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DESCRIPTION OF REPORTED CATCH DATA FOR NON-TARGET SPECIES: DOES SUFFICIENT DATA EXIST TO PRODUCE A COMPREHENSIVE ECOLOGICAL RISK ASSESSMENT?

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1. SUMMARY

This document presents a review of catch data available for target and non-target species from fisheries operating in the eastern Pacific Ocean (EPO) for the purposes of developing a comprehensive Ecological Risk Assessment (ERA). Both target and non-target species catch are reported to the IATTC by fisheries operating within the EPO. Unfortunately, while relatively good information is available for tunas and billfishes from many fisheries, information for non-target species is limited. An exception is the purse-seine fishery of large vessels (Class 6; carrying capacity > 363 metric tons). Non-target species catch data (both retained and discarded) are collected by onboard observers under the Agreement on the International Dolphin Conservation Program (AIDCP) for nearly all trips of large purse-seine vessels. Although some information on retained catches of non-target species is reported for small purse-seine (Class 1-5; ≤ 363 metric tons carrying capacity), pole-and-line, and longline, the information appears to be incomplete, not validated, and/or is of limited use for an ERA because species identifications were not provided or could not be verified. In addition, information on at-sea discards is limited for fisheries other than those of large purse-seine vessels. This lack of fundamental information on species composition and catch biomass severely compromises our ability to produce a comprehensive EPO ERA. Progressing in the absence of such critical data is likely to lead to inappropriate management action.

2. BACKGROUND

Long-term ecological sustainability is the ultimate goal of ecosystem-based fisheries management. Fishing directly impacts the populations of not only target species, but also the species incidentally caught as bycatch. The vulnerability of these bycatch species to overfishing by the EPO tuna fisheries is unknown, primarily due to a paucity of reliable biological and fisheries data. Given these limitations, many fisheries managers and scientists have evaluated ecological effects of fishing using various ERA approaches, which have been designed for data-limited situations. Vulnerability is defined here as the potential for the productivity of a stock to be diminished beyond expected natural fluctuations by direct and/or indirect fishing impacts. The IATTC staff has applied a version of an ERA – productivity and

susceptibility analysis (PSA) (Patrick *et al.* 2010)¹ – used to evaluate fisheries in other ocean regions in recent years, to estimate the vulnerability of data-poor, non-target species caught by the purse-seine fishery of large vessels in the EPO ([SAC-02-12](#), [SAC-04-08](#), [SAC-06-09](#)).

PSAs reported in the literature often account for either a particular fishery or a particular guild (e.g., sharks). The preliminary PSAs attempted by IATTC staff ([SAC-02-12](#), [SAC-04-08](#), [SAC-06-09](#)) were conducted only for the fisheries of large purse-seine vessels because the dataset is the most comprehensive of all EPO fisheries with respect to species composition of both target and non-target species, and with respect to retained catch and discards. In the recent PSA attempt ([SAC-06-09](#)), IATTC staff: (1) combined the susceptibility values for each species across purse-seine fishing modes to produce one overall species-specific purse-seine susceptibility, and (2) included catch information in the formulation of susceptibility. However, these PSAs may be misleading because they do not directly account for impacts from other fisheries operating in the EPO. For example, a species may appear vulnerable to the purse-seine fishery when in fact another fishery may have a greater impact. Thus, changes in the catch of the species in the purse-seine fishery over time are likely the result of activities of many fisheries. Estimating the cumulative impact of all fisheries operating in the EPO is a challenging task and requires data on non-target species from all EPO fisheries.

In response to requests made by SAC participants at the 2015 SAC Meeting to develop an ERA for all fisheries operating in the EPO, here we summarize current information available to IATTC on target and non-target species catches for EPO fisheries. We report what is known about the existing catch data in order to assess the current limitations for progressing with an ERA for both target and non-target species. By summarizing available catch composition data, we can identify data deficiencies requiring attention before a comprehensive ERA for the EPO can be undertaken, and its outcomes used to guide management and policy. An Ecosystem Specialist and recognized expert in ERAs will join the IATTC staff in August 2016 and will lead the ERA development for the EPO fisheries.

3. DATA CONSIDERED

Reported catch data for the year 2014 was selected for this summary because data reporting and sampling coverage for non-target species has improved in recent years. Therefore, it is assumed that 2014 data represent the best quality available. (Databases for 2015 were not complete at the time this document was drafted.)

4. DESCRIPTION OF DATA AVAILABLE BY FISHERY

4.1 Fisheries with reported catch data in 2014

Fisheries that operated in the EPO during 2014 and reported catch data include: purse seine, longline, pole-and-line, gillnet, harpoon, recreational, troll, and other/unknown gear. The purse-seine fishery is divided into large vessels, and small vessels; these fisheries are separated for the purposes of conducting an ERA due to differences in data types available by vessel size category and also due to the areas of operation of the two vessel size categories ([SAC-07-07f\(i\)](#)). There are three purse-seine set

¹ Patrick, W.S., P. Spencer, O. Ormseth, J. Cope, J. Field, D. Kobayashi, T. Gedamke, E. Cortés, K. Bigelow, W. Overholtz, J. Link, and P. Lawson. 2010. Use of Productivity and Susceptibility Indices to Determine Stock Vulnerability, with Example Applications to Six U.S. Fisheries. 90 pp.

types that are considered separate fisheries because of the different species that interact with purse-seine gear by each of these set types: sets on tunas associated with dolphins, sets on unassociated tuna schools, and sets on tunas associated with floating objects. The longline fishery is divided into two groups (1) distant-water tuna-billfish longline fisheries and (2) large-pelagic multi-species longline fisheries of coastal States. Thus, a total of 13 fisheries operated in the EPO in 2014 and reported catch data to the IATTC.

4.2 Data sources

The data summarized in this report were derived from various sources, including observer data, vessel logbooks, unloading information provided by canneries and other sources, (e.g., inspection programs) and data summaries reported by Members and Cooperating Non-Members (CPCs). Resolution [C-03-05](#) recommends that pertinent catch information by species and fishing gear be provided where practical, via vessel logbooks and unloading information, and otherwise in aggregated form with catch and effort data as a minimum requirement. Exceptions are in place for artisanal and recreational fishing vessels. Three types of data summaries are provided by CPCs: (1) total catch by species, (2) sample data in 5° x 5° grids for longline and 1° x 1° grids for surface fisheries, by year and month (subject to confidentiality rules), and (3) aggregated length-frequency data by year and month (subject to confidentiality rules).

Observer data

Data collected by onboard observers are currently the most comprehensive data available for non-target species from EPO fisheries. Onboard observer coverage of large purse-seine vessel trips is nearly 100%. In contrast less than 5% of purse-seine trips of small vessels carried an observer in 2014 ([SAC-07-07f\(i\)](#)). Positional data are available in this dataset, in addition to general size classifications (small, medium, and large) for some species (e.g., tuna, billfishes, sharks, rays, and bony fishes including dorado, wahoo, rainbow runner and yellowtail). Size measurements of individual turtles, sharks and billfishes are also collected by observers.

Resolution [C-11-08](#) stipulates that high-seas longline fishing vessels shall ensure that at least 5% of the fishing effort by vessels greater than 20 meters in length carry a scientific observer to record any available biological information, the catches of targeted fish species, overall species composition and any available biological information, as well as any interactions with non-target species such as sea turtles, seabirds and sharks. Highly summarized data in the form of EPO total catch and effort (number of hooks), month and 5° x 5° cell, are provided. Detailed information on species composition of non-target species and catch amounts (retained and discarded) is limited.

Logbook data

These data are available for small purse-seine vessels and pole-and-line vessels. Only retained catch is recorded, so the at-sea discards of target and bycatch species are unknown. Positional data are available in this dataset. Reporting of non-target species in the logbooks appears to be incomplete (see below).

Unloading information

Unloading information provided by canneries and other sources include a summary of the tuna catch by purse-seine, pole-and-line, recreational and unknown (or other) gear types. Positional data are not available in these records. Data are incomplete for non-tuna species.

Summary data reported by CPCs

Individual CPCs provide summary information for several fisheries: longline, gillnet, troll, and harpoon. Data are available by 5° area and month, and/or summarized for the year. Summary data are primarily available from longline fisheries (see below). Limitations to the reported catch data for longline gear include a combination of data types (i.e., data is reported in numbers or weights, or a combination of numbers and weights dependent on the CPCs providing the data). In addition, species may be pooled together into broad categories (e.g., “sharks” SAC-07-06b(ii)).

5. SPECIES COMPOSITION

5.1 Overall species composition

The fundamental basis for ERA is a comprehensive list of all species that are impacted, either directly or indirectly, by the activities of individual fisheries or gear types within a fishery. A list of species reported to have interacted with each gear type in 2014 is presented in Table 1. It is clear that some animals are reported in aggregated taxonomic groups (e.g., unidentified sharks, billfishes, large fishes etc.) rather than by species. For an ERA, this is problematic as species within an aggregate group can have different life history characteristics and/or susceptibility traits to a particular gear. Of the 117 types of animals reported in the catch data, 33 were pooled into an aggregate group (hereafter termed “pooled groups”) with varying levels of taxonomic resolution. For the purposes of conducting an ERA, animals not identified to species are required to be omitted from the analysis (Arrizabalaga *et al.* 2011)². Following these guidelines, Table 1 shows a wide range of species (n=84) with varying degrees of life history characteristics: 6 species of tunas, 6 billfishes, 7 dolphins, 27 sharks, 6 rays, 19 large fishes, 10 small fishes, and 3 turtles.

5.2 Purse-seine fishery, large vessels

5.2.1 Dolphin sets

Catch data for 41 species were reported for purse-seine dolphin sets. Catch of an additional 14 pooled groups were also reported (Fig. 1). Thus, the potential species list for this fishery includes species in the following categories: 4 tunas, 6 billfishes, 6 dolphins, 10 sharks, 5 rays, 6 large fishes, 3 small fishes, and 1 turtle.

5.2.2 Unassociated tuna-school sets

Catch data for 36 species were reported for purse-seine unassociated sets. Catch of an additional 19 pooled groups were also reported (Fig. 2). Thus, the potential species list for this fishery includes species in the following categories: 5 tunas, 6 billfishes, 9 sharks, 6 rays, 6 large fishes, and 4 small fishes.

5.2.3 Floating-object sets

Catch data for 55 species were reported for purse-seine floating-object sets. Catch of an additional 24 pooled groups were also reported (Fig. 3). Thus, the potential species list for this fishery includes species in the following categories: 5 tunas, 6 billfishes, 1 dolphin, 12 sharks, 6 rays, 14 large fishes, 9 small fishes, and 2 turtles.

² Arrizabalaga, H., P. de Bruyn, G.A. Diaz, H. Murua, P. Chavance, A.D. de Molina, D. Gaertner, J. Ariz, J. Ruiz, and L.T. Kell. 2011. Productivity and susceptibility analysis for species caught in Atlantic tuna fisheries. *Aquatic Living Resources* 24(01): 1-12.

5.3 Purse-seine fishery, small vessels

Catch data for 4 species of tunas and 1 pooled group of tunas (Fig. 4) were reported for small purse-seine unassociated sets. The species list for small purse-seine floating-object sets was more extensive than that of unassociated sets, largely due to the few trips that carried observers. Overall, catch data for 30 species and an additional 5 pooled groups were reported: 5 tunas, 5 billfishes, 4 sharks, 2 rays, 7 large fishes, and 7 small fishes; the non-tuna species accounted for a very small proportion (<0.2%) of the reported catch (Fig. 5). Based on comparison of the species list from the few observed trips of small vessels and the species list from trips with only logbook information (the source of almost all catch information for small purse-seine vessels), it appears that the non-tuna catch available from logbooks is unlikely to be fully representative of the suite of species that interact with the small purse-seine vessel fisheries. Comparison to the species list for large-purse-seine vessels yields a similar result, although some of the difference may be due to spatial effects due to the areas of operation of small and large purse-seine vessels ([SAC-07-07f\(i\)](#)). The small purse seiners have a smaller net size, catch fewer animals, have less carrying capacity, and do not fish as far offshore as compared to larger vessels.

5.4 Longline fishery

Catch data for 20 species were reported for the distant-water longline fisheries. An additional 9 pooled groups were also reported in the catch (Fig. 6). Thus, the potential species list for this fishery includes species in the following categories: 4 tunas, 6 billfishes, 4 sharks, 6 large fishes. The distant-water longline fisheries targeted primarily tunas and billfishes with <8% of the catch composed of non-target tunas and billfishes (Fig. 6). When we assessed individual reports of non-target catch for each CPC, shark catch ranged from 0.4% to 34%, and catches of large fishes ranged from 2.8% to 23.4%, potentially indicating that the catch of non-target species may not be fully representative of the fishery as a whole.

Catch data for 20 species and an additional 5 pooled groups were reported for the large-pelagic multi-species longline fisheries of the coastal States (Fig. 7). Thus, the potential species list for this fishery includes species in the following categories: 5 tunas, 5 billfishes, 8 sharks, and 2 large fishes. It has been noted that fleet coverage and data quality vary for these fisheries and reliable fishery statistics are deficient ([SAC-07-06b\(ii\)](#)). The main source of shark fishery data comes from inspection programs; some programs collect data on shark landings by species and fleet, while others pool all sharks into a single category ([SAC-07-06b\(ii\)](#)). However, based on available data, these fisheries mainly targeted billfishes, sharks, and dorado (Fig. 7). It is important to note the target species varies seasonally ([SAC-07-06b\(ii\)](#)) and seasonality was not assessed in this report.

5.5 Gillnet fishery

Catch data for 6 species were reported and the potential species list for this fishery includes species in the following categories: 1 tuna, 1 billfish, 3 sharks, and 2 large fishes (Table 1).

5.6 Harpoon fishery

Catch data for only the target species, swordfish, was reported for the harpoon fishery (Table 1).

5.7 Recreational fishery

Catch data were reported for 4 tuna species, 1 species classified as a large fish (but is in the tuna family

Scombridae), and 1 pooled group of tunas in the recreational fishery. No data was reported for non-tuna species (Table 1).

5.8 Troll fishery

Catch data for the troll fishery consisted only of catches of albacore (Table 1).

5.9 Other/Unknown

Catch data were reported for 27 species under the category other and/or unknown gear: 3 tunas, 2 billfishes, 21 sharks, and 1 large fish (Fig. 8). An additional 9 pooled groups were also reported in the catch. The majority of the catch consisted of bigeye tuna and swordfish, although the species composition of the catch was diverse (Fig. 8).

6. DISCUSSION

The purpose of this paper was to review the availability and reliability of species composition and species-specific catch data within each fishery that operated in the EPO during 2014. Two main shortcomings in the reported catch data were identified. First, it is not clear if catch of non-target species was fully reported. In these cases, it could not be reliably determined whether non-target species were caught but not reported (i.e., a false negative), or if they were not caught. For fisheries other than those of large purse seiners, species composition catch data for non-target species is severely lacking. The current resolutions in place do not require CPCs to inform the IATTC of at-sea discards nor to report retained catch of non-target species. In the case of small purse-seine vessels, almost all data for non-tuna species was derived from the few trips (<5%; [SAC-07-07f\(i\)](#)) that carried an observer. This strongly suggests that non-tuna species are under-represented in the abstracted logbook information of small purse-seine vessels. By using the currently available data *prima facie* for fisheries other than those of large purse seiners, the outcomes of ERAs will be severely compromised as excluded species will erroneously appear to be unaffected by a particular fishery. This could lead to any number of false negative incidences where conclusions will be made that some species are not vulnerable or at risk of being negatively impacted by a fishery. For example, some shark species and the giant manta had the highest overall vulnerability scores in the preliminary PSAs for the large purse-seine fishery in the EPO ([SAC-02-12](#), [SAC-04-08](#), [SAC-06-09](#)), however, these species also may be impacted by other EPO fisheries with limited or non-existent bycatch data.

The second major shortcoming in the reported catch data is the occasional pooling of species data into broad categories (e.g., “sharks”), which is of limited use in an ERA as species within an aggregate group may have very different life history characteristics and/or susceptibility traits to a particular gear. Information on total catch (i.e., retained and discarded) for non-target and target species, at the species level, is required for developing a comprehensive and cumulative ERA for the EPO fisheries.

Efforts to improve data collection for non-target species are underway, in particular, a current project to improve data collection for shark fisheries in the EPO ([SAC-07-06b\(ii\)](#)). However, revisions to resolutions on data provision will be necessary to obtain the full spectrum of species impacted by the various fisheries operating in the EPO. At present, resolutions mainly focus on requiring data for tuna and tuna-like species (primarily billfishes), but lack an explicit mandate for reporting on non-target species. Recommendations for improving data collection are provided in [SAC-07-06b\(iii\)](#).

Data findings in this report will be reviewed with the Ecosystem Specialist in August 2016 and a plan

to progress this work will be devised.

7. ACKNOWLEDGEMENTS

We would like to thank Shane Griffiths (CSIRO: Oceans and Atmosphere Flagship, Dutton Park, Queensland, Australia), Mark Maunder and Brad Wiley for reviewing this document.

Table 1. Species reported to have interacted with the fishery for tunas and billfishes in the EPO in 2014. PS=Purse seine, large class 6 vessels (carrying capacity >363 metric tons) and small class 1-5 vessels (carrying capacity ≤363 metric tons). DOL=sets on tunas associated with dolphins, NOA=sets on unassociated tuna schools, OBJ=sets on tunas associated with floating objects. LP=Pole and Line, DW LL=distant-water tuna-billfish longline fisheries, CS LL=large-pelagic multi-species longline fisheries of coastal States, GN=Gillnet, HAR=Harpoon, RG=Recreational, LTL=Troll, OTR/NK=Unknown or Other. ¹=pooled group where catch was not reported to a single species.

Group Name	Scientific Name	Common Name	PS, large vessels			PS, small vessels		LP	DW LL	CS LL	GN	HAR	RG	LTL	OTR/NK	
			DOL	NOA	OBJ	NOA	OBJ									
TUNAS	<i>Thunnus albacares</i>	Yellowfin	√	√	√	√	√	√	√			√		√		
	<i>Thunnus obesus</i>	Bigeye	√	√	√	√	√	√	√					√		
	<i>Katsuwonus pelamis</i>	Skipjack	√	√	√	√	√	√	√			√				
	<i>Thunnus alalunga</i>	Albacore						√	√			√	√			
	<i>Thunnus orientalis</i>	Pacific bluefin		√						√		√		√		
	<i>Euthynnus lineatus</i>	Black skipjack	√	√	√	√	√		√							
	<i>Auxis thazard</i> , <i>A.roche</i> ¹	Bullet and frigate tunas	√	√	√											
	<i>Sarda chiliensis</i> , <i>S. orientalis</i> ¹	Eastern Pacific and striped bonito		√		√	√						√			
	<i>Thunnini</i> ¹	Tunas, nei							√						√	
	BILLFISHES	<i>Xiphias gladius</i>	Swordfish	√	√	√				√	√	√	√			√
<i>Istiompax indica</i>		Black marlin	√	√	√				√	√						
<i>Makaira nigricans</i>		Blue marlin	√	√	√				√	√						
<i>Kajikia audax</i>		Striped marlin	√	√	√				√	√						
<i>Istiophorus platypterus</i>		Indo-Pacific sailfish	√	√	√				√						√	
<i>Tetrapturus angustirostris</i>		Shortbill spearfish	√	√	√				√	√						
<i>Makaira</i> , <i>Tetrapturus</i> ¹		Marlin, nei	√	√	√											
Istiophoridae, Xiphiidae ¹		Marlin, sailfish, spearfish, nei		√	√				√	√					√	
Istiophoridae, Xiphiidae ¹		Billfish, nei	√	√	√										√	
DOLPHINS		<i>Tursiops truncatus</i>	Bottlenose dolphin	√												
		<i>Delphinus delphis</i>	Common dolphin	√												
		<i>Stenella longirostris</i>	Eastern spinner dolphin	√												
		<i>Stenella longirostris</i>	Whitebelly spinner dolphin	√												
	<i>Stenella attenuata</i>	Offshore spotted dolphin	√													
	<i>Stenella coeruleoalba</i>	Striped dolphin	√													
	<i>Steno bredanensis</i>	Roughtoothed dolphin													√	
	Delphinidae ¹	Dolphin, nei	√													

Group Name	Scientific Name	Common Name	PS, large vessels			PS, small vessels		LP	DW LL	CS LL	GN	HAR	RG	LTL	OTR/NK
			DOL	NOA	OBJ	NOA	OBJ								
SHARKS	<i>Alopias vulpinus</i>	Thresher shark	√	√	√						√				√
	<i>Alopias pelagicus</i>	Pelagic thresher shark	√	√	√					√	√				
	<i>Alopias superciliosus</i>	Bigeye thresher shark	√	√	√					√					√
	<i>Alopias</i> spp. ¹	Thresher shark, nei	√	√	√				√						√
	<i>Carcharhinus falciformis</i>	Silky shark	√	√	√				√	√					√
	<i>Carcharhinus longimanus</i>	Oceanic whitetip shark			√					√					√
	<i>Carcharhinus limbatus</i>	Blacktip shark	√							√					√
	<i>Carcharhinus leucas</i>	Bull shark													√
	<i>Carcharhinus obscurus</i>	Dusky shark													√
	<i>Carcharhinus plumbeus</i>	Sandbar shark			√										
	Carcharhinidae ¹	Requiem sharks, nei	√	√	√										√
	<i>Sphyrna lewini</i>	Scalloped hammerhead shark	√	√	√										√
	<i>Sphyrna zygaena</i>	Smooth hammerhead shark	√	√	√										√
	<i>Sphyrna mokarran</i>	Great hammerhead	√	√	√										
	<i>Sphyrna</i> spp. ¹	Hammerhead shark, nei	√	√	√				√	√					√
	<i>Isurus oxyrinchus</i>	Short fin mako shark	√	√	√				√	√		√			√
	<i>Isurus paucus</i>	Longfin mako shark							√						
	<i>Isurus</i> spp. ¹	Mako shark, nei		√	√				√	√					√
	<i>Prionace glauca</i>	Blue shark	√	√	√				√	√					√
	<i>Negaprion brevirostris</i>	Lemon shark													√
	<i>Nasolamia velox</i>	Whitenose shark													√
	<i>Galeocerdo cuvier</i>	Tiger shark													√
	<i>Rhizoprionodon longurio</i>	Pacific sharpnose shark													√
	<i>Triakis semifasciata</i>	Leopard shark													√
	<i>Ginglymostoma cirratum</i>	Nurse shark													√
	<i>Squatina californica</i>	Pacific angelshark													√
	<i>Carcharodon carcharias</i>	Great white shark													√

Group Name	Scientific Name	Common Name	PS, large vessels			PS, small vessels		LP	DW LL	CS LL	GN	HAR	RG	LTL	OTR/NK
			DOL	NOA	OBJ	NOA	OBJ								
RAYS	<i>Lamna ditropis</i>	Salmon shark													√
	<i>Galeorhinus galeus</i>	Tope shark													√
	<i>Rhincodon typus</i>	Whale shark			√										
	<i>Squalus acanthia</i>	Picked dogfish, Spiny dogfish							√						
	<i>Euselachii</i> ¹	Sharks, nei	√	√	√										
	<i>Euselachii</i> ¹	Various sharks nei						√							√
	<i>Pteroplatytrygon violacea</i>	Pelagic stingray	√	√	√										
	<i>Manta birostris</i>	Giant manta		√	√										
	<i>Mobula tarapacana</i>	Chilean devil ray	√	√	√										
	<i>Mobula munkiana</i>	Munk's devil ray	√	√	√										
	<i>Mobula thurstoni</i>	Smoothtail manta	√	√	√		√								
	<i>Mobula japonica</i>	Spinetail manta	√	√	√										
	<i>Mobula spp.</i> ¹	Manta ray, nei	√	√	√										
	<i>Mobulidae</i> ¹	Manta rays	√	√	√										
	<i>Mobulidae,</i> <i>Dasyatidae</i> ¹	Rays, nei	√	√	√										
LARGE FISHES	<i>Coryphaena hippurus</i>	Common dolphinsfish	√	√	√		√		√						√
	<i>Coryphaena equiselis</i>	Pompano dolphinsfish	√		√										
	<i>Coryphaenidae</i> ¹	Dorado, mahi mahi, dolphin fish, nei		√	√				√		√				√
	<i>Acanthocybium solandri</i>	Wahoo	√	√	√				√		√				
	<i>Elagatis bipinnulata</i>	Rainbow runner	√	√	√										
	<i>Seriola lalandi</i>	Yellowtail amberjack		√	√										√
	<i>Seriola rivoliana</i>	Longfin yellowtail			√										√
	<i>Seriola peruana</i>	Fortune jack			√										
	<i>Seriola spp.</i> ¹	Amberjacks, nei			√										
	<i>Seriola, Caranx spp.</i> ¹	Yellowtail		√	√										√
	<i>Caranx sexfasciatus</i>	Bigeye trevally			√										
	<i>Uraspis helvola</i>	Whitetongue jack			√			√							
	<i>Caranx spp.</i> ¹	Jacks, crevalles, nei	√	√	√										
	<i>Mola mola</i>	Ocean sunfish, Mola	√	√	√										
	<i>Ranzania laevis</i>	Slender sunfish			√										
<i>Masturus</i>	Sharptail mola			√											

Group Name	Scientific Name	Common Name	PS, large vessels			PS, small vessels		LP	DW LL	CS LL	GN	HAR	RG	LTL	OTR/NK
			DOL	NOA	OBJ	NOA	OBJ								
SMALL FISHES	<i>lanceolatus</i>														
	<i>Ruvettus pretiosus</i>	Oilfish						√							
	<i>Lepidocybium flavobrunneum</i>	Escolar						√							
	<i>Luvarus imperialis</i>	Luvar						√			√				
	<i>Lampris guttatus</i>	Opah			√			√			√				
	<i>Lampris</i> spp. ¹	Moonfish, opah, mambo						√							
	<i>Gasterochisma melampus</i>	Butterfly kingfish						√							
	<i>Scomber japonicus</i>	Chub mackerel											√		
	<i>Lobotes surinamensis</i>	Tripletail	√			√									
	<i>Sphyræna</i> spp. ¹	Great barracuda			√	√									
	Belonidae ¹	Needlefish nei				√									
	Bramidae ¹	Pomfrets, ocean breams nei						√							
	<i>Lutjanus</i> spp. ¹	Snappers nei								√					
	Osteichthyes ¹	Large fish, nei			√	√									
	<i>Canthidermis maculata</i>	Ocean triggerfish	√	√	√										
	<i>Aluterus monoceros</i>	Unicorn filefish	√	√	√										
	<i>Aluterus scriptus</i>	Scrawled filefish				√									
	<i>Aluterus</i> spp. ¹	Leatherjacket filefishes	√		√										
	<i>Kyphosus analogus</i>	Blue-bronze sea chub				√									
	<i>Kyphosus elegans</i>	Cortez sea chub				√									
	<i>Kyphosus</i> spp. ¹	Drummer				√									
	<i>Sectator ocyurus</i>	Bluestriped chub				√									
	<i>Decapterus macarellus</i>	Mackerel scad			√	√									
	<i>Naucrates ductor</i>	Pilotfish			√	√									
	<i>Exocoetus volitans</i>	Tropical two-wing flyingfish	√												
	<i>Remora remora</i>	Shark sucker				√									
	Balistidae ¹	Triggerfishes, durgons, nei				√									
	Balistidae, Monocanthidae ¹	Triggerfishes, filefishes				√									
Osteichthyes ¹	Small fish, nei	√	√	√											
TURTLES	<i>Lepidochelys olivacea</i>	Olive ridley turtle				√									
	<i>Caretta caretta</i>	Loggerhead turtle				√									

Group Name	Scientific Name	Common Name	PS, large vessels			PS, small vessels		LP	DW LL	CS LL	GN	HAR	RG	LTL	OTR/NK
			DOL	NOA	OBJ	NOA	OBJ								
UNID./ OTHERS	<i>Eretmochelys imbricata</i>	Hawksbill turtle	√												
	Testudinata ¹	Marine turtles, nei			√										
	Pisces ¹	Fish, nei			√										
Total number of species and pooled groups			55	55	79	5	35	2	29	25	7	1	6	1	36

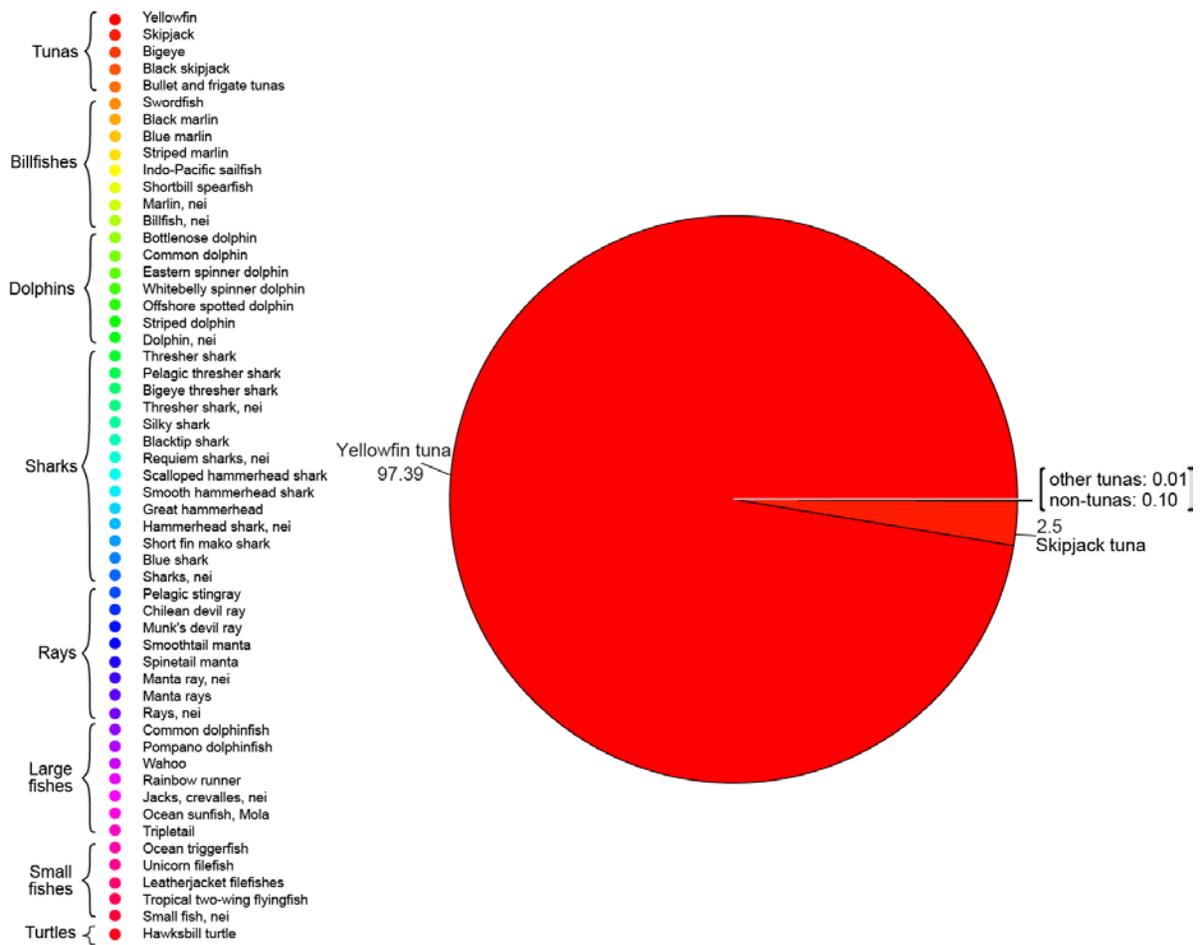


Figure 1 Catch composition in percent reported metric tons for large purse-seine vessels, sets on dolphins in 2014.

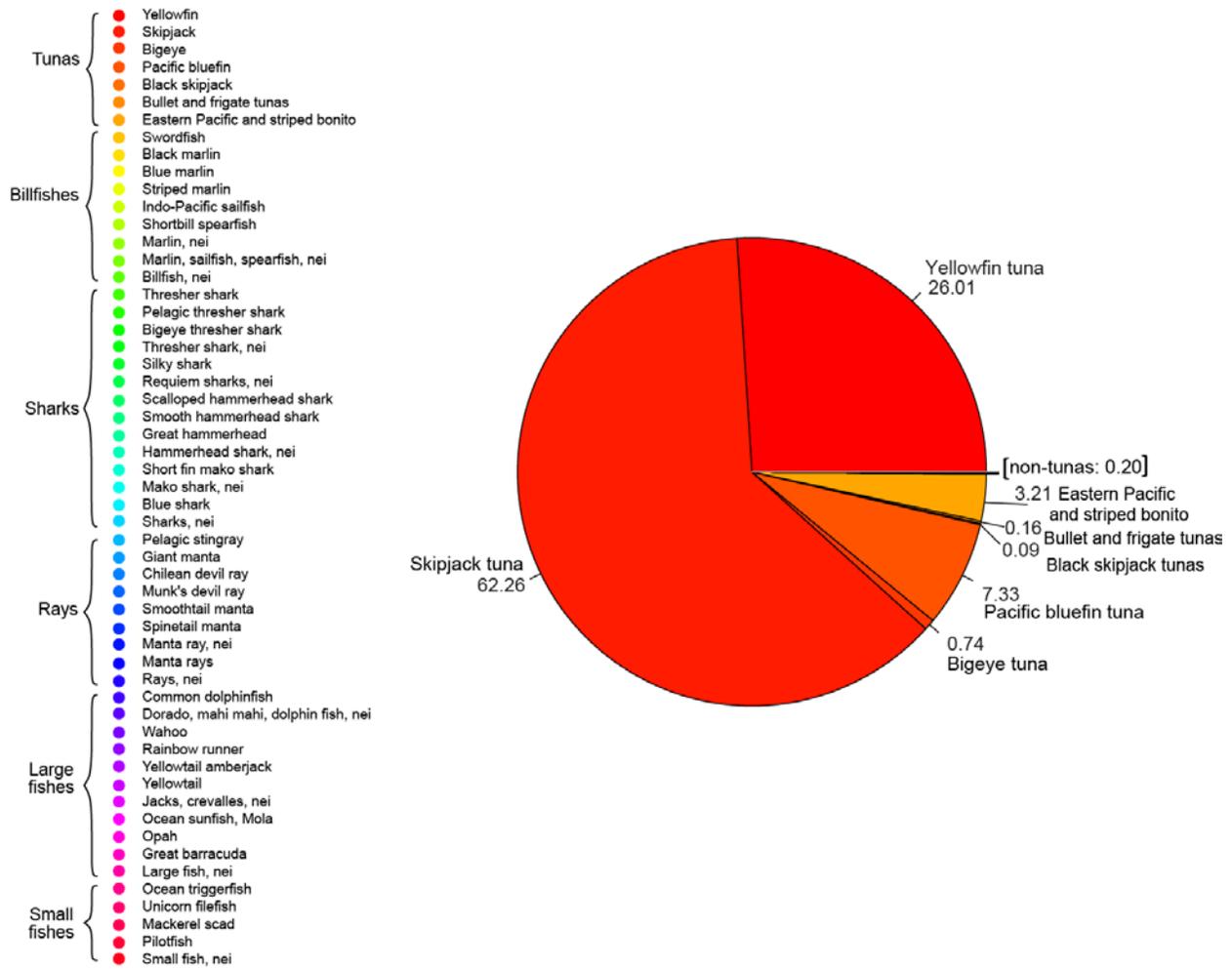


Figure 2 Catch composition in percent reported metric tons for large purse-seine vessels, sets on unassociated tuna schools in 2014.

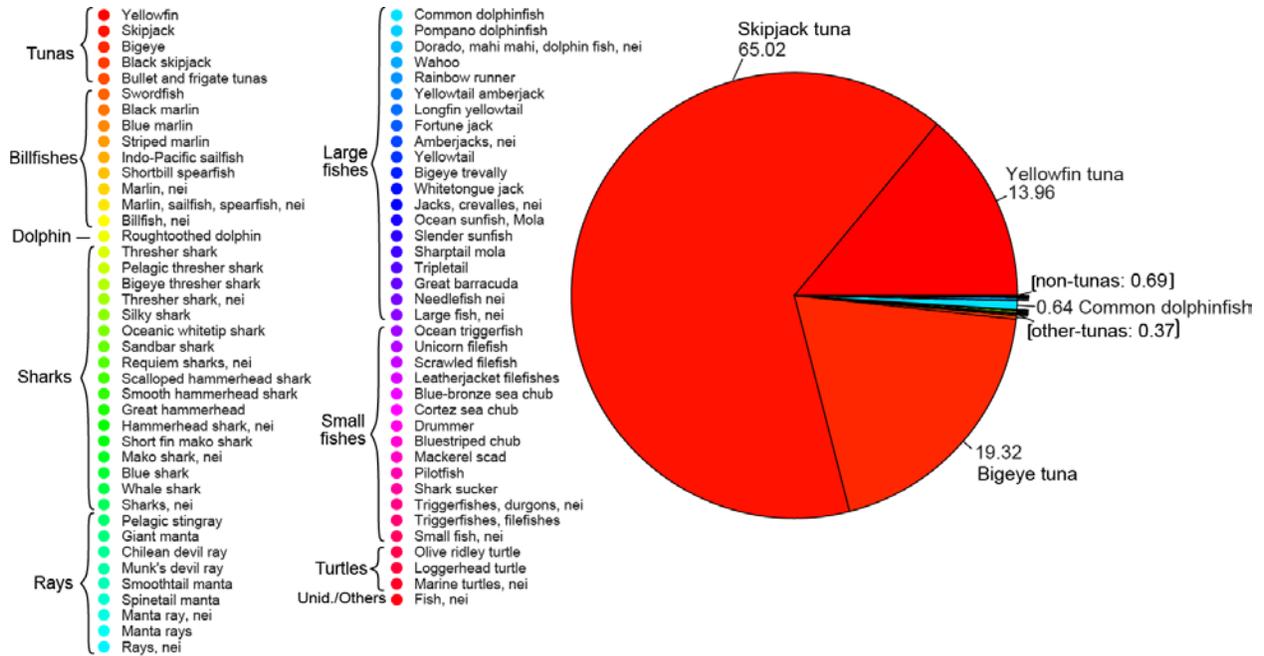


Figure 3 Catch composition in percent reported metric tons for large purse-seine vessels, sets on floating objects in 2014.

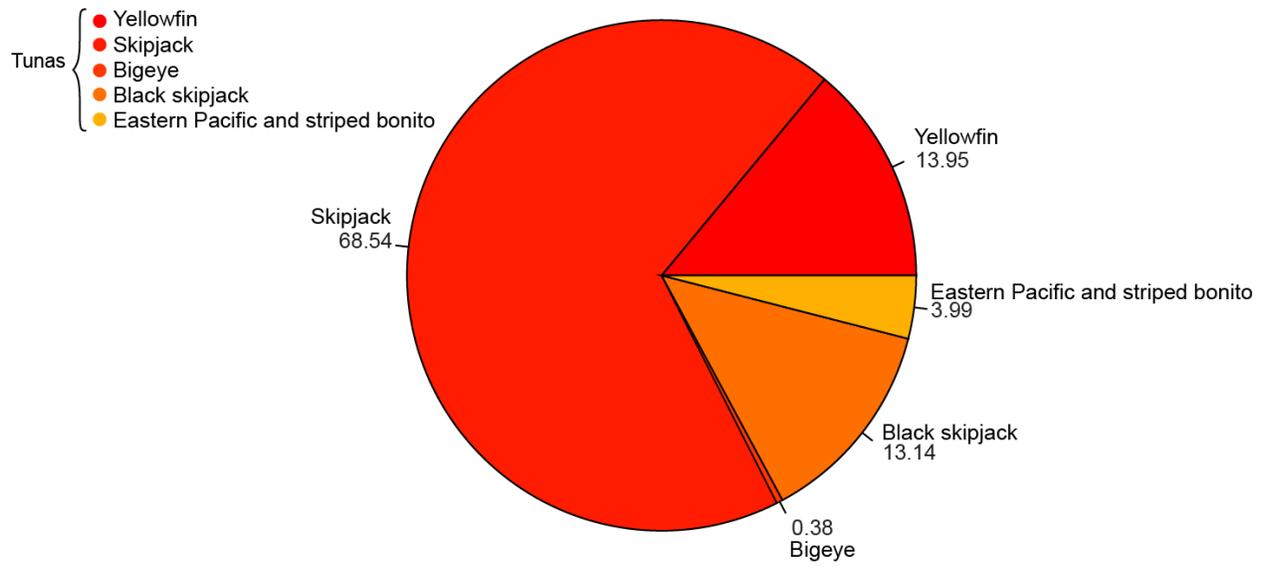


Figure 4 Catch composition in percent reported metric tons for small purse-seine vessels, sets on unassociated tuna schools in 2014.

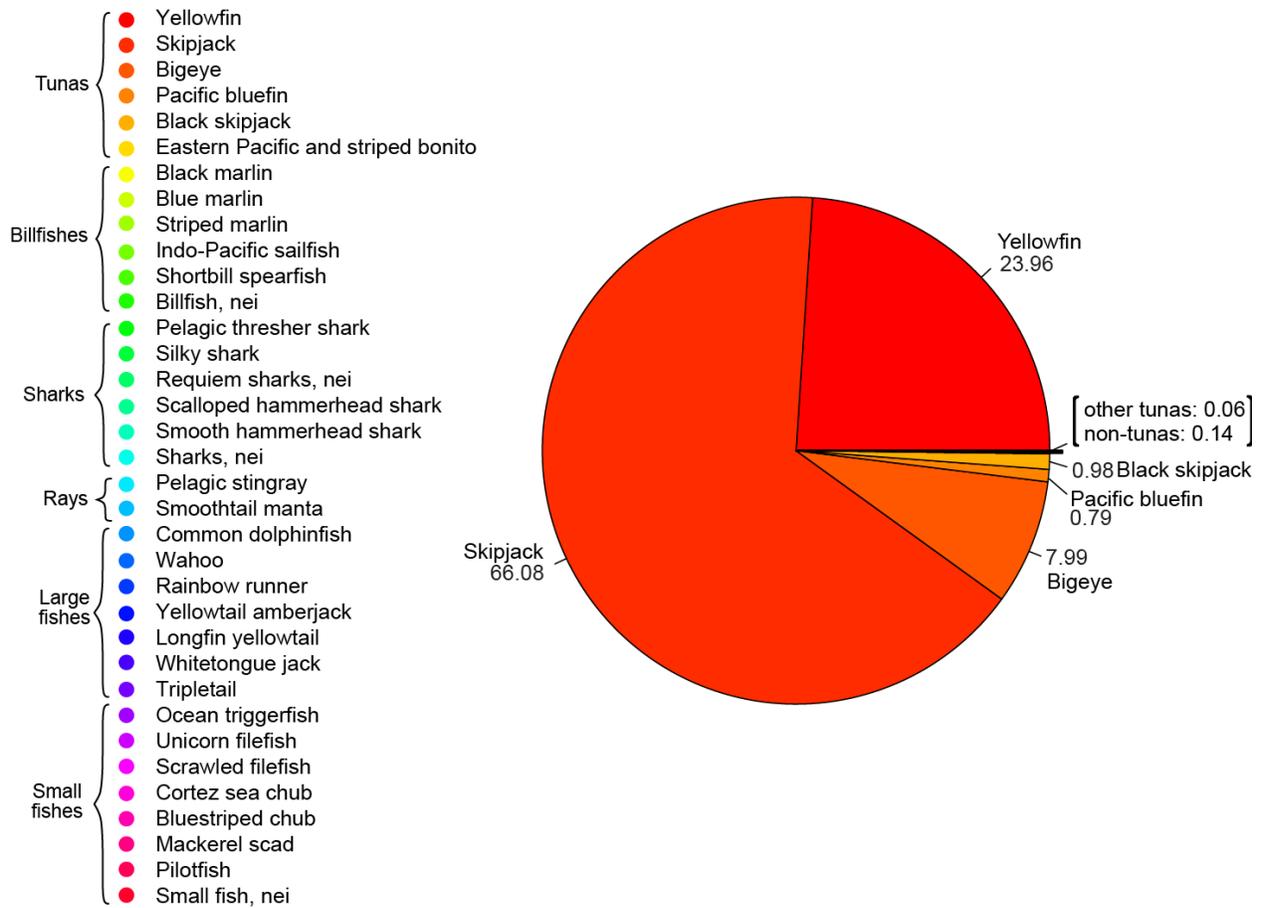


Figure 5 Catch composition in percent reported metric tons for small purse-seine vessels, sets on floating objects in 2014.

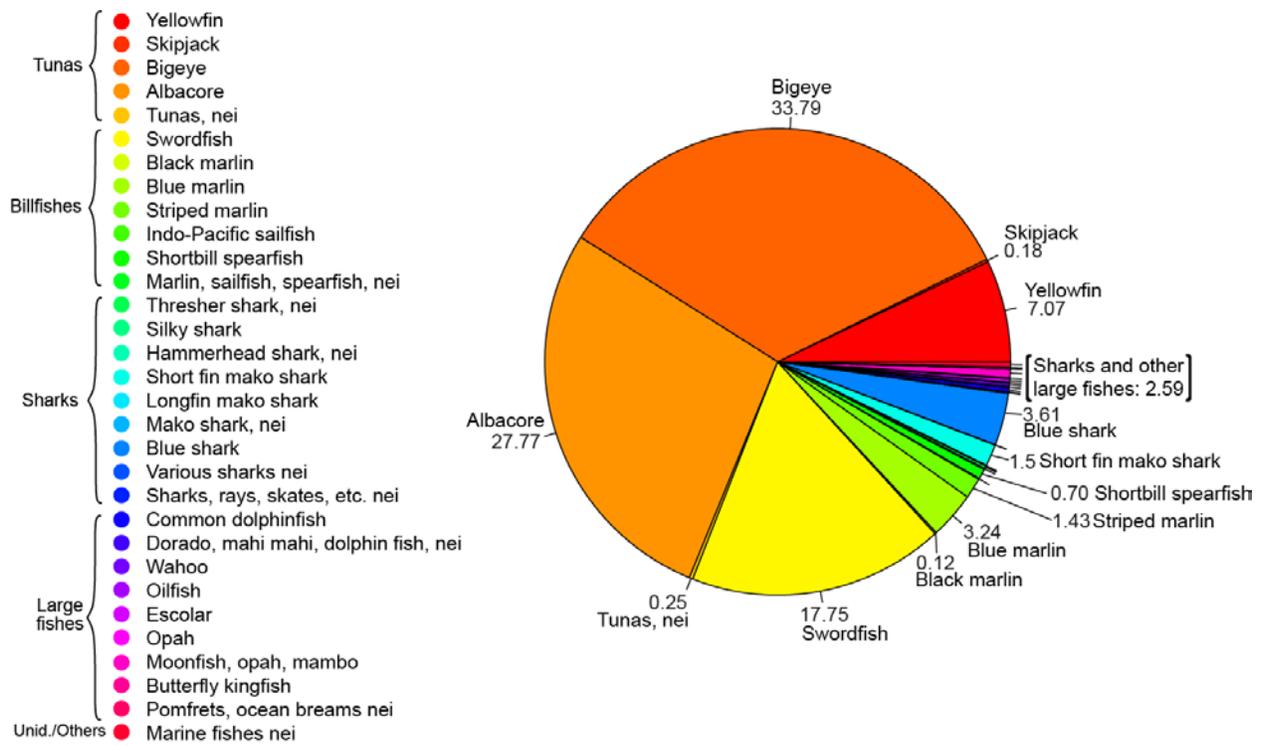


Figure 6 Catch composition in percent reported metric tons for the distant-water longline fisheries in 2014.

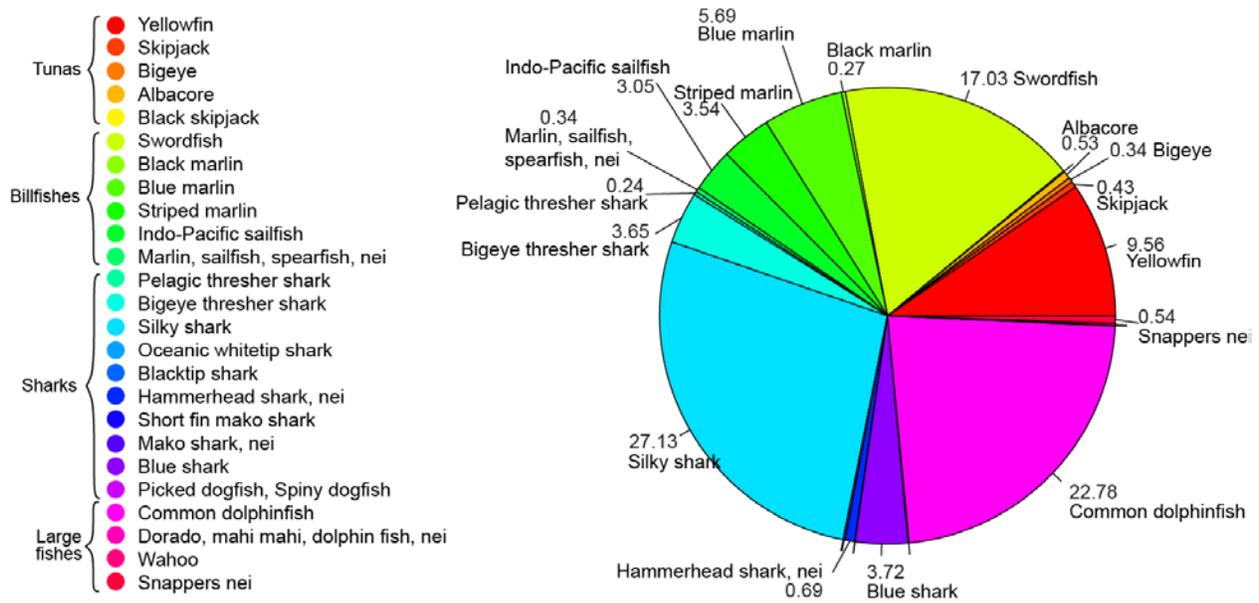


Figure 7 Catch composition in percent reported metric tons for the large-pelagic multi-species longline fisheries of the coastal States in 2014. Percentages shown in the figure do not sum to 100; some small values were omitted for visualization purposes.

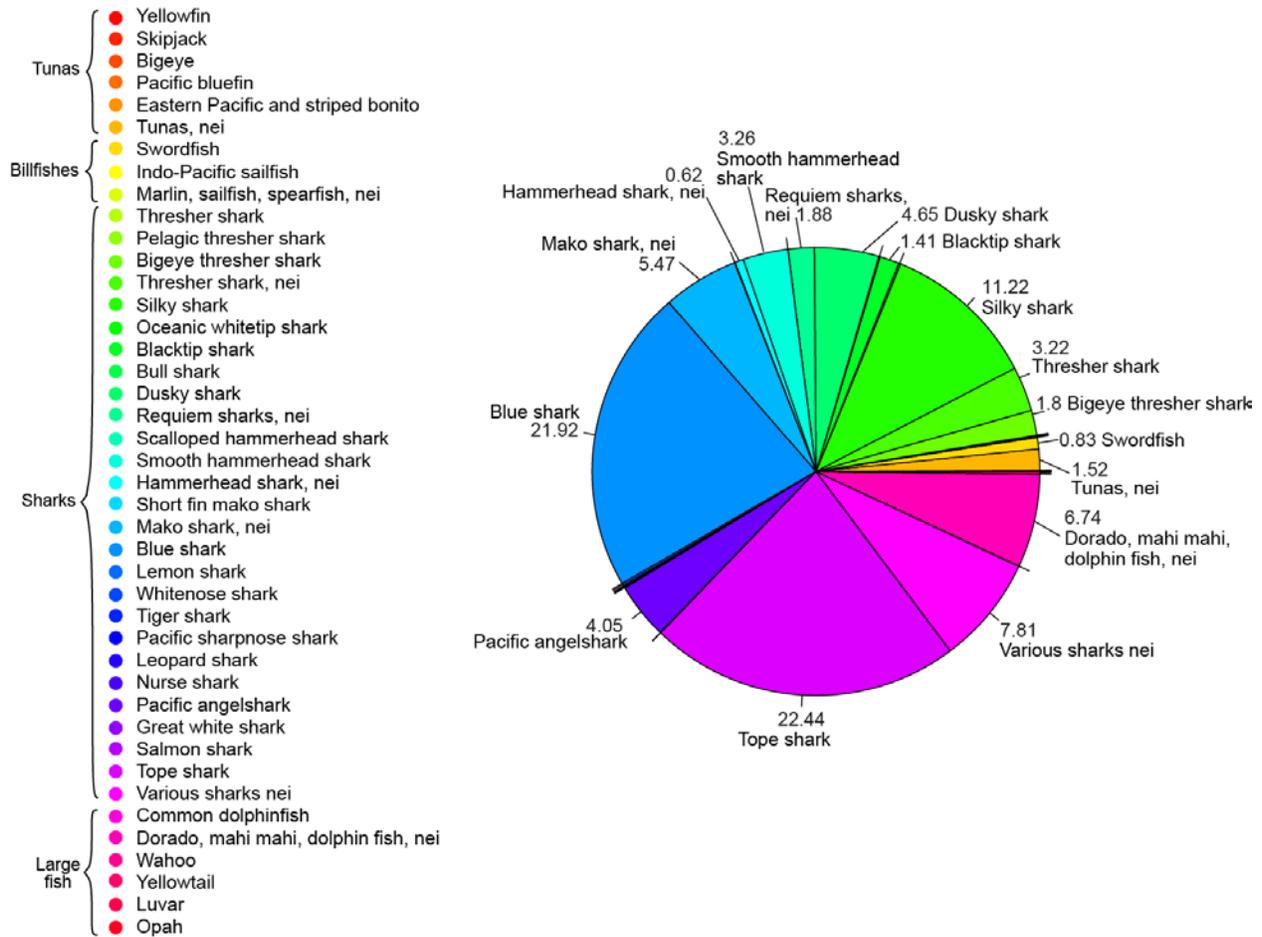


Figure 8 Catch composition in percent reported metric tons for other/unknown gear in 2014. Percentages shown in the figure do not sum to 100; some small values were omitted for visualization purposes.