. OFFSHORE SHOOTOUT 2008	9/26/2008	9/28/2008	
NY	SHINNCOCK MARINA & TUNA CLUB	6/28/2008	6/30/2008	
NY	Trade Winds Stephen Sloan Memorial Tag and Release Shark Tournaments	10/3/2008	10/5/2008	X
NY	WOODCLEFT SHARK TOURNAMENT 2008	6/28/2008	6/28/2008	X
NY	Long Island (South Shore) Marlin and Tuna Tournament	7/19/2008	.	
NY	PEQUONNOCK YACHT CLUB	7/11/2008	.	
NY	Mako Mania Shinnecock Anglers Society 2008	7/19/2008	.	
NY	BABYLON TUNA	7/25/2008	.	
NY	WALLY OAKLAND MEMORIAL	6/17/2008	6/17/2008	
RI	39th Annual Block Island Billfish Tournament	8/18/2008	8/21/2008	X
RI	Run and Gun Offshore Tournament	9/6/2008	9/7/2008	
RI	SNUG HARBOR SHARK TOURNAMENT 2008	7/12/2008	7/13/2008	X
RI	Tri-State Canyon Shootout	8/3/2008	8/7/2008	
RI	5th Annual "Over the Edge" Offshore Tournament	8/14/2008	8/16/2008	
VA	2008 Eastern Shore Marlin Club Billfish Release Tournament	7/24/2008	7/28/2008	
VA	Little Creek Offshore Tournament	8/28/2008	8/29/2008	

State	Tournament Name	Start date	End date	Used for LPIS-Director Comparison
VA	VA BEACH INVITATIONAL MARLIN TOURNAMENT 2008	7/25/2008	7/27/2008	X
VA	VA. BEACH SPORT FISHING BLUEWATER CLASSIC 2008	8/15/2008	8/17/2008	X
VA	VIRGINIA BEACH BILLFISH TOURNAMENT 2008	8/21/2008	8/23/2008	X
VA	VIRGINIA BEACH TUNA TOURNAMENT 2008	7/10/2008	7/12/2008	X
VA	WINE, WOMEN, AND FISHING 2008	8/16/2008	8/17/2008	X
VA	HRUHCA BIG CATCH	6/21/2008	.	
VA	BIG MONEY OPEN	9/30/2008	.	
VA	CHIC CHARTER CLUB TUNA	8/17/2008	8/17/2008	

Appendix E: HMS tournament dockside sampling questionnaire.

2008 HMS Tournament Dockside Sampling Form OMB No. 0648-0380 (Exp. 6/30/2009)

1. INTERVIEWER INITIALS ☐☐☐ 2. INTERVIEW DATE (MO / DAY) ☐☐☐☐ 3. DOCUMENT # ☐☐

4. INTERVIEW TIME (USE 24 HOUR CLOCK) ☐☐☐☐ 5. STATE ☐☐ 6. LPS SITE NUMBER ☐☐☐☐

7. TOURNAMENT NAME ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

8. SCREENER QUESTION: Were you participating in the tournament today? IF NO, TERMINATE INTERVIEW

9. What is your boat name? ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

10. Will your boat be kept at this site tonight?
◯ YES ◯ NO
If no, ask and record the marina where boat will be kept:
☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

INTERVIEWER: If vessel is listed in HMS permit list, record 8 digit HMS permit # in boxes below:
☐☐☐☐☐☐☐☐

11. Interviewer: If not last day of the tournament ask - **How many <u>more</u> days do you plan to fish in <u>this</u> tournament?** ☐
Interviewer: Determine if this vessel fished previous days in this tournament that have not previously been recorded. If so, use additional forms and record Qs 12 and 13 for each day fished. Use Q3. (document number) to link fishing days for same vessel.
Record date of trip for this form or fill-in circle: TODAY ◯ <u>OR</u> MO / DAY ☐☐☐☐

12. How many hours were spent fishing? That is, how many hours were lines in the water? ☐☐

13. Did you or anglers on your boat catch any fish today? ◯ YES ◯ NO ◯ **Refused**

Species / Size Category		Total Number Kept	Number Reported of those Kept	Total Number Released Alive	Total Number Released Dead	Number Reported of those Released	Number Tagged of those Released
BFT	Young School (< 27")						
	School (27"to < 47")						
	Large School (47" to < 59")						
	Small Medium (59" to < 73")						
	Large Medium (73" to < 81")						
	Giant (81" or greater)						
NOTES:	Bigeye Tuna						
	Albacore						
	Yellowfin Tuna						
	Skipjack Tuna						
	Blue Marlin						
	White Marlin						
	Swordfish						
	Shortfin Mako Shark						
	Tiger Shark						
	Unidentified Hammerhead Shark						
	Blue Shark						
	Common Thresher Shark						
	Dusky Shark						
	Sandbar Shark						
	Dolphin						
OTHER							
OTHER							
OTHER							

14. In the event that we want to re-contact you to collect additional data, may I have your name and telephone number?

RESPONDENT'S NAME ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

AREA CODE & TELEPHONE NUMBER ☐☐☐ ☐☐☐☐☐☐☐