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SUMMARY

U.S. fishing fleets harvest highly migratory species (HMS), including tuna and tuna-like species, from the North Pacific Ocean (NPO) in the U.S. exclusive economic zones and in the high seas. Fisheries operate within the eastern Pacific Ocean (EPO) and western and central Pacific Ocean (WCPO) from coastal waters of North America to the archipelagos of Hawaii, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), and American Samoa. Small-scale gillnet, harpoon, pole-and-line, troll, and handline fleets operate primarily in coastal waters; while most of the tuna catches are from large-scale purse seine, albacore troll, and longline fleets that operate both within the U.S. exclusive economic zone and on the high seas. In addition, thousands of small-scale troll and handline vessels operate in waters of the tropical Pacific; however, these fleets account for a small fraction of the total tuna catch.

In 2024, NOAA Fisheries continued research on Pacific tunas and associated species at its Southwest and Pacific Islands Fisheries Science Centers, often in collaboration with scientists from other organizations. Stock assessment research on tuna and tuna-like species was conducted primarily through collaboration with participating scientists of the International Scientific Committee (ISC) for Tuna and Tuna-Like Species in the NPO and international Regional Fisheries Management Organizations. Two noteworthy studies could help improve ISC stock assessments (Brooks and Brodziak 2024; Minte-Vera et al. 2024). While another study could improve assessments for small pelagic fish, such as Pacific saury used as bait for pelagic fisheries (Hsu et al. 2024).

Research studies were conducted on monitoring and socio-economics for fisheries operating in the waters of the U.S. Pacific coast, Hawaiian Islands, U.S. territories, and the high seas; on the biology of tunas, tuna-like species, and bycatch species caught in these fisheries; and on the marine ecosystems where these fisheries occur. NOAA Fisheries scientists also produced reports summarizing monitoring data collected for pelagic fisheries and fisher observations for small boat fisheries operating out of Hawaii, Guam, and the CNMI.

Highlighted research includes:

- Stock assessment research (Brooks and Brodziak 2024; Minte-Vera et al. 2024; Hsu et al. 2024).
- The effects of climate change on marine ecosystems (Eddy *et al.,* 2025);
- Changes in marine food web productivity across epipelagic, mesopelagic, and bathypelagic zones (Calhoun-Grosch *et al.,* 2024);
- The ecological role of small pelagic fish in food webs (Ruzicka *et al.,* 2025);
- Migration patterns of Pacific bluefin tuna (Uematsu *et al.,* 2024);
- Diet composition of mahimahi (*Coryphaena hippurus*) (Himmelsbach *et al.,* 2024);
- Sample design strategies for estimating bigeye tuna (*Thunnus orientalis*) catch in purse seine fisheries (Lennert-Cody *et al.* 2024);
- Seafood marketing dynamics (Advani *et al.,* 2024; Chan *et al.,* 2025);
- Shark biology (Skelton *et al.,* 2024; Stock *et al.,* 2024) and movement patterns (Vaudo *et al.,* 2024).

1. INTRODUCTION

Various U.S. fishing fleets harvest tuna and tuna-like species in the NPO. Large-scale commercial purse seine, albacore (*Thunnus alalunga*) troll, and longline fisheries operate both in coastal waters and in the high seas. Small-scale commercial fisheries generally operate in coastal waters along the North American coast using purse seine, gillnet, harpoon, troll, handline, and hook-and-line gears and around the archipelagos of Hawaii, Guam, CNMI, and American Samoa using troll and handline gears. Recreational sport fisheries also operate in these areas, including guided charter trips. In some areas, fishers may sell fish and retain fish for personal use. Overall, the range of U.S. fisheries harvesting tuna and tuna-like species in the NPO is extensive, from coastal waters of North America to the U.S. territories of Guam, CNMI, and American Samoa in the WCPO, and from the equatorial region to the upper reaches of the North Pacific Transition Zone.

In the U.S., the federal government (NOAA Fisheries) shares monitoring responsibilities for tunas and bill- fishes with partner fisheries agencies in the states of California, Oregon, Washington, Hawaii, and territories of American Samoa, Guam, and the CNMI. NOAA fisheries offices based in California (West Coast Regional Office, WCRO, and Southwest Fisheries Science Center, SWFSC) and in Hawaii (Pacific Islands Regional Of- fice, PIRO, and the Pacific Islands Fisheries Science Center, PIFSC) monitor HMS fisheries catch and effort and biological information from landings and sales records, fisher self-reported logbooks, fisheries observer data, and creel surveys (that may include shoreside fisher interviews, biological sampling, and collection of effort data). In California, Washington, and Oregon, landings receipts are collected by state agencies and maintained in the federally-funded Pacific Fisheries Information Network (PacFIN) data system at the Pacific States Marine Fisheries Commission (PSMFC). State agencies also collect fisher reports (logbooks) and size composition data for some fisheries. In the WCPO, monitoring by U.S. territory partner agencies includes market sampling and creel surveys of fishery activities and is managed by PIFSC and coordinated by the federally-funded Western Pacific Fishery Information Network (WPacFIN). Together, the SWFSC, WCRO, PIFSC, and PIRO share responsibilities for reporting on the data collected from the U.S. Pacific fisheries for tuna and tuna-like species.

This report provides information on the number of active vessels by fleet and their catches of tunas and billfishes in the NPO based on the data available through 15 March 2025. The U.S. fisheries data reported for 2024 are considered preliminary. Although this report focuses on tunas and billfishes, some of the U.S. fisheries catch other pelagic species important to the fishing fleets and local economies. Catch data for these species are not reported here but are included in the U.S. data submissions to the ISC for 2024.

NOAA Fisheries also conducts scientific research in support of marine resource conservation and management both domestically and internationally. These studies include stock assessments, biological and oceanographic studies, socio-economic analysis, and more. This report includes highlights of recent and ongoing scientific work by NOAA Fisheries of interest to the ISC.

2. FISHERIES

2.1. Purse Seine

Currently, the U.S. purse seine fishery consists of two separate fleets, one composed of large purse seine vessels that operate mostly in the WCPO (most of effort is within the WCPFC management area but some is in the IATTC management area), and a small coastal purse seine fleet that operates in the EPO off the coast of Southern California. Prior to 1995, the purse seine fleet targeted free-swimming schools of tuna in the WCPO and fished on tuna schools associated with dolphins in the EPO. Since 1995, most catches in the WCPO have been associated with fish aggregation devices (FADs) or other floating objects. Historically, most of the U.S. purse seine tuna catch was from the EPO where the fishery began in the 1950s. However, around 1993, fishing operations shifted to the WCPO as many vessels moved in response to dolphin conservation measures in the EPO. Fishing became possible in the WCPO when access was granted to the U.S. by the South Pacific Tuna Treaty (SPTT) in 1987. The WCPO purse seine fleet has generally operated in areas between 10°N and 10°S latitude and 130°E and 150°W longitude. However, in recent years the fishing effort has declined with a reduced spatial distribution. In 2024, fishing effort was limited to above the equator to 10°N latitude and between 170°E and 130°W longitude (Figure 1). The number of unique large purse seine vessels fishing north of the equator in the WCPO has fluctuated from a high of 74 vessels in 1988 to a low of 11 in 2006. In 2024, 13 large purse seine vessels fished north of the equator around the WCPO, which was below the 5-year average of 22 vessels.

The Inter-American Tropical Tuna Commission (IATTC) monitors the purse seine fleets fishing in the EPO; while the U.S. purse seine vessels fishing in the WCPO are monitored by NOAA Fisheries under the SPTT (since 1988). The SPTT requires submission of purse seine landings data and fisher self-reported logbooks with logbooks at 100% coverage of fishing operations in the WCPO. Historically, catch was sampled for species and size composition from vessels landing in American Samoa by NOAA Fisheries personnel or by Secretariat of the Pacific Community (SPC) samplers in other ports; however, this sampling program was discontinued. Instead, biological data are derived from fisheries observers with the Forum Fisheries Agency (SPTT Treaty Manager) placing observers on 100% of the purse seine trips in the WCPO. In the EPO, logbooks are submitted by vessel operators to either NOAA Fisheries or the IATTC, and landings data are obtained for each vessel trip from canneries or fish buyers. IATTC fishery observers are required on all large purse seine vessels in the EPO.

2.2. Longline

The U.S. longline fisheries targeting tuna and tuna-like species in the NPO includes fleets based in Hawaii, California, and American Samoa. The fishing fleets are separated into a deep-set sector defined by >15 hooks set between floats that targets bigeye tuna (*Thunnus obesus*) and a shallow-set sector with <15 hooks set between floats that targets swordfish (*Xiphias gladius*). The majority of effort and catch occur by the Hawaii-based deep-set fleet with a small subset of vessels that also participate in the shallow-set fishery and may land fish in California.

The Hawaii shallow-set fishery overlaps spatially and temporally with seasonal abundance of sea turtles, which resulted in recent closures in 2018 and 2019 when annual loggerhead sea turtle interaction limits were reached (34 loggerhead sea turtles in 2018; 17 loggerhead sea turtles in 2019). However, it is less likely that this fishery will close as there are no longer annual interaction limits on loggerhead sea turtles, the species most commonly interacted with by this fishery. Current regulations include an annual interaction limit of 16 leatherback sea turtles and trip limits of 5 loggerhead and 2 leatherback sea turtles.

In 2024, the U.S. longline fisheries operated in both the north and south Pacific Oceans with fishing in the NPO between 125°W to 180°W longitude and from 10°N to 40°N latitude (Figure 2). The total number of U.S. vessels fishing in the NPO was 149 vessels in 2024, which is slightly above the 5-year average of 148 vessels. The spatial distribution of catches of bigeye tuna, yellowfin tuna (*Thunnus albacares*), albacore tuna, and swordfish in the NPO were similar; however, the areas with the highest concentrations of swordfish catches are further north (between 30°N and 40°N) compared to the areas with the highest concentrations of tuna catches (between 10°N and 20°N; Figure 3).

The U.S. longline catch in the NPO is dominated by bigeye tuna with annual landings totaling over 4,000t annually for the past twenty years with a 2024 bigeye tuna catch of 6,129 t, which is below the 5-year average of 6,679 t. Swordfish was the dominant component of the longline catch from 1990 through 2000 with a peak catch of 4,834 t in 2000 and a low of 728 t in 2020. In 2024, the U.S. swordfish catch in the NPO was 1,018 t, which was slightly below the 5-year average of 1,048 t. Note that whole weights are used for reporting. However, in Hawaii and California, swordfish are generally landed headed, tailed, and gutted; tunas and large marlins are landed gilled and gutted; and other bony fishes landed whole. Landed weights are converted to whole weight using standard conversion factors.

The size distribution (in weight) of retained fish (that were landed) are shown by selected species of tuna and marlin for 2023 and 2024 in the Hawaii-based deep-set and shallow-set fisheries (Figure 4 through Figure 7). In the Hawaii deep-set fishery, there is a distinct bimodal size distribution for landed albacore tuna catch with the largest peak around 15 kg in 2023 but closer to 30 kg in 2024. For yellowfin tuna the largest peak in the size-frequency distribution occurs around 35 kg in both 2023 and 2024. The bigeye tuna size-frequency distribution in the deep-set fishery shows broader coverage across size classes compared to the shallow-set fishery, which has a much smaller sample size. The deep-set fishery had the largest peaks in the proportion of retained fish at around 35 kg and 20 kg in 2023 and 50 kg in 2024. Swordfish catch in both the deep-set and shallow-set fisheries is right-skewed with a larger proportion of fish caught at the smaller sizes in the range.

The Hawaii-, California-, and American Samoa- based longline fisheries are monitored by NOAA Fisheries through mandatory fisher reports (federal longline logbooks), landing reports, and fisheries observers. Log- books provide information on fishing effort, area fished, catch by species and amount, and other details of fishing operations. Commercial Marine Dealer landing reports are required by Hawaii's Division of Aquatic Resources (DAR) and California's Department of Fish and Wildlife (CDFW) and provide weight data for re- tained fish. Trip coverage rates are close to 100% for both logbooks and landing reports. Fisheries observers contracted by NOAA Fisheries provide information for fish species that are discarded, protected species in- teractions, length data for retained and discarded catch, and other data on vessel operations. Hawaii-based longline vessels have historically had about 20% coverage of deep-set fishing trips; however, coverage dropped to 17% in 2023 and to 13% in 2024 of fishing trips. While the shallow-set longline fishery has maintained coverage rates of 100%.

2.3. Albacore troll and pole-and-line

The U.S. troll and pole-and-line fisheries in the NPO consist of small and large vessels that target albacore with operations ranging between the U.S. West Coast and 160°W longitude with 2024 spatial distribution staying with the coast and 150°W (Figure 8 and Figure 9) with fishing usually from summer through fall. The fishery catches almost exclusively albacore with minor incidental catches of Pacific bluefin tuna (*Thunnus orientalis*), eastern Pacific bonito (*Sarda chiliensis lineolata*), yellowtail (*Seriola lalandi*), and mahimahi (*Coryphaena hippurus*).

NOAA fisheries monitor the U.S. albacore troll and pole-and-line fisheries through mandatory fisher reports (logbooks), dealer landing reports, and biological data collected from landed fish. Logbooks have been submitted to NOAA fisheries since 2005, and the requirements have been dictated by the Highly Migratory Species Fishery Management Plan. Since 1961, albacore size data have been collected from landings in Oregon and Washington ports by state staff, and sampling instructions and database maintenance have been provided by NOAA Fisheries.

In 2024, 357 vessels participated in the NPO fisheries, below the 5-year average of 369 vessels. The albacore catch in 2024 was 4,697 t – an increase from 3,651 metric tons in 2023. U.S. vessels accounted for just 0.6% of the high seas catch, a sharp decline from 20.6% the previous year. The nominal CPUE (catch per unit effort) rose to 142 albacore per day, up from 109 per day in 2023. The average price of albacore also increased, reaching $1.59 per pound in 2024, compared to $1.32 per pound in 2023.

Generally, sizes of albacore caught in the albacore troll and pole-and-line fishery range between 55 cm fork length (3.9 kg) and 90 cm (14.5 kg). Length-to-weight conversions are based on the methodology outlined in the paper "Revised Practical Solutions of Application Issues of Length-Weight Relationship for the North Pacific Albacore with Respect to the Stock Assessment," applied after data collection. In 2024, a total of 16,564 albacore were measured for length. The average sampling weight in 2024 was 6.5 kg, lower than the 2023 average of 7.4 kg. The weight distribution for landed albacore catch is shown for 2023 and 2024 (Figure 10).

2.4. Small Boat Fisheries

A large number of small vessels (typically around 8 m in length) operate from the archipelagos of Hawaii, Guam, and the CNMI and target tuna and tuna-like species in the NPO. The majority of fishers use tropical troll fishing gear with some fishers operating out of Hawaii using handline fishing gears. Generally these fishers make one-day fishing trips that may be for commercial, recreational, or subsistence purposes with trips often including fish that are both sold and retained for personal use. Commercial fishing trips may also include charter fishing trips where fish are not sold but instead profit is derived from paid clients. Generally commercially sold fish are landed whole with some catch gilled and gutted. Standard conversion factors are applied for any processed fish as whole weights are used for reporting.

The Hawaii-based tropical troll and handline fisheries are monitored through Hawaii DAR Commercial Fish Catch reports and Commercial Marine Dealer landing reports. Fisher catch reports are required for trips by fishers that have commercial permits (including charter fishers) no matter if fish are being sold on a trip. However, if fishing trips are performed solely for subsistence, personal use, or recreational purposes and a fisher is not commercially permitted, then no catch reports are required.

Territorial troll data are monitored through creel surveys by CNMI Division of Fish and Wildlife (DFW) and Guam Division of Aquatic and Wildlife Resources (DAWR) staff. Size composition and catch and effort data are collected through shoreside interviews of fishers, with additional effort data collected through logging boat activity across the islands. The sampling data are entered into WPacFin data warehouse, and estimates of total catch and effort are derived from these data.

In 2024, a total of 1,896 tropical troll and handline vessels operated in the NPO. The 2024 total retained catch from tropical troll and handline fisheries in the NPO was 962 t, which was below the 5-year average (1,275 t). The catch composition has been similar in the last 5 years with the majority of troll catch from yellowfin and skipjack tuna (*Katsuwonus pelamis*) with other catch mostly composed of mahimahi, blue marlin (*Makaira nigricans*), and wahoo (*Acanthocybium solandri*), and the majority of handline catch from yellowfin and bigeye tuna. In 2024 catch consisted of 374 t of yellowfin tuna, 319 t skipjack tuna, 136 t blue marlin, 82 t bigeye tuna, with remaining catch from other pelagic species, mostly wahoo and mahimahi.

The size distributions of tunas (skipjack; yellowfin; and bigeye) and marlins (striped marlin, *Kajikia audax*; and blue marlin) caught in the Hawaii tropical troll and handline fishery are summarized for 2023 and 2024 based on landed fish weights obtained from Hawaii DAR dealer data (Figure 11 through Figure 13).

2.5. Drift Gillnet

The U.S. large-mesh drift-gillnet fishery targets swordfish and common thresher sharks with other pelagic sharks, small amounts of tunas, and other pelagic species caught with fishing operations occurring within the EEZ in California waters and historically off the coast of Oregon (no landings since 2004). This fishery is set to be terminated in the next few years with changes in fishery regulations. The number of vessels participating in this fishery has steadily decreased from a high of 220 in 1986 to the lowest of 4 in 2024. Swordfish dominate the catch and peaked in 1985 at 2,990 t; The 2024 swordfish catch was 24 t, which is just below the 5-year average of 28 t. In 2024, there was an estimated total of 4 t bluefin tuna caught, which is below the 5-year average of 25 t and the 16 t caught in 2023.

The drift gillnet fishery is monitored through mandatory fisher reports (federal logbooks), landing reports, and fisheries observers. Federal logbooks have been used since 2019, with state agency-issued logbooks before that time. Size (length) composition data were historically (1981–1999) collected by CDFW for landed swordfish from less than 1% of landings. NOAA fisheries observers have collected size (length) data since 1990 and information on fishing location, protected species interactions, fish catch, and disposition of catch and bycatch. A total of 2 drift gillnet vessels were monitored by fisheries observers in 2024.

2.6. Harpoon

A small fishery that targets swordfish with harpoon gear operates within the EEZ in California waters between 32°N and 34°N latitude. In 2024, 9 vessels participated in this fishery. The size of the harpoon fishing fleet has fluctuated over the years and was at its largest in 1986, with 113 vessels. Along with the size of the fleet, swordfish catches have fluctuated from a high of 305 t in 1985 to a low of 5 t in 2015. The 2024 swordfish catch was 19 t, below the 5-year average of 28 t.

2.7. Sport

Sport (recreational) fisheries that catch tuna and other pelagic fish occur along the U.S. West Coast, with fishers operating from private vessels and commercial passenger fishing vessels (CPFV). Most of the HMS catch from these sport fisheries is albacore, yellowfin, and Pacific bluefin tuna. The 2024 albacore tuna catch was 865 t, above the 5-year average (505 t). In 2024, the Pacific bluefin tuna catch was about average with 1,385 t caught, just below the 5-year average (1410 t).

Catch and effort are monitored through fisher reports (logbooks) and surveys conducted by the states of California, Oregon, and Washington, with data maintained within the Recreational Fisheries Information Network (RecFIN) at the PSMFC. Fishers submit logbook data for

California-based trips to the CDFW, while logbooks for Oregon- and Washington-based fishing trips are submitted directly to NOAA Fisheries.

In addition, size composition data are collected for Pacific bluefin tuna and are used to estimate catch according to methods outlined in the Pacific Ocean stock assessment report from 2020. Bluefin tuna size composition data were collected from CPFV at fishing ports, with sampling by NOAA fisheries staff since 2014 and by IATTC staff from 1993 to 2012. The 2023 and 2024 size distribution for Pacific bluefin tuna is shown in Figure 14.

2.8. Deep-Set Buoy gear

On September 15, 2023, NOAA Fisheries approved deep-set buoy gear (DSBG) as an alternative method for harvesting swordfish and other HMS off the U.S. West Coast with less bycatch compared to other fishing methods (e.g. drift gillnet fishery). In 2024, swordfish landings dropped significantly to 8 t, down from 31 t in 2023. Participation in the DSBG fishery also fell sharply, with the number of active vessels decreasing from 21 in 2023 to 13 in 2024.

3. HIGHLIGHTED RESEARCH

Estimating the scope, scale, and contribution of direct seafood marketing to the United States seafood sector

Advani *et al.* (2024) determined that direct seafood marketing is common in the U.S. as determined from surveying 39,511 wild capture commercial harvesters. Direct seafood marketing, which connects harvesters more closely with consumers, appears especially resistant to food system disruptions and offers benefits to both parties. However, little is known about the scope and diversity of this sector in the U.S. This paper highlights the value of collecting data on direct seafood marketing and outlines an approach to building a national sampling frame. Initial findings show that direct marketing is common—especially through source- identified distributors. Combining survey and permit data, it is estimated that 12% of U.S. seafood harvesters participate in direct sales. These insights can inform policies and programs that support resilient, diverse seafood supply chains and enhance national food security.

Simulation testing performance of ensemble models when catch data are underreported

Brooks and Brodziak (2024) demonstrate the value of using an ensemble model for fisheries stock as- sessments due the model's ability to capture uncertainty across different model structures, especially when no single model clearly outperforms others. This study uses simulations to examine how the selection of candidate models and the method of weighting them influence the accuracy and reliability of both assess- ments and short-term forecasts. Results show that ensemble models only outperform single models when the ensemble includes a model close to the true population dynamics. The effectiveness of different weight- ing schemes varied depending on data quality: information-theoretic weights performed best with accurate catch data, while equal weighting was more robust when catches were underreported, though it introduced multiple potential outcomes. The study highlights the challenge of ensuring that an ensemble captures thetrue state of nature and emphasizes the need for clear protocols to select diverse, representative models and assess their adequacy.

Simulating productivity changes of epipelagic, mesopelagic, and bathypelagic taxa using a depth-resolved, end-to-end food web model for the oceanic Gulf of Mexico

Calhoun-Grosch *et al.* (2024) incorporates the complex processes of diel vertical migration and particle sinking to model open-ocean and deep-sea food webs, ecosystems where long-term datasets are typically limited. Following the Deepwater Horizon Oil Spill, new biomass data enabled the development of a depth- resolved food web model for the oceanic Gulf of Mexico. The model tracks energy transfer across three depth zones—epipelagic, mesopelagic, and bathypelagic—and shows how changes in biomass of key groups, such as large jellyfish, decapods, and mesopelagic fishes, affect food web dynamics. Non-copepod mesozooplankton and euphausiids play a central role in energy flow below 200 m. Increasing jellyfish biomass reduced the abundance of forage species due to competition and predation, while reducing migrating mesopelagic fish biomass led to increases in competing groups. These static scenarios offer a foundation for future dynamic modeling to assess long-term ecosystem impacts.

Hedonic price model of Hawaii Ahi Tuna (*Thunnus obesus* and *Thunnus albacares*) market: Implications of climate change and shark depredation

Chan *et al.* (2025) applies a hedonic price model to demonstrate that in Hawai i, the prices of tuna— specifically bigeye (*Thunnus obesus*) and yellowfin (*Thunnus albacares*)—are shaped by a variety of factors, including fish characteristics, trip-level details, market conditions, foreign imports, seller-specific effects, and time trends. Sea surface temperature (SST) at the fishing location and trip length are used as indicators of fish quality; both higher SST and longer trips are linked to lower prices, suggesting reduced quality. The findings highlight the potential economic impacts of climate change on tuna pricing in Hawai i. Rising SST, shifts in tuna habitats requiring longer travel distances, climate-driven reductions in fish size, and changes in tuna abundance and distribution all influence supply and pricing. Additionally, the study quantifies the negative revenue impact of shark depredation on the fishery.

Global and Regional Marine Ecosystem Models Reveal Key Uncertainties in Climate Change Projections

Eddy *et al.* (2025) shows that global marine ecosystem models project greater biomass declines with climate change than regional marine ecosystem models for many regions with more uncertainty around impacts at regional scales. Marine ecosystem global and regional models were compared across 10 ocean regions using two Earth system models. The level of agreement between model types varies significantly by region. These differences highlight the need to better understand why global and regional models diverge and to improve observational data to evaluate and refine projections. Ultimately, more accurate regional forecasts are essential for informed, adaptive management of ocean resources under climate change.

Diet Analysis of Mahimahi (*Coryphaena* spp.) Caught on O'ahu, Hawai'i, Using DNA Barcoding

Himmelsbach *et* al. (2024). Mahimahi (Coryphaena hippurus and C. equiselis) are epipelagic predators important to non-commercial and small-scale commercial fisheries on O ahu, Hawai i. While past studies using morphology showed they eat various fishes, cephalopods, and crustaceans, species-level ID was limited by prey degradation. This study analyzed 200 stomachs collected from 2019–2022 using DNA barcoding to improve taxonomic resolution. Prey were measured, weighed, and barcoded, revealing a diverse diet, with pelagic juveniles of reef-associated fishes making up over half of identified prey by number and biomass. Results show mahimahi feed across multiple habitats and taxonomic groups.

On the probable distribution of stock-recruitment resilience of Pacific saury (*Cololabis saira*) in the Northwest Pacific Ocean

Hsu *et al.* (2024) uses a simulation approach for Pacific saury to estimate the distribution of steepness, a key factor in characterizing stock resilience, and hence providing management reference points. A median steepness of 0.82 (80% probable range: 0.59–0.93) was estimated and suggested that Pacific saury can maintain relatively high recruitment levels even when spawning biomass declines to 20% of its unfished level. Sensitivity (elasticity) analysis reveals that steepness is most influenced by early life stage survival, mean body weight, growth rate, and length-at-maturity. These traits are vulnerable to environmental changes, indicating that warming ocean conditions could reduce the stock's resilience. Our approach offers a transferable framework for estimating steepness in other small pelagic species likely to be affected by rising sea surface temperatures under climate change.

Within-well patterns in bigeye tuna catch composition and implications for purse seine port- sampling and catch estimation for the Eastern Pacific Ocean

Lennert-Cody *et al.* (2024) examined sampling procedures to estimate catch of bigeye (BET) tuna from offloading purse seine vessels. In response to stock concerns for bigeye tuna in the Eastern Pacific Ocean, the Inter-American Tropical Tuna Commission introduced new management measures in 2021, including vessel-specific catch thresholds and a mandate for improved port sampling. A 2022 pilot study in Manta and Posorja, Ecuador, tested a high-frequency systematic sampling method during well unloading of purse seine vessels targeting floating-object (OBJ) sets. Sampling about 10% of containers per well revealed large within-well variation in BET proportions, often linked to the number of OBJ sets contributing to the catch. Simulations showed that systematic sampling reduced estimation error compared to random sampling, but that low within-well coverage could inflate variance in trip- and fleet-level estimates. Results suggest that sampling at least 2–3% of containers per well is necessary to improve the accuracy of BET catch estimates, highlighting the importance of both sampling design and coverage for effective fisheries monitoring and management.

The use of conceptual models to structure stock assessments: A tool for collaboration and for "modelling what to model"

Minte-Vera *et al.* (2024) present a framework for constructing conceptual models (CMs) to improve stock assessments, using fisheries systems for highly migratory pelagic species in the Pacific Ocean—specifically north Pacific Albacore tuna, eastern Pacific Dorado, and south Pacific Swordfish—as illustrative examples. Conceptual models are simplified representations of the main components and processes of a dynamic system, the mechanisms by which they are related, and the ways they are observed (i.e., the data-generating pro- cesses). Building a CM should be the first step in planning a new stock assessment or updating an existing one, as it guides the workflow and helps clarify what aspects of the system to model.

To develop a CM, several key steps are required: (1) gather existing knowledge about the species and associated fisheries, (2) define the objectives of the assessment, (3) establish the appropriate spatial and temporal scales, and (4) outline the biological, fisheries, and observation processes, including the drivers behind them. CMs should synthesize current information while also articulating hypotheses and assumptions about uncertain or poorly understood elements of the system. Draft models should be grounded in the best available science and constructed using principles from ecology, socioecology, fisheries science, and other relevant fields.

Minte-Vera et al. emphasize that CMs are not static, but dynamic tools that evolve over time to incorporate new insights and direct future research. They highlight the importance of the elicitation process—structured activities such as expert workshops—that enrich the model with diverse perspectives and knowledge across disciplines. By integrating these steps, the authors demonstrate how well-developed CMs can lead to im- proved stock assessment models.

The role of small pelagic fish in diverse ecosystems: knowledge gleaned from food-web models

Ruzicka *et al.* (2025) used 199 food-web models from around the world to analyze the role of small pelagic fish (SPF) in ecosystems by examining their diets, biomass, and fishery catches. SPF are essential species in many marine ecosystems linking plankton to larger predators and supporting major global fisheries. Understanding how SPF interact with other species and fisheries is important for managing these resources, especially as they face environmental and human-related pressures. This study found that SPF makes up 43% of total fish production and relies on 8% of ocean primary production. They also account for 18% of total fish and invertebrate catch—rising to 53% in nutrient-rich upwelling areas. Beyond direct harvest, SPF plays a large role in supporting predators and fisheries indirectly, contributing to 22% of seabird, 15% of marine mammal, and 34% of fisheries production on average. These contributions are even higher in upwelling systems. The findings highlight the need to consider both the direct and indirect roles of SPF when making fisheries and ecosystem management decisions.

Observations of skin color aberrations in four shark species off the coast of southern California

Skelton *et al.* (2024) highlighted different skin color aberrations from observations of four shark species native to southern California, USA. They reported the first recorded instance of apparent leucism (regional pigmentation loss), in a California horn shark (*Heterodontus francisci*) (Girard 1855) and tope shark (*Gale- orhinus galeus*) (Linnaeus 1758). They also reported the apparent second documented occurrence of albinism in the swell shark (*Cephaloscyllium ventriosum*) (Garman 1880) from a newly hatched captive individual with parents of normal pigmentation. Lastly, they redescribed a rare secondary color morph in the leopard shark (*Triakis semifasciata*) (Girard 1855) using previous literature and new sightings/images from sharks in the wild. Color aberrations may lead to different advantages (e.g., certain color morphs may offer additional camouflage) or disadvantages (e.g., reduced pigmentation may limit camouflage and protection from ultravi- olet light). Documenting these rare color aberrations augments an understanding of how color patterns can vary between individuals and taxa, and ultimately how these conditions potentially impact shark biology.

Micrometer-scale structure in shark vertebral centra

Stock *et al.* (2024) examined centrum microarchitecture in lamniform and carcharhiniform sharks with synchrotron microComputed Tomography (microCT), scanning electron microscopy and spectroscopy and light microscopy. The analysis centered on the blue shark (carcharhiniform) and shortfin mako (lamniform), species studied with all three modalities. Synchrotron microCT results from seven other species complete the report. The main centrum structures, the corpus calcareum and intermedialia, consist of fine, closely-spaced, mineralized trabeculae whose mean thicknesses <Tb.Th> and spacings <Tb.Sp> range from 4.5 to 11.2 μm and 4.5 to 15.6 μm, respectively. A significant ($p = 0.00001$) positive linear relationship between <Tb.Th> and

<Tb.Sp> exists for multiple positions within one mako centrum. Carcharhiniform species' <Tb.Th> and <Tb.Sp> exhibit an inverse linear relationship ($p = 0.005$) while in lamniforms these variables tend toward a positive relationship which does not reach statistical significance ($p = 0.099$). In all species, the trabeculae form an uninterrupted, interconnected network, and the unmineralized volumes are similarly interconnected. Small differences in mineralization level are observed in trabeculae. Centrum growth band pairs are found to consist of locally higher/lower mineral volume fraction. Within the intermedialia, radial canals and radial microrods were characterized, and compacted trabeculae are prominent in the mako intermedialia. The centra's mineralized central zones were non-trabecular and are also described.

Distinct natal origins based on vertebral ring analysis corroborate the migration pattern of Pacific bluefin tuna in the North Pacific Ocean

Uematsu *et al.* (2024) analyzed vertebral samples collected from a wide range of ages and areas and estimated the natal grounds of Pacific bluefin tuna (PBF) (*Thunnus orientalis*) from the first annulus in the vertebra to understand the population structure and migratory ecology of the species in the North Pacific Ocean. Both spawning groups of PBF, including fish that originated from the Sea of Japan (assigned as group SJ) and from the waters around the Ryukyu Archipelago and Taiwan (group RT), were observed in all sampling areas and age classes. In younger age classes, the percentages of group SJ were higher around Japan, whereas those of group RT were higher in the eastern Pacific Ocean (EPO). The percentage of group RT decreases around Japan as they migrate to the EPO and then increases when they return. These results suggest a tendency toward different migration patterns depending on the natal area. Interestingly, the results suggest that fish from the EPO rarely migrate to the Sea of Japan. The percentages of group RT for age 10+ were similar and higher in all sampling areas, and these are considered to be the final percentages of the relative contribution of the 2 natal grounds. This is a useful approach that enables us to easily examine the relative contribution of the 2 spawning grounds across time and space, providing insights into the dynamics of movement around the Pacific based on variations in the population composition.

Integrating vertical and horizontal movements of shortfin mako sharks *Isurus oxyrinchus* in the eastern North Pacific Ocean

Vaudo *et al.* (2024) investigated how vertical behaviors change in relation to horizontal movements in the pelagic, highly migratory, shortfin mako shark (*Isurus oxyrinchus*). Data from 30 sharks (114 to 245 cm total length), double-tagged with Pop-up Archival and Transmitting (PAT) and Smart Position or Temperature Transmitting (SPOT) tags within the Southern California Bight were analyzed. Vaudo et al. examined shark daytime depth distributions after their horizontal movements were first classified by water column thermal structure (thermal habitat), and into 1 of 2 behavioral modes (area-restricted search or transient) using a switching state-space model. Despite high inter- and intra-individual variability, thermal habitat and behavioral mode influenced depth distribution. Within thermal habitats, sharks spent similar amounts of time near the surface in both behavioral modes, although transient animals spent more time in deeper waters within some thermal habitats. Comparing among thermal habitats, sharks performing transient movements in warmer waters spent more time at depth. Sharks experienced an expansion of vertical habitat use when they switched to transient behaviors, possibly to search for prey, and the degree of habitat expansion may be influenced by temperature. These results suggest that in a 3-dimensional habitat, such as the pelagic environment, prey searching behaviors in the horizontal and vertical dimensions are linked.

4. RELEVANT NOAA FISHERIES PUBLICATIONS FROM THE PAST YEAR

Peer–Reviewed Publications

Advani S, O'Hara JK, Shoffler SM , Pinto da Silva P, Agar J, Arnett, J, Brislen, L, Cutler M, Harley A, Hospital J, Norman K, Ragland E, Squires D, Stoffle B, Szymkowiak M, Vega-Labiosa AJ, Stoll JS. 2024. Estimating the scope, scale, and contribution of direct seafood marketing to the United States seafood sector. Marine Policy, 165:106188. https://doi.org/10.1016/j.marpol.2024.106188

Brooks EN, Brodziak JKT. 2024. Simulation testing performance of ensemble models when catch data are underreported. ICES Journal of Marine Science, 81:61. https://doi.org/10.1093/icesjms/fsae067

Calhoun-Grosch S, Ruzicka J, Robinson KL, Wang VH, Sutton T, Ainsworth C, Hernandez F. 2024. Simulating productivity changes of epipelagic, mesopelagic, and bathypelagic taxa using a depth-resolved, end-to-end food web model for the oceanic Gulf of Mexico. Ecological Modelling, Volume 489:110623. https://doi.org/10.1016/j.ecolmodel.2024.110623

Chan HL, Kobayashi D, Suca J. 2025. Hedonic price model of Hawai i Ahi Tuna (Thunnus obesus and Thunnus albacares) market: Implications of climate change and shark depredation. PLOS Climate, 4(3). https://doi.org/10.1371/journal.pclm.0000595

Eddy, T. D., Heneghan, R. F., Bryndum-Buchholz, A., Fulton, E. A., Harrison, C. S., Tittensor, D. P., et al.. 2025. Global and Regional Marine Ecosystem Models Reveal Key Uncertainties in Climate Change Projections. Earth's Future, 13: e2024EF005537. https://doi.org/10.1029/2024EF005537

Hsu, J, Chang Y, Brodziak J, Kai M, Punt AE. 2024. On the probable distribution of stock-recruitment resilience of Pacific saury (Cololabis saira) in the Northwest Pacific Ocean. ICES Journal of Marine Science, 81(4). https://doi.org/10.1093/icesjms/fsae030

Lennert-Cody CE, De La Cadena C, McCracken M, Chompoy L, Vogel NW, Maunder MN, Wiley BA, Nieto EA, Aires-da-Silva A. 2024. Within-well patterns in bigeye tuna catch composition and implications for purse-seine port-sampling and catch estimation for the Eastern Pacific Ocean. Fisheries Research. 277: 107079. https://doi.org/10.1016/j.fishres.2024.107079

Minte-Vera, C.V., M.N. Maunder, A. Aires-da-Silva, H. Xu, J.L. Valero, S.L.H. Teo, P. Barría, and N.D. Ducharme-Barth. 2024. The use of conceptual models to structure stock assessments: A tool for collaboration and for "modelling what to model". FISH RES, 279: 107135. https://doi.org/10.1016/j.fishres.2024.107135

Ruzicka J, Chiaverano L, Coll M, Garrido S Tam J,Murase H, Robinson K, Romagnoni G, Shannon L, Silva A, Szalaj D, Watari S. 2025. The role of small pelagic fish in diverse ecosystems: knowledge gleaned from food-web models. Mar Ecol Prog Ser: 741: 7-27. Contribution to the Theme Section 'Small pelagic fish: new research frontiers'. https://doi.org/10.3354/meps14513

Skelton, Z.R., T.S. Prinzing, A.P. Nosal, Z. Vagner, P. Demman, P.J. Zerofski, N. Wegner. 2024. Observa- tions of skin color aberrations in four shark species off the coast of southern California, USA. Environ Biol Fish 107, 391–400. https://doi.org/10.1007/s10641-024-01532-3

Stock, S.R., U. Kierdorf, K.C. James, P.D. Shevchenko, L.J. Natanson, S. Gomez, and H.

Kierdorf. 2024. Micrometer-scale structure in shark vertebral centra. ACTA BIOMATER, ISSN 1742-7061. https://doi.org/ 10.1016/j.actbio.2024.01.033

Uematsu, Y., T. Ishihara, T. Shimose, K.S. Chen, J.A. Mohan, J.R. Rooker, R. J. David Wells, O.E. Snodgrass, H. Dewar, S. Ohshimo, Y. Tanaka. 2024. Distinct natal origins based on vertebral ring analysis corroborate the migration pattern of Pacific bluefin tuna in the North Pacific Ocean. Mar Ecol Prog Ser 743:65-74. https://doi.org/10.3354/meps14656

Vaudo, J.J., H. Dewar, M.E. Byrne, B.M. Wetherbee, M.S. Shivji. 2024. Integrating vertical and horizontal movements of shortfin mako sharks Isurus oxyrinchus in the eastern North Pacific Ocean. Mar Ecol Prog Ser 732:85-99. https://doi.org/10.3354/meps14542

Technical reports and other publications

Ayers A, Leong K, Hospital J, Tam C, Morioka R. 2024. 2023 Guam and CNMI Fisher Observations Data Summary and Analysis. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-24-12, 20p. https://doi.org/10.25923/zh4f-4k39

Ayers A, Leong K, Hospital J, Tam C, Morioka R. 2024. 2023 Hawai i fisher observations data summary and analysis Department of Commerce. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-24-09, 30 p. https://doi.org/10.25923/yyfz-a677

Chan HL. 2024. Economic Contributions of Small Boat Fisheries in Guam and the CNMI. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-160, 29 p. https://doi.org/10.25923/ nsxb-my70

Cooper B, Bigelow K. 2024. Projecting U.S. Western and Central Pacific Longline Bigeye Tuna Annual Catch. Pacific Islands Fisheries Science Center, PIFSC Data Report, DR-24-15, 9p. https://doi.org/10.25923/n5g7- t472

Ely TD, Mukai GNM, Kobayashi DR, Marko PB, Moran AL, Wren JLK. 2024. Key sensitivities for long- distance dispersal models in the North Central Pacific Ocean. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-166, 39 p. https://doi.org/10.25923/tqem-v681

Himmelsbach NS, Suca J.J, Timmers MA, Asher JM, Boland RC, Kamikawa KT, Samson JC, Whitney JL. 2024. Diet Analysis of Mahimahi (Coryphaena spp.) Caught on O'ahu, Hawai'i, Using DNA Barcoding.

U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-164, 41 p. https://doi. org/10.25923/7z9f-xt14

5. FIGURES

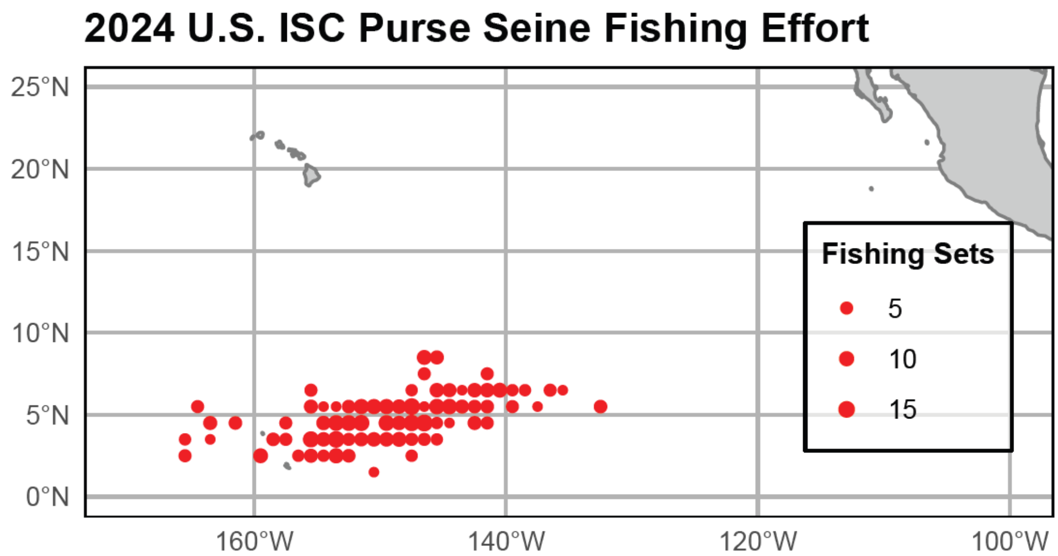


Figure 1. Spatial distribution of reported logbook fishing effort by the U.S. Western Pacific purse seine fishery within 1° latitude by 1° longitude grids. Effort in some areas is not shown in order to preserve data confidentiality.

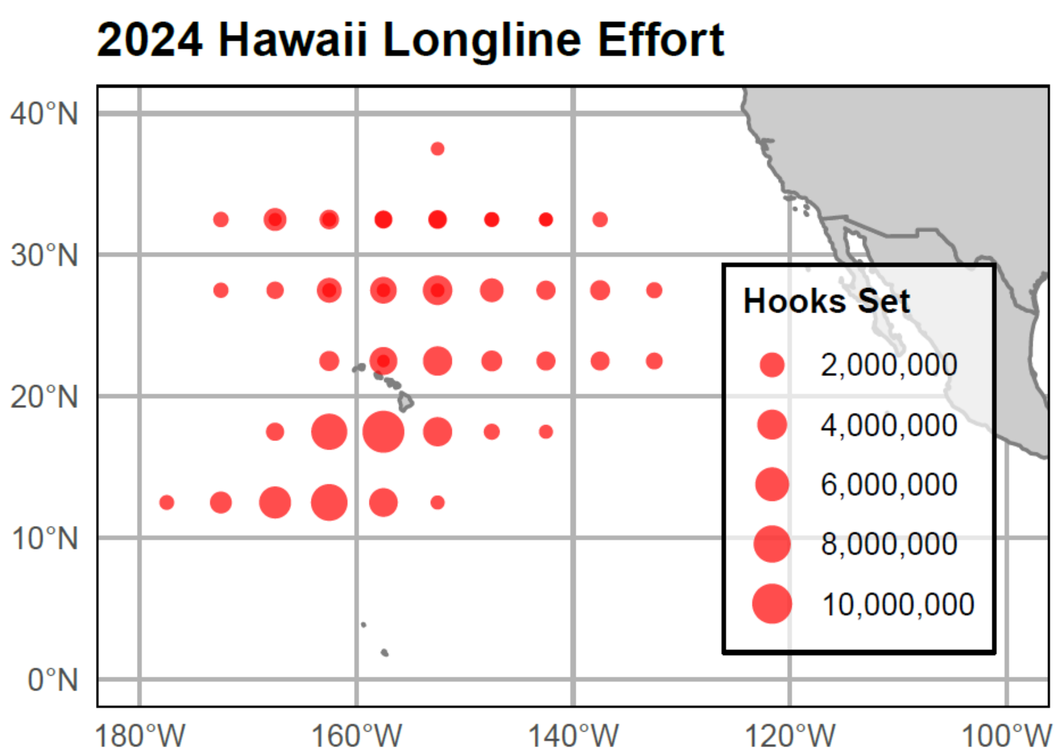


Figure 2. Spatial distribution of U.S. longline fisheries in the Pacific Ocean in 2024 within 5° latitude by 5° longitude grids. Data are based on fisher reports in federal logbooks. Effort in some areas is not shown in order to preserve data confidentiality.

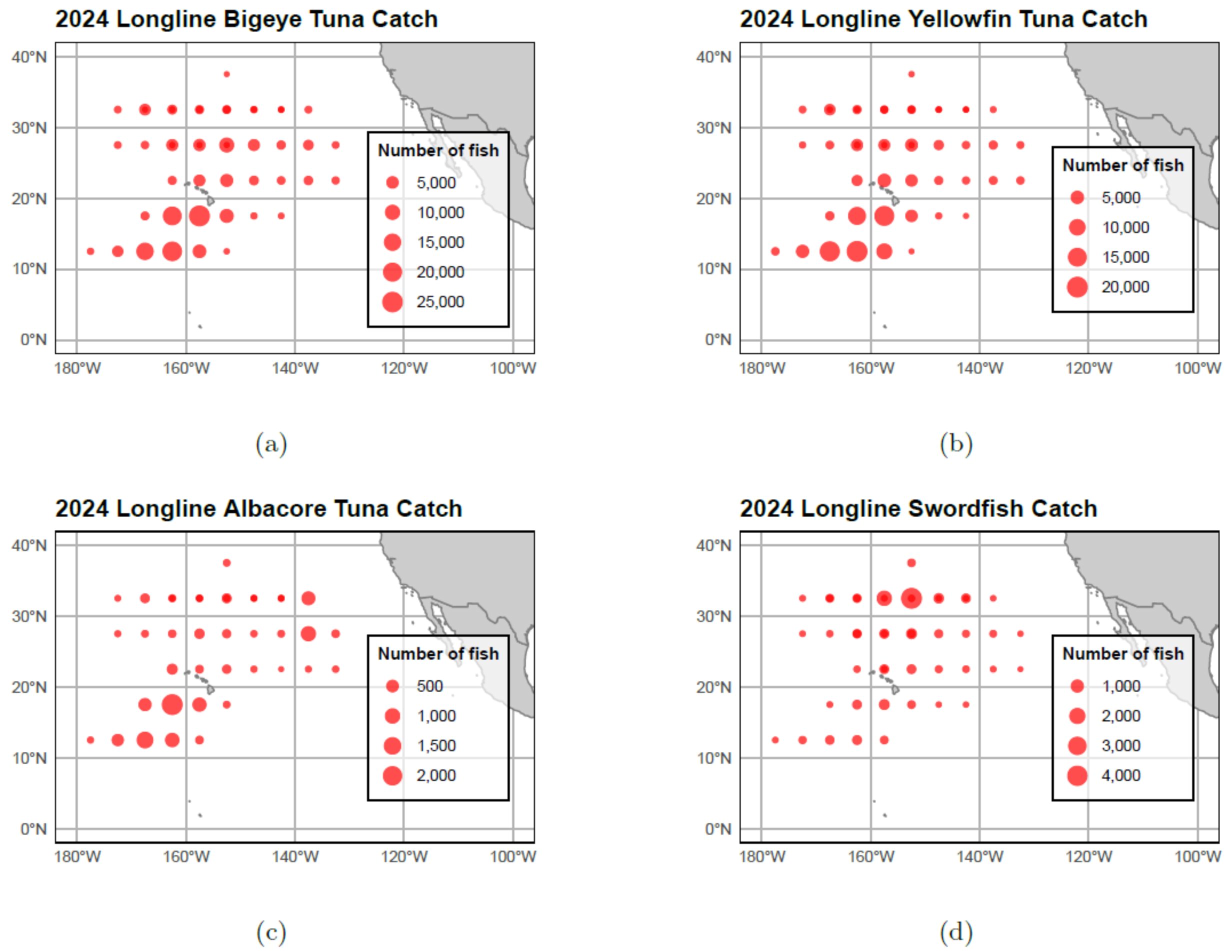


Figure 3. Spatial distribution of U.S. longline fisheries retained catch in the North Pacific Ocean in 2024 for bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*), albacore tuna (*Thunnus alalunga*), and swordfish (*Xiphias gladius*) within 5° latitude by 5° longitude grids. Data are based on fisher reports in federal logbooks. Effort in some areas is not shown in order to preserve data confidentiality.

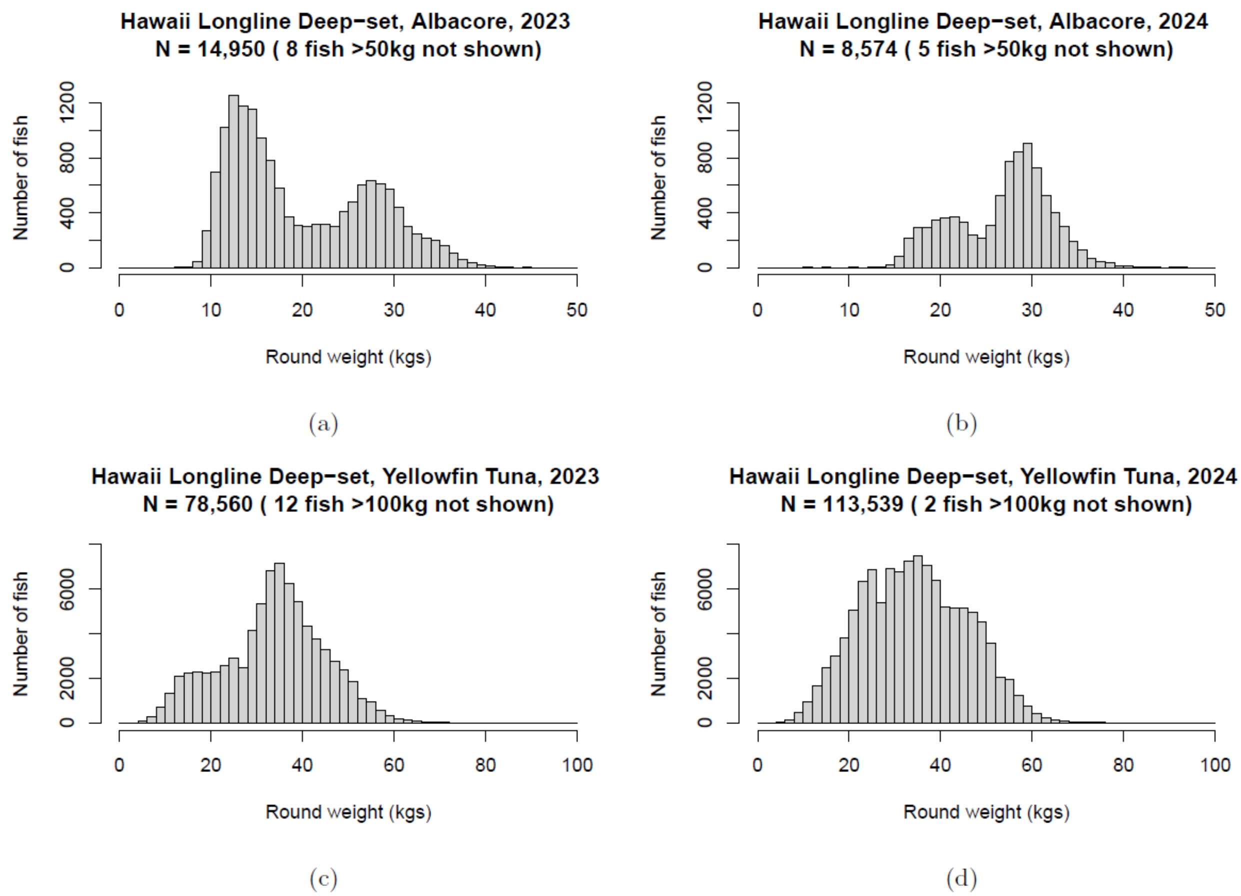


Figure 4. Size distribution landed catch of (top) albacore tuna (*Thunnus alalunga*) and (bottom) yellowfin tuna (*T. albacares*) caught by Hawaii-based deep-set longline fishery in 2023–2024.

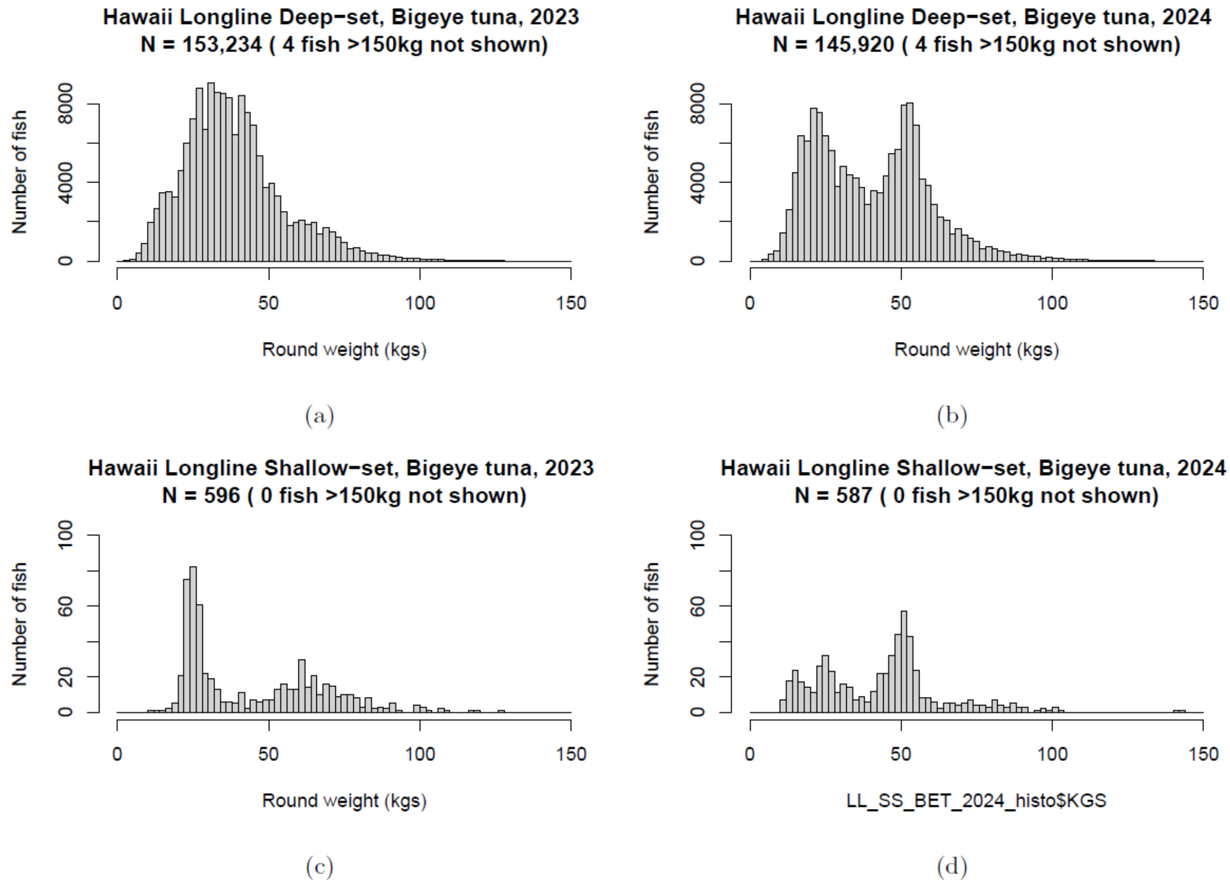
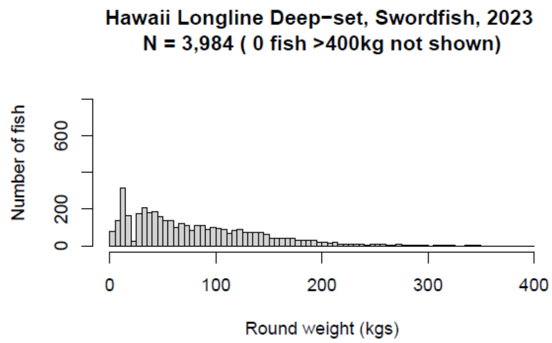
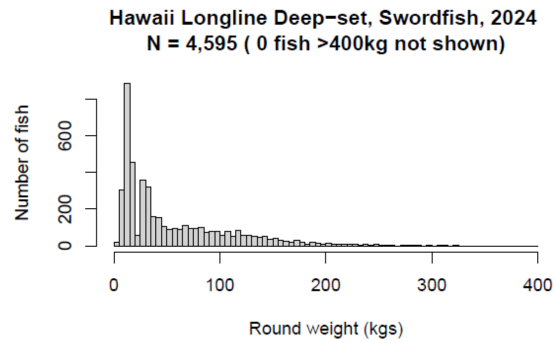


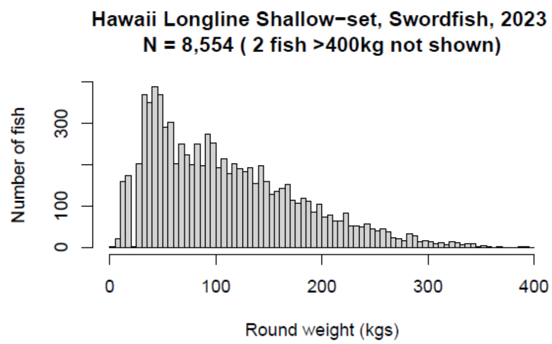
Figure 5. Size distribution landed catch of bigeye tuna (*T. obesus*) caught by Hawaii-based (top) deep-set and (bottom) shallow-set longline fishery in 2023–2024.



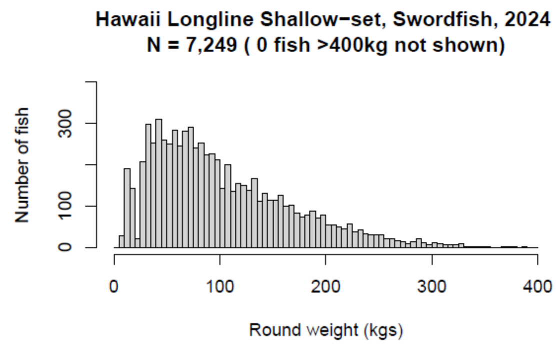
(a)



(b)



(c)



(d)

Figure 6. Size distribution landed catch of swordfish (*Xiphias gladius*) caught by Hawaii-based (top) deep-set and (bottom) shallow-set longline fishery in 2023 – 2024.

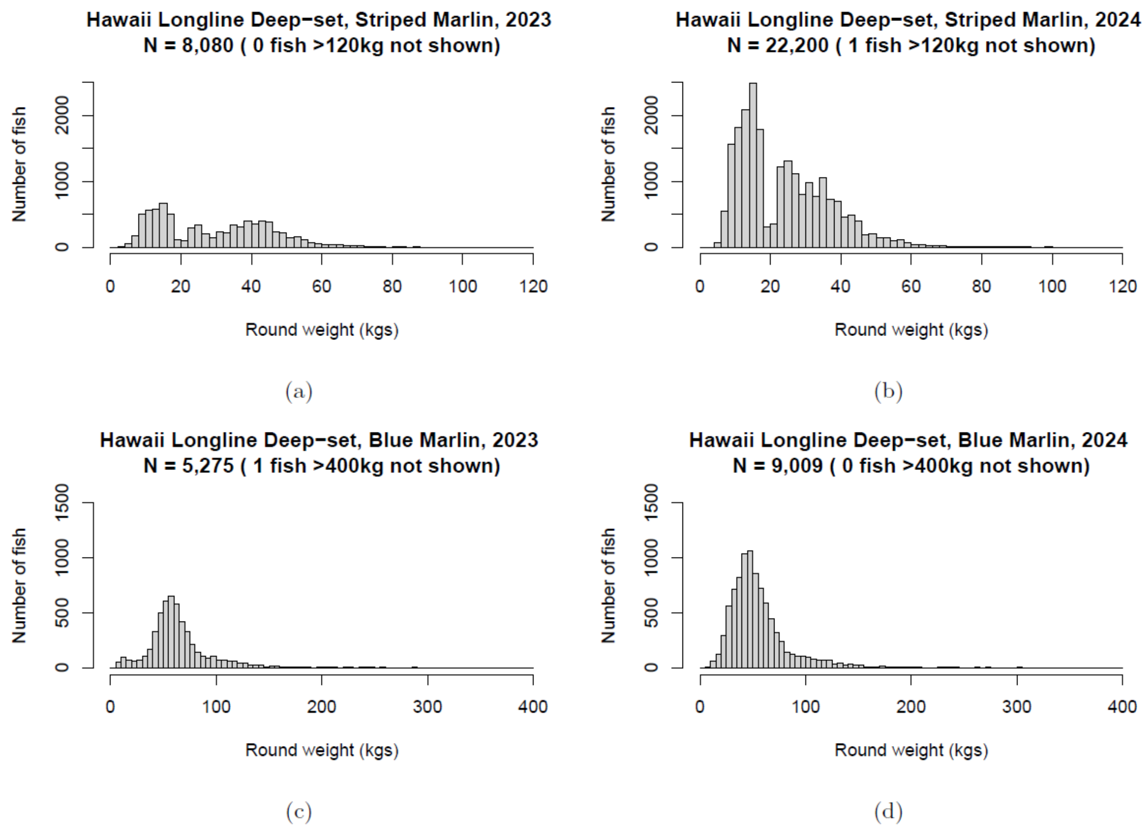


Figure 7. Size distribution landed catch of (top) striped marlin (*Kajikia audax*), and (bottom) blue marlin (*Makaira nigricans*) caught by the Hawaii-based deep-set longline fishery in 2023 – 2024.

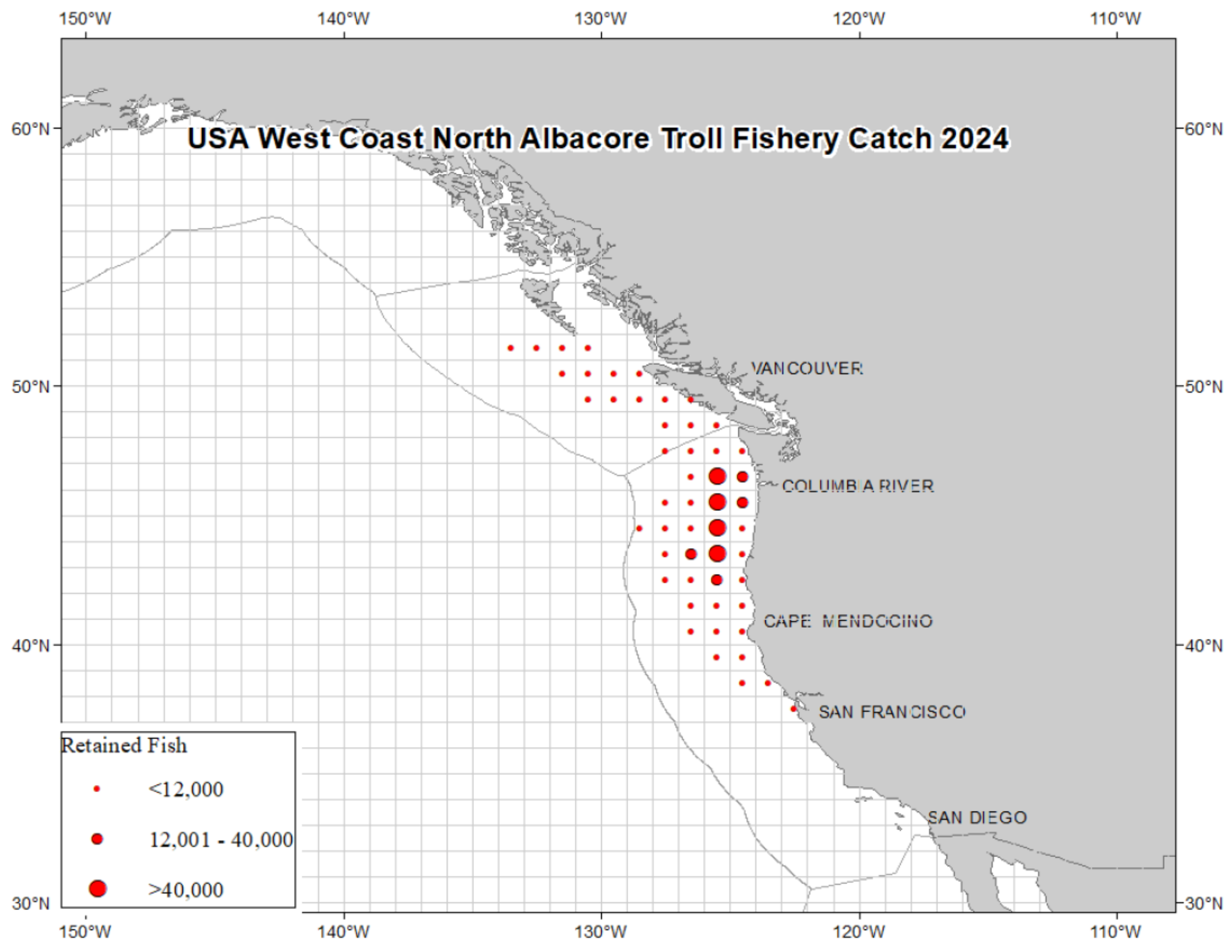


Figure 8. Spatial distribution of reported logbook catch by the 2024 U.S.A albacore troll and pole-and-line fishery in number of fish. The size of the circles is proportional to the amount of catch. Some catch areas are not shown to preserve data confidentiality.

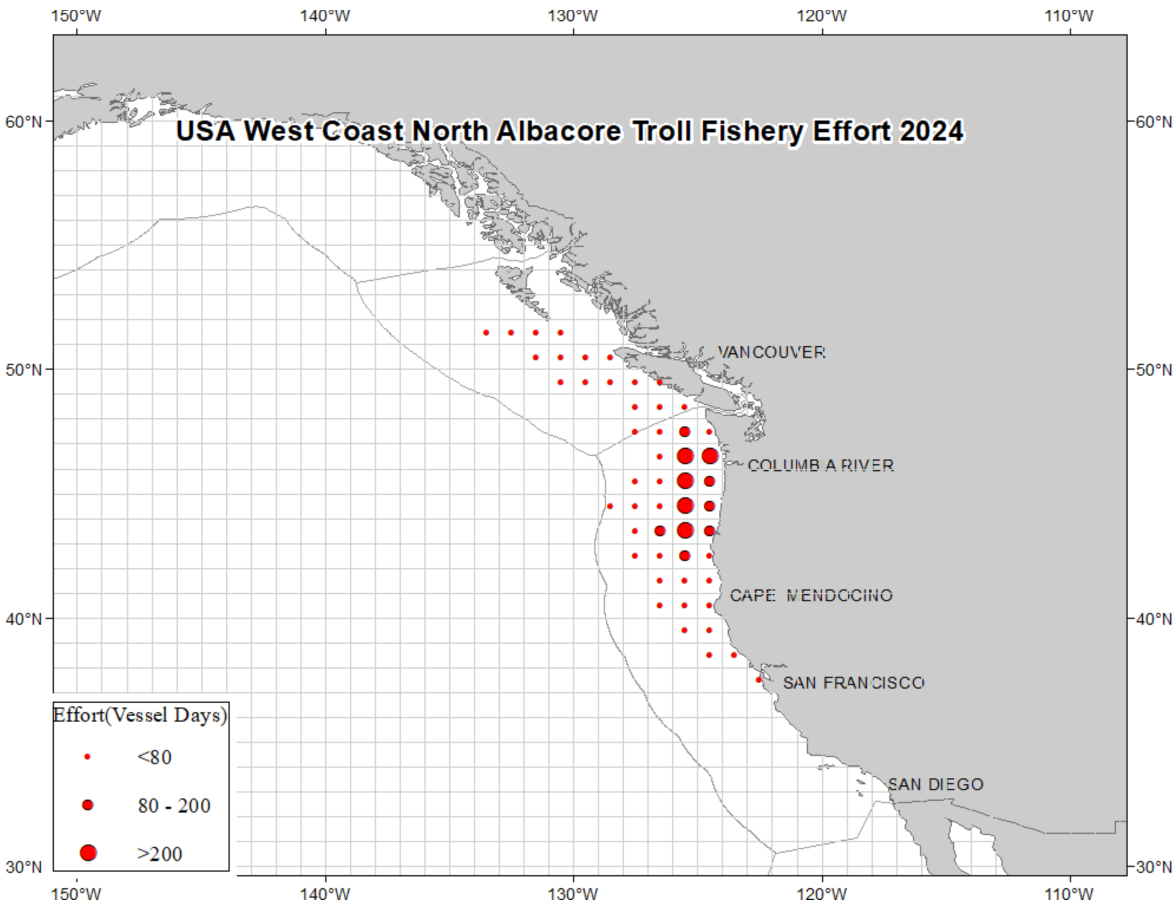


Figure 9. Spatial distribution of reported logbook fishing effort by the 2024 U.S. albacore troll and pole-and- line fishery in vessel days. The size of circles is proportional to the amount of effort. Some effort areas are not shown to preserve data confidentiality.

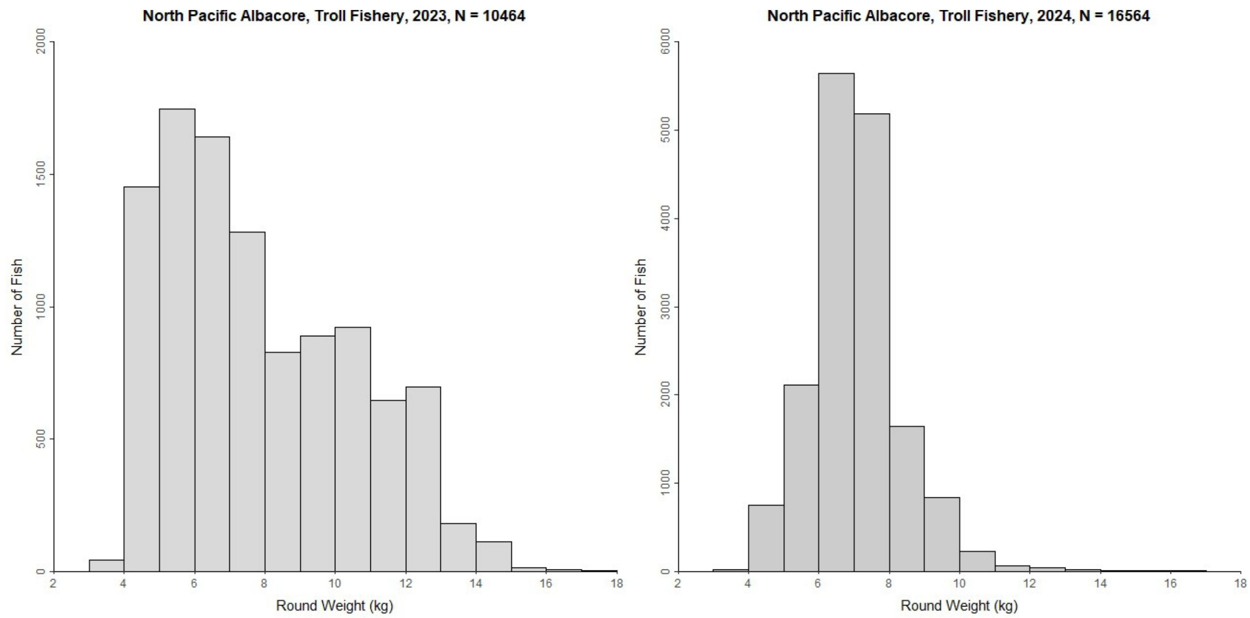


Figure 10. Size distribution of albacore (*Thunnus alalunga*) caught in 2023 – 2024 in the U.S. albacore troll and pole-and-line fishery.

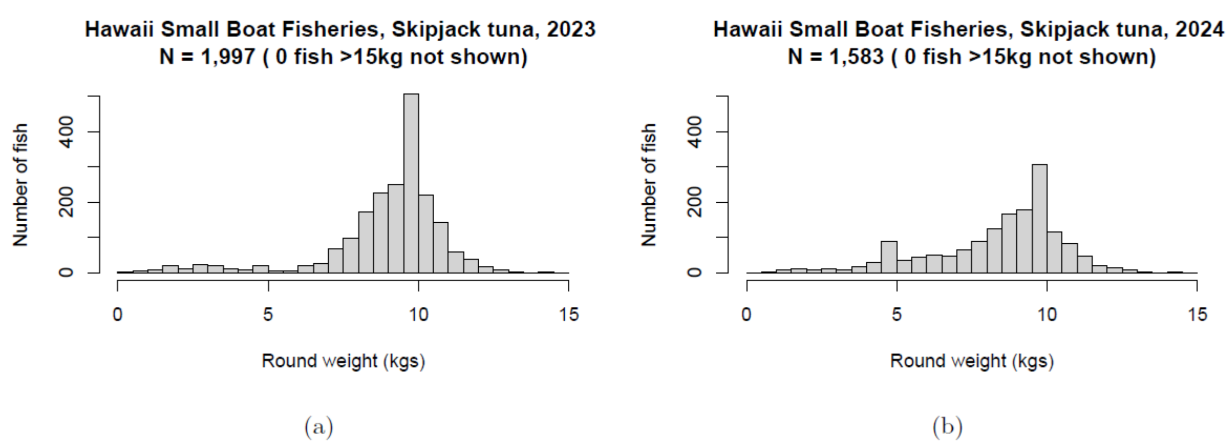


Figure 11. Size distribution landed catch of skipjack tuna (*Katsuwonus pelamis*) caught by the Hawaii small boat fisheries in 2023 – 2024.

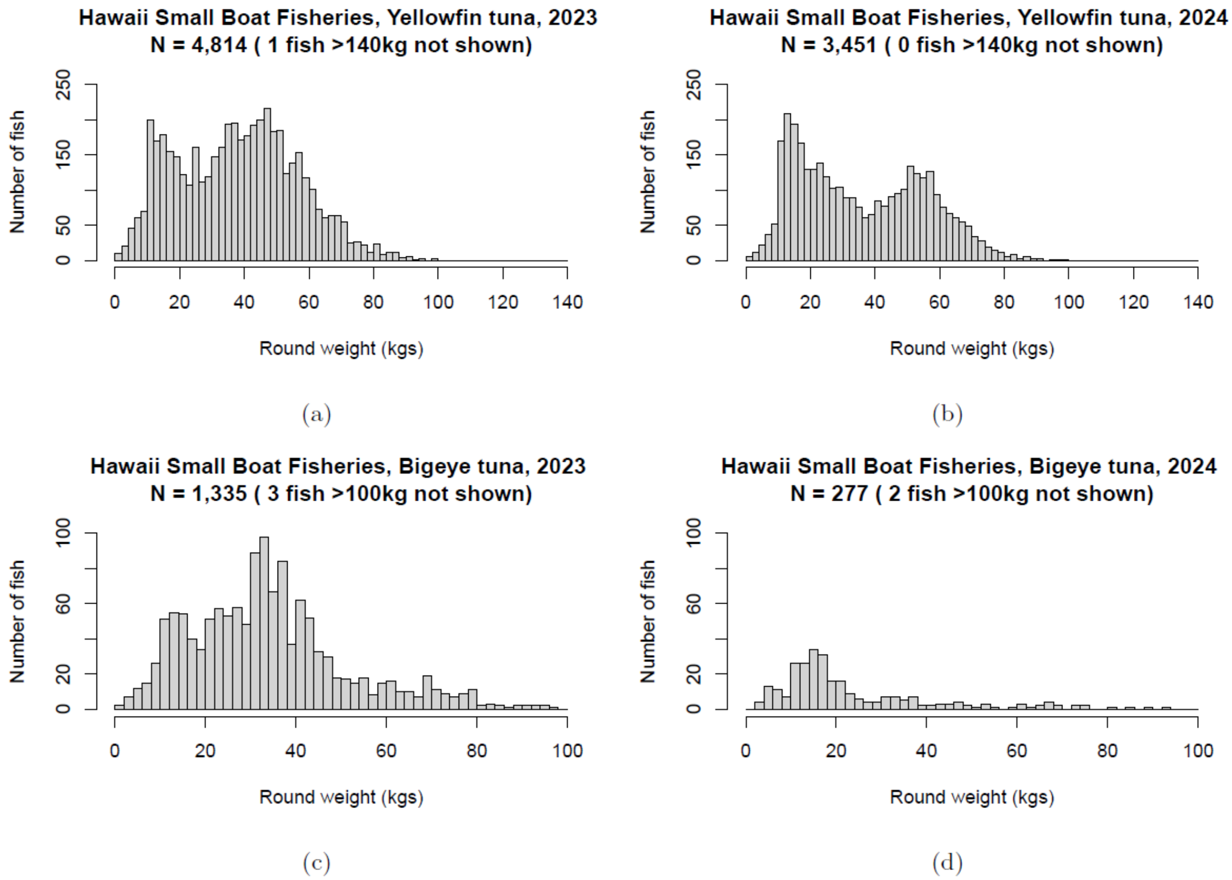


Figure 12. Size distribution landed catch of (top) yellowfin tuna (*T. albacares*) and (bottom) bigeye tuna (*T. obesus*) caught by the Hawaii small boat fisheries in 2023 – 2024.

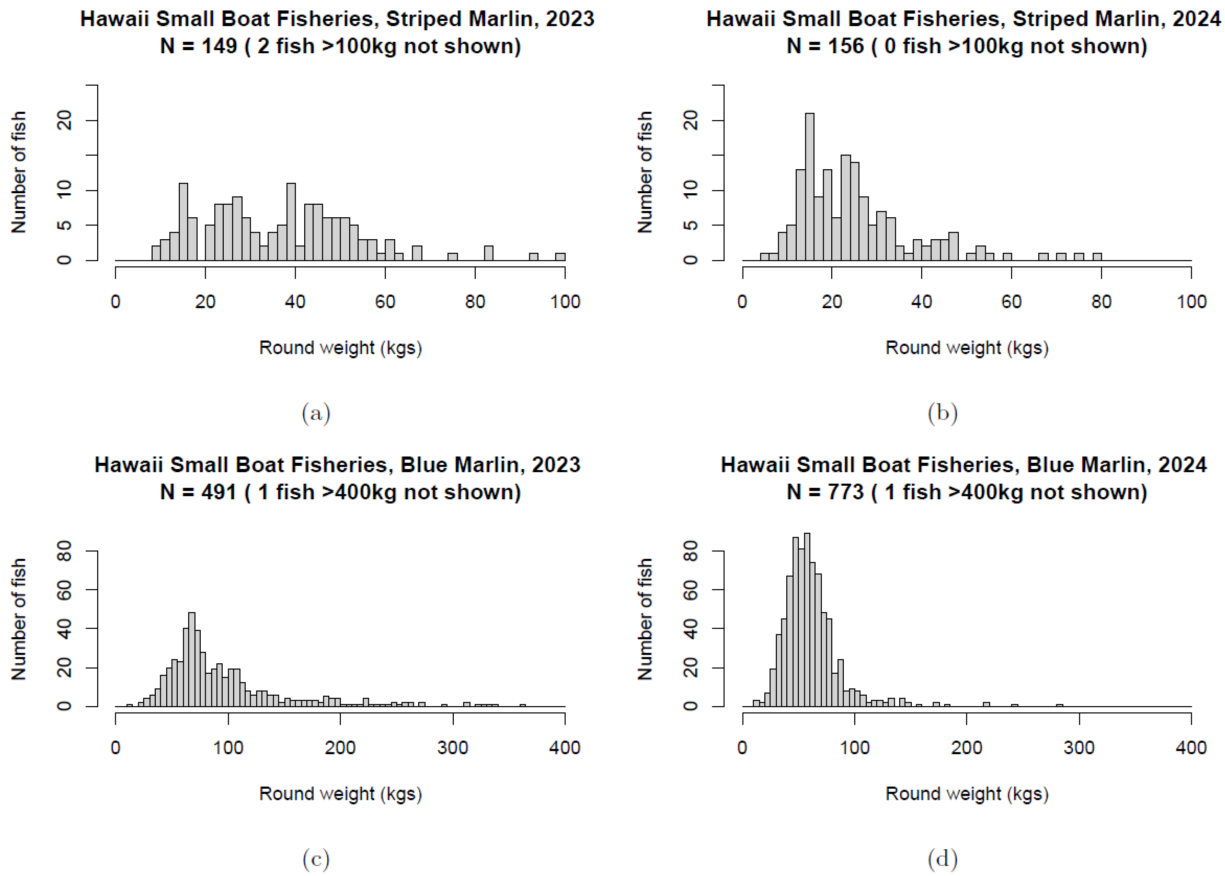


Figure 13. Size distribution landed catch of (top) striped marlin (*Kajikia audax*) and (bottom) blue marlin (*Makaira nigricans*) caught by the Hawaii small boat fisheries in 2023 – 2024 .

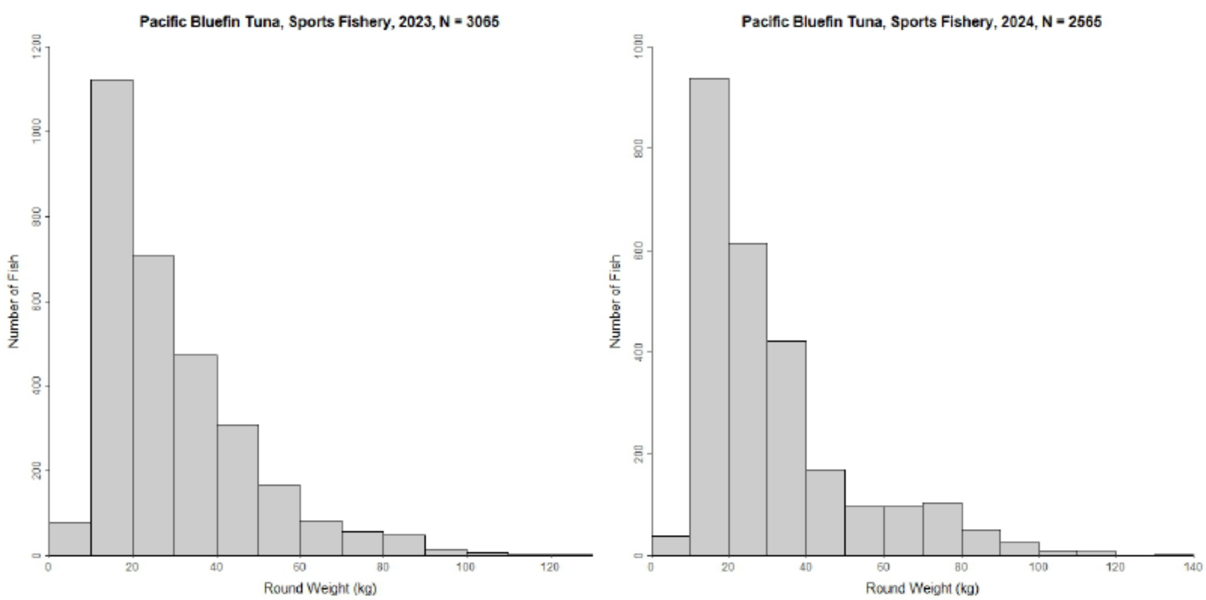


Figure 14. Size distribution of Pacific Bluefin Tuna (*Thunnus orientalis*) caught in 2023–2024 in the U.S. West Coast sportfishing industry.