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# Tuna Species of the U.S. West Coast: A Photographic Identification Guide

NOAA Technical Memorandum NMFS  
NOAA-TM-NMFS-SWFSC-624

November 2019









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# **Tuna Species of the U.S. West Coast: A Photographic Identification Guide**

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**Front cover: Albacore tuna (*Thunnus alalunga*). NOAA image**



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# Introduction

The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service is responsible for the stewardship of United States (U.S.) marine resources and habitat. The NOAA Southwest Fisheries Science Center (SWFSC) conducts research on the reproductive biology, growth, foraging ecology, distribution, and habitat of highly migratory and coastal pelagic species in the North Pacific Ocean. Through decades of collaboration with the recreational and commercial fishing industries, SWFSC scientists collect biological samples that support these studies.

Species-specific life history parameters are used in population stock assessments conducted by SWFSC researchers to allow managers to determine sustainable harvest rates, respond to natural and introduced changes in populations, and predict the impacts of various management scenarios. SWFSC scientists work with scientists from other nations within tuna Regional Fisheries Management Organizations to conduct and review assessments on highly migratory fish stocks. Assessment results and management advice on pelagic species in the EPO are provided to the Pacific Fishery Management Council of the United States.



Yellowfin tuna (*Thunnus albacares*). NOAA image

## About this Guide

This guide was created for recreational anglers, the general public, and citizen scientists interested in the basic visual identification of tuna species encountered off California, Oregon, and Washington (hereafter referred to as the U.S. West Coast). Although encountered and described here within the U.S. Exclusive Economic Zone (EEZ) out to 200 nautical miles offshore, these tuna populations range over large portions of the entire Pacific Ocean. As such, seasonal ranges, typical sizes and ages, and other information presented in this guide is tailored for the U.S. West Coast even if some species also frequent the waters of Hawai'i, Alaska, Canada, Mexico, and the Western Pacific Ocean. Even within this local scale, some species show a large range of habitat, movements, diet preferences, and seasonal abundance depending on oceanic conditions.

While many species are easily distinguishable, tunas vary in size, coloration, and morphology and should not be identified by just one characteristic alone. This guide describes the general external features of local species while highlighting their ecological preferences and behaviors. Although some internal differences may serve as diagnostic features, these should be used as a secondary consideration if external morphology is inadequate to differentiate species. It is important to note that tuna are easier to identify alive or recently deceased with fresh color because a loss of blood, damage to tissues, or changes in body volume may impair some key colorations or identifying features. When possible, fresh and postmortem pictures of coloration and juvenile and adult stages of key species are provided for reference. Most postmortem pictures featured in this guide were captured at sportfishing docks and thus may include inconsistencies like rubbed-off skin, injuries, or line marks associated with fishing and storage.

# The U.S. West Coast

As used here, the U.S. West Coast encompasses the Exclusive Economic Zone extending to 200 nautical miles offshore of California, Oregon, and Washington. These waters support abundant ecosystem goods and services including fisheries, recreation and tourism, energy production, and transportation for the region and the country as a whole. The southern flow of cold water from Alaska to Baja California, Mexico via the California Current, along with seasonal upwelling of nutrient-rich waters along the coast, support vital populations of baitfish like sardines, Northern anchovy, squid, mackerel, and crustaceans that serve as food for species of birds, mammals, bony fish, and sharks. Coastal islands, canyons, offshore seamounts, and extensive pelagic habitat support large oceanic predators that aggregate near current and thermal fronts, including a variety of tuna species.

Tuna forage in these productive waters and, depending on seasonal temperatures, both temperate and tropical tuna species inhabit the coastal and offshore zones. They are an important component of the Pacific Ocean food chain and the offshore pelagic ecosystem as a whole. Tuna are valued for their fighting power, large size, beautiful coloration, and protein-rich meat and are a mainstay for recreational and commercial fishing in the U.S. and around the world. They are sold fresh, frozen, or canned and are popular in raw sushi and sashimi cuisine. Off the U.S. West Coast, a variety of tuna species are targeted commercially by longline, troll, purse seine, and pole-and-line operations and targeted recreationally by hook-and-line and spearfishing.

The U.S. West Coast tuna industry has been a source of fishery technology innovation for decades, in large part thanks to Chinese, Croatian, Italian, Japanese, Portuguese, and Spanish immigrants, among others, who arrived in the early 1900's with their respective fishing histories and knowledge. Southern California is the birthplace of modern onboard fish refrigeration, modified bamboo pole gear, helicopter spotter pilots, dolphin-safe backdown approaches, nylon net technology, and many other technologies used in tuna fisheries<sup>1</sup>. Needless to say, tuna fishing has been of cultural, economic, and culinary importance for the world and the U.S. for generations.



Schooling yellowfin tuna (*Thunnus albacares*). Image: David Itano



Height of the San Pedro Purse Seine fleet, post-WW II. Image: State Fish Company



# The Scombrids



Albacore tuna (*Thunnus alalunga*). NOAA image

Tuna belong to the family Scombridae. These marine fish are found mostly in epipelagic waters in temperate and tropical zones around the world. The Scombridae family is divided into two subfamilies, *Gasterochismatinae* and *Scombrinae*, the former comprised of only one species, the butterfly kingfish (*Gasterochisma melampus*). *Scombrinae* is further divided into tribes which include the mackerels (*Scombrini*), Spanish mackerels (*Scomberomorini*), bonitos (*Sardini*) and the tunas (*Thunnini*). This identification guide focuses on both *Thunnini* and *Sardini* encountered off the U.S. West Coast, which includes species in the genera *Sarda*, *Auxis*, *Euthynnus*, *Katsuwonus*, and *Thunnus*.

Many species of tunas (*Auxis* sp., *Euthynnus* sp., *Katsuwonus* sp., and *Thunnus* sp.) are highly mobile pelagic fish known for their ability to travel great distances and gather in large schools to feed and spawn. Some species are known to make extensive deep dives and undertake trans-Pacific migrations. Tuna are an integral component of the pelagic ecosystem and food web, both as prolific prey species and as key predators. While all tuna are endothermic (warm blooded) and use a countercurrent heat exchange system to conserve heat in their muscle, some species can also warm their viscera and brain<sup>2</sup>. Endothermy allows tuna to maintain body tissue temperature warmer than the surrounding waters so they can inhabit diverse temperature ranges, maintain high aerobic metabolic potential compared to ectothermic fish, and make dives into deep, cold waters to hunt. Tuna are built for power, speed, and stamina: hydrodynamic drag is reduced with a streamlined body, eyes are set flush to the head, pectoral fins retract into fin grooves, and a median caudal keel and finlets aid in locomotion and steering. These features allow their sleek bullet-shaped bodies to intermittently "glide" through the water and save energy. While the bonitos (*Sardini* sp.) are not endothermic, they have similar morphological adaptations for enhanced swimming performance.

Decadal and interannual variability in ocean conditions affect the distribution and abundance of tuna and bonito off the U.S. West Coast. Although seasonal, the most common species are Pacific bluefin tuna (*Thunnus orientalis*), yellowfin tuna (*Thunnus albacares*), North Pacific albacore tuna (*Thunnus alalunga*), skipjack tuna (*Katsuwonus pelamis*), Pacific bonito (*Sarda chiliensis*), bullet tuna (*Auxis rochei*), and frigate tuna (*Auxis thazard*), while bigeye tuna (*Thunnus obesus*) and black skipjack tuna (*Euthynnus lineatus*) are less common. Most of the tuna found off the U.S. West Coast are juveniles that feed in productive waters before returning to their respective spawning grounds elsewhere in the Pacific.

# Management of U.S. West Coast Tuna

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) was established in 1976 and reauthorized in 2006 as the overarching and primary law for U.S. federal fisheries management and conservation. The MSA established eight management councils specific to each region of the U.S., including the Pacific Fisheries Management Council (PFMC) for the West Coast. The PFMC created the *Fisheries Management Plan for U.S. West Coast Fisheries for Highly Migratory Species*, which is implemented by NOAA's National Marine Fisheries Service and guides the research of the Southwest Fisheries Science Center and other state and federal fisheries research organizations in California, Oregon, and Washington. Both the MSA and this plan allow for collaboration of U.S. and foreign agencies to manage yellowfin tuna, skipjack tuna, bigeye tuna, Pacific bluefin tuna, and North Pacific albacore, among other species.



Pacific bluefin tuna (*Thunnus orientalis*). NOAA image

## Key Pacific Fishery Science and Management Agencies:

Pacific Fisheries Management Council (PFMC)

Inter-American Tropical Tuna Commission (IATTC)

Western Pacific Regional Fishery Management Council (WPRFMC)

Western and Central Pacific Fisheries Commission (WCPFC)

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)

Secretariat of the Pacific Community (SPC)

Fisheries and Aquaculture Department, Food and Agriculture Organization of the United Nations (FAO)

## Key Documents and Treaties:

Magnuson-Stevens Fishery Conservation and Management Act (MSA)

Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species (FMPHMS)

U.S.-Canada Albacore Treaty

IATTC Convention Treaty (Antigua Convention)

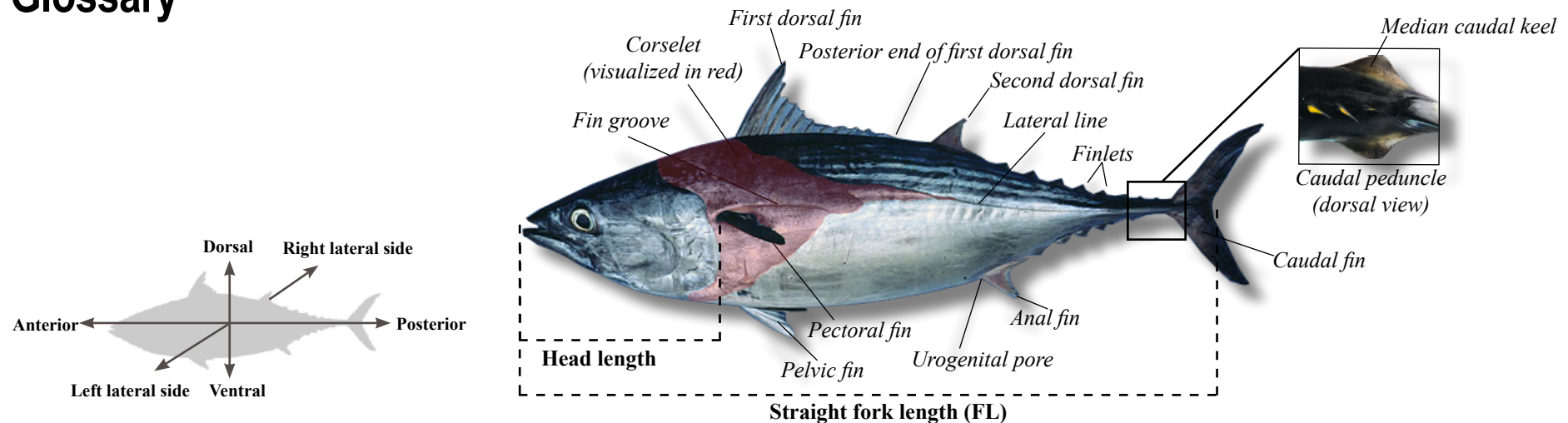
WCPFC Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

South Pacific Tuna Treaty (SPTT)

FAO Code of Conduct for Responsible Fisheries



# Glossary



**Corselet:** a zone or area of scales behind the head and the pectoral fins of certain tunnies, albacores, bonitos, and frigate mackerels

**Endothermic:** ability to maintain body tissue temperature warmer than ambient water temperature

**Epipelagic:** upper strata of the ocean where enough visible sunlight penetrates the water column for photosynthesis to occur, about 200 meters deep; also known as the "sunlight zone"

**Pelagic:** occurring in the open ocean and in the upper and mid-layers of the water column

**Lateral line:** a visible line of sensing organs located along the midline of the body that are used to detect vibrations and pressure in the water

**Median caudal keel:** a lateral ridge on each side of the caudal peduncle used in stabilization and drag reduction during swimming in some tunas; anterior to two oblique caudal keels on the caudal fin

**Mesopelagic:** middle strata of the ocean below the epipelagic zone, starting around 200 meters deep; also known as the "twilight zone"

**Striations:** blood vessels allowing for counter-current heat exchange enabling warm viscera

**Thermocline:** abrupt transition layer between warmer mixed water at the surface and cooler deep water

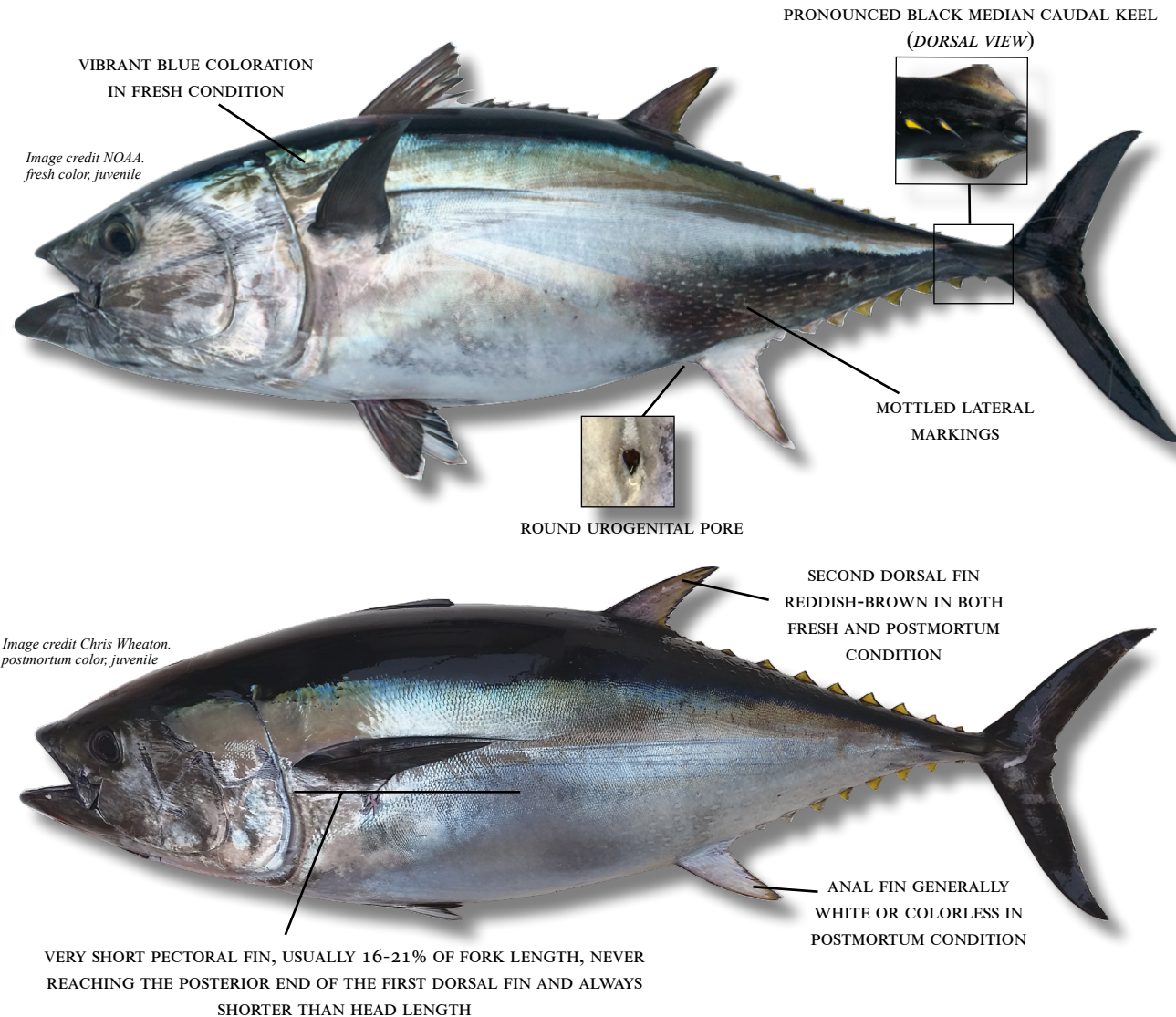
**Urogenital pore:** a small ventral opening anterior to the anal fin used to excrete waste and reproductive fluids into the surrounding water





# Pacific bluefin tuna (*Thunnus orientalis*)

**Description:** Deep body profile with skin transitioning from titanium blue back into lighter blue; dark blue, almost black pectoral fin is shorter than head length; lower sides and belly are silver with consistent lateral spots and faint vertical lines; second dorsal fin is reddish-brown and anal fin is edged with black.



**Other common names (language or location):**  
Atún aleta azul or atún rojo (Spanish), hon-maguro (Japanese)

**Size and reproduction:** Pacific bluefin tuna reach sexual maturity around 150 cm FL (5 ft.; age 4-5 years), as early as age 3 in the Sea of Japan<sup>4</sup>. Although Pacific bluefin can reach 300 cm FL (9.8 ft.), those found off the U.S. West Coast generally range from 40-200 cm FL (1-7 ft.; 40-350 pounds) and are not reproductively mature.

**Habitat:** Pacific bluefin tuna are epipelagic, spending the majority of time within the surface mixed layer and making extensive vertical dives from the surface up to 1,500 m<sup>5</sup>. Pacific bluefin spawn from April to July in the Western Pacific Ocean (WPO) off eastern Chinese Taipei and the Ryukyu Islands, and July to August in the Sea of Japan. An unknown portion of the population migrates to the EPO around ages 1-3 to forage before returning to spawning grounds in the WPO. Pacific bluefin generally school in similar size cohorts and adults are hardy and cold tolerant, entering warm waters only for spawning.

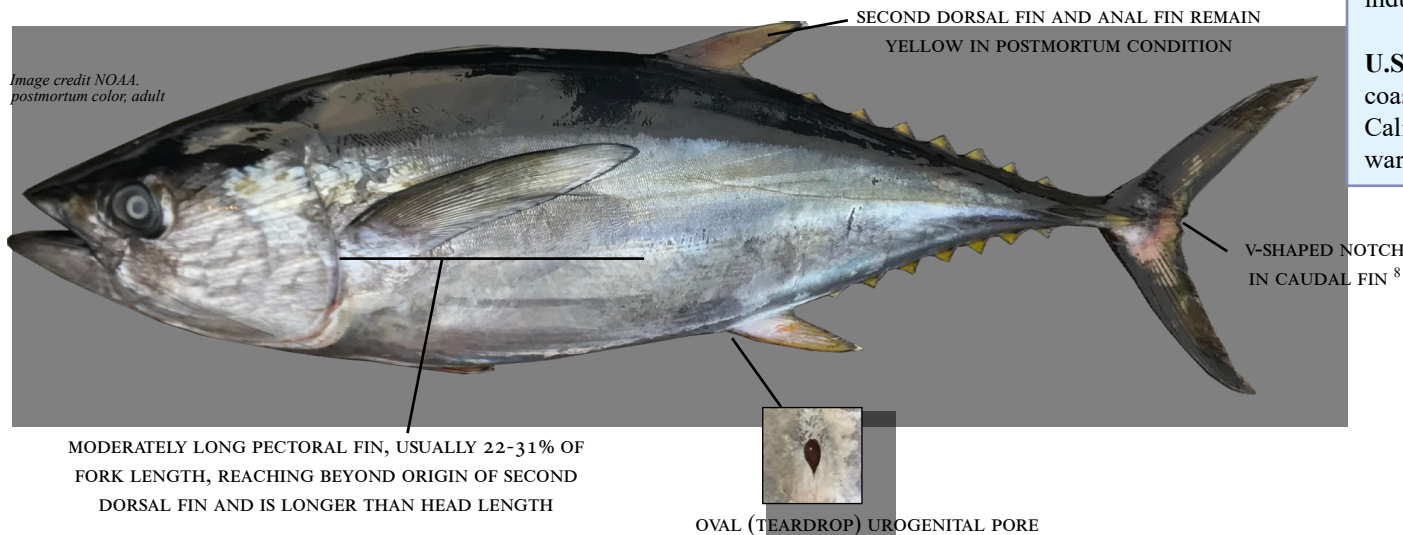
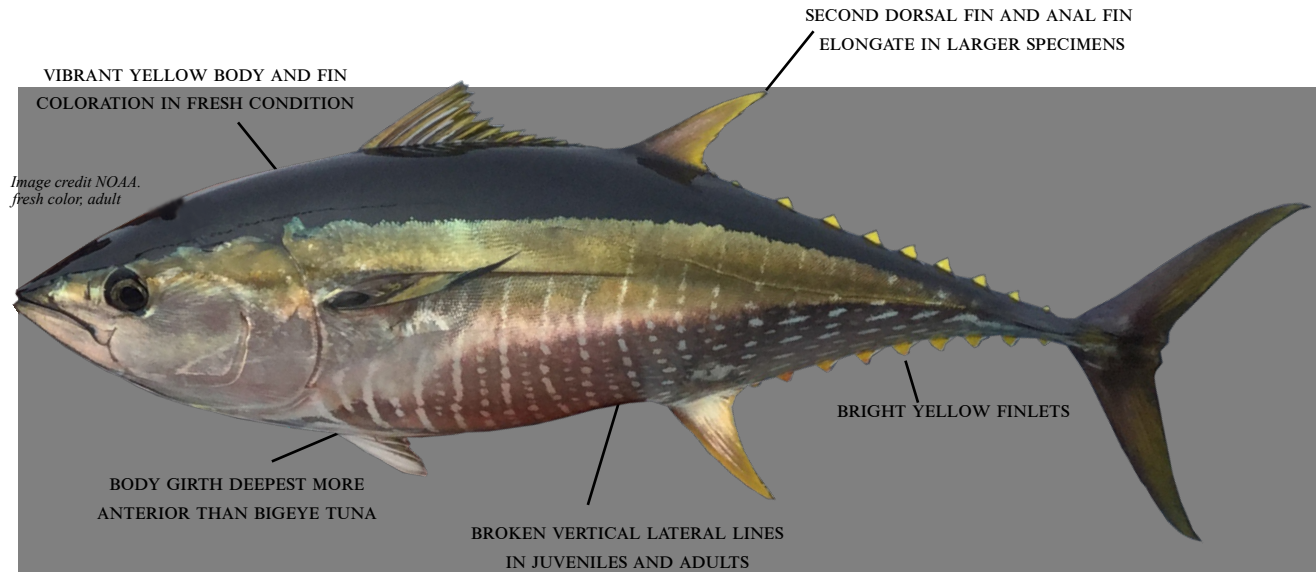
**Diet:** Small pelagic fish and crustaceans, and squid.

**Fishing:** Purse seine, longline, troll, gillnet, harpoon, hook-and-line, spear gun. Bluefin are highly valued for sushi and sashimi.

**U.S. West Coast seasonal range:** Common in coastal and offshore waters from U.S.-Canada border to U.S.-Mexico border, although seasonal distribution is largely dependent on water temperatures and bait availability. Juveniles move into southern California from Baja California, Mexico in spring, then to central and northern California by early fall<sup>14,15</sup>.

# Yellowfin tuna (*Thunnus albacares*)

**Description:** Dark blue back with abrupt shift to bright yellow and silver sides; yellow fins and finlets are lined with a black edge; lower sides are marked with consistent lines and spots in almost vertical lines<sup>8</sup>.



**Other common names:** Atún aleta amarilla (Spanish), ahi (Hawai'i), kihada (Japanese)

**Size and reproduction:** Sexual maturity is generally reached around 69 cm FL (2.2 ft.) for males and 96 cm FL for females (3.1 ft.; age 2 years). Yellowfin tuna can grow up to 200 cm FL (6.5 ft.), but fish around 60-150 cm FL (2-5 ft.) are most common off the U.S. West Coast.

**Habitat:** Yellowfin tuna are a tropical species restricted by a temperature range of 64°-86° F and they rarely venture into cooler waters<sup>3</sup>. They are found above and below the thermocline based on oxygen availability and temperature gradients and dive up to depths of 1,600 m<sup>10</sup>. Yellowfin are found seasonally in Southern California, however this is only a portion of the total population distributed across the Pacific Ocean.

**Diet:** Small fish, pelagic crustaceans, and squid.

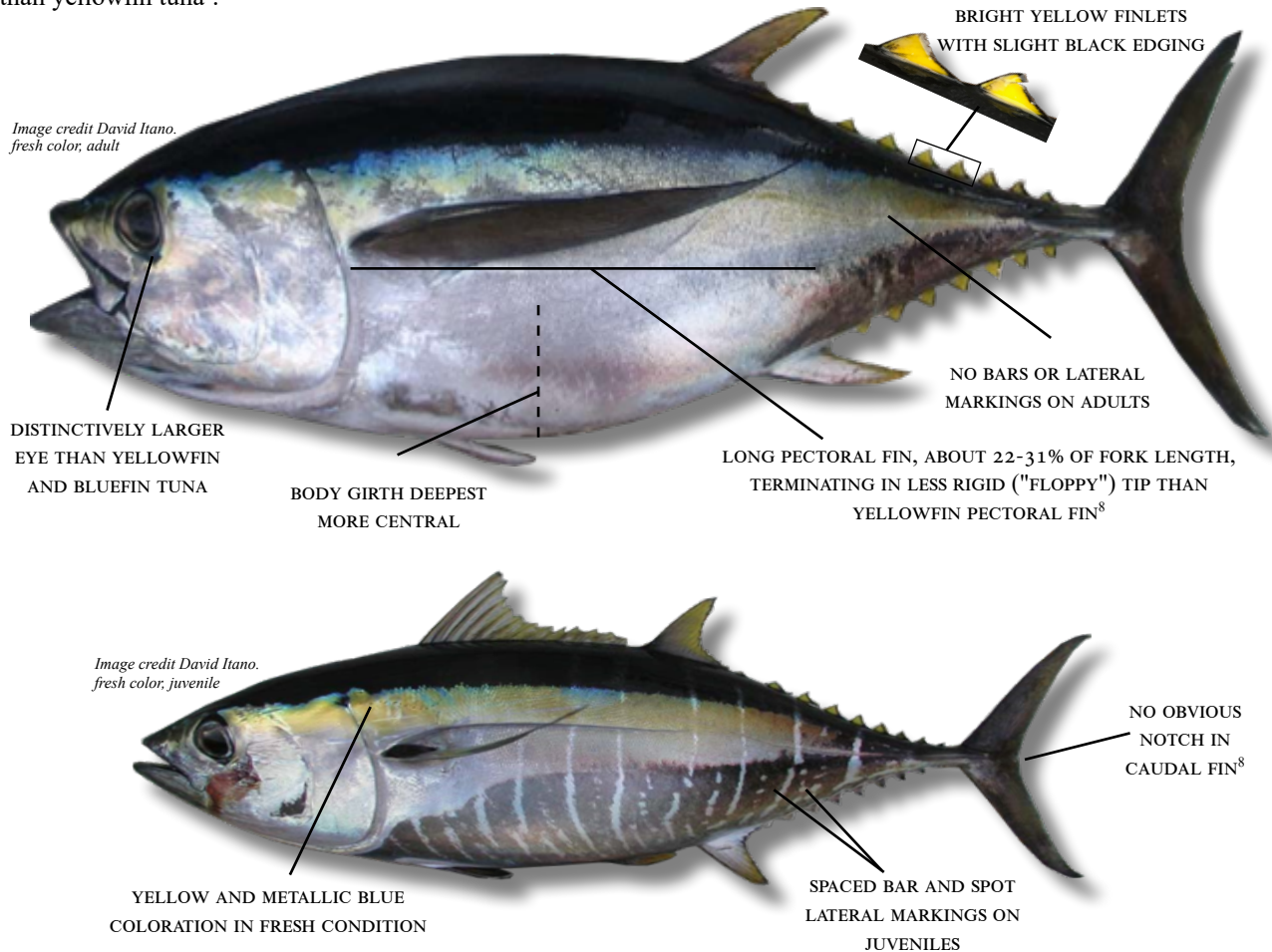
**Fishing:** Purse seine, longline, troll, hook-and-line, handline, spear gun. Yellowfin are important commercial targets for the fresh, frozen, and canned industries.

**U.S. West Coast seasonal range:** Common in coastal and offshore waters from central to southern California, primarily during summer months with warmer water temperatures.



# Bigeye tuna (*Thunnus obesus*)

**Description:** Metallic dark blue back with faint lateral blue band on live fish; skin gradually transitions through silver blue to yellow to pinkish-silver; anal finlets are dark and second dorsal and anal fins are light yellow; bigeye closely resembles yellowfin tuna at various size classes, but the most distinctive feature is a larger eye and a deeper body profile than yellowfin tuna<sup>8</sup>.



**Other common names:** Atún patudo (Spanish), ahi (Hawai'i), mebachi (Japanese)

**Size and reproduction:** Bigeye tuna reach sexual maturity around 100-130 cm FL (3-4 ft.) and can exceed 200 cm FL (6.5 ft.), but those found off the U.S. West Coast average around 80-100 cm FL (2.6-3 ft.).

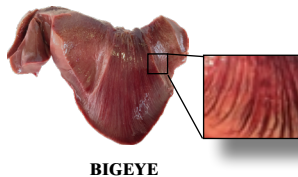
**Habitat:** Bigeye tuna are a tropical species found in epipelagic and mesopelagic waters with distribution largely driven by thermocline depth and temperatures of 56°-85° F<sup>3</sup>. Bigeye forage on the deep scattering layer in cool deep water during the day. They are known to aggregate around anchored or floating fish aggregating devices (FAD) and mix with schools of yellowfin or skipjack tuna.

**Diet:** Small pelagic fish, crustaceans, and cephalopods.

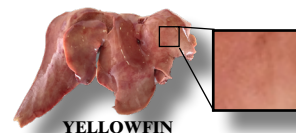
**Fishing:** Purse seine, longline, troll, hook-and-line, FAD fishing. Bigeye are caught in large numbers in Hawai'i and Pacific island nations, as they are valued for sushi and sashimi.

**U.S. West Coast seasonal range:** Occasional in coastal and offshore waters in central to southern California if waters are warm enough, with optimal temperatures around 63- 71° F<sup>10</sup>.

For further differentiation between bigeye and yellowfin tuna, the following internal features can be assessed as secondary considerations, but not recommended as a primary diagnostic tool:



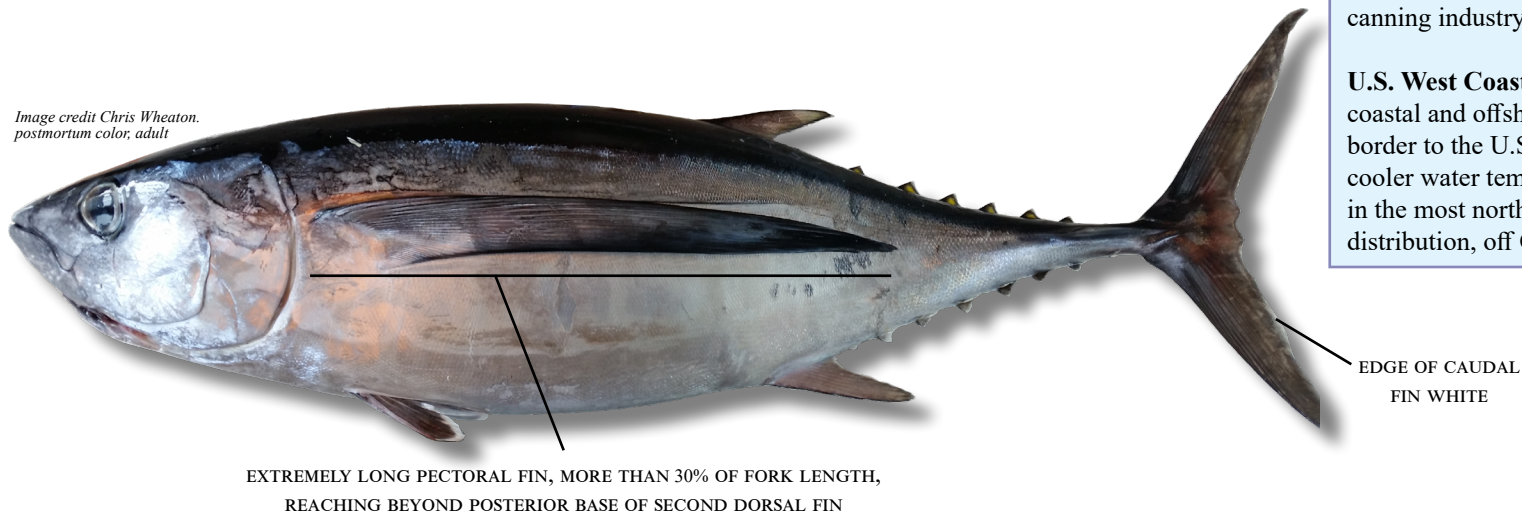
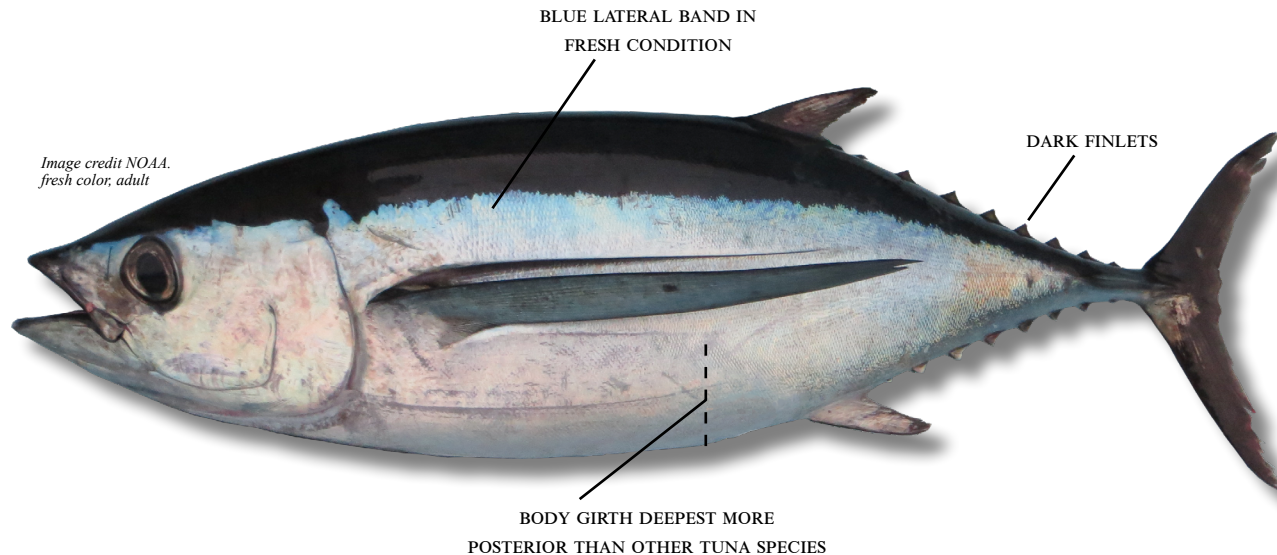
1. Dark red liver with roughly equal-sized lobes and striations (*left*)
2. Large, inflated swim bladder occupies almost entire body cavity<sup>8</sup> (*not pictured*)



1. Smooth, light red liver with longer right lobe and no striations (*left*)
2. Small, slightly inflated swim bladder occupies only anterior half of body cavity<sup>8</sup> (*not pictured*)

# Albacore tuna (*Thunnus alalunga*)

**Description:** Metallic dark blue back with faint lateral blue band along the side of live fish; skin gradually transitions through silver-blue to silver-white; anal finlets are dark and second dorsal fin and anal fins are light yellow; the most distinctive feature is a very long pectoral fin and the white edge of the caudal fin.



**Other common names:** Atún albacora (Spanish), tombo (Hawai'i), binnaga (Japanese)

**Size and reproduction:** North Pacific albacore can grow up to 140 cm FL (4.5 ft.) and reach sexual maturity around 83-93 cm FL (3 ft.; age 4.5 years) for females and 78-93 cm FL (2.5- 3 ft.) for males<sup>13</sup>. Typical sizes off the U.S. West Coast range from 30-121 cm FL (1-4 ft.; 20-80 pounds).

**Habitat:** Albacore is a cool-water species inhabiting offshore waters between 56°-66° F. They tend to concentrate along thermal oceanic fronts<sup>3</sup>, like the Kuroshio Current, where they are caught in abundance. Albacore are known to migrate across the entire North Pacific Ocean within water masses instead of across temperature and oxygen boundaries.

**Diet:** Schooling fish stocks such as sardine, anchovy, rockfish, and squid.

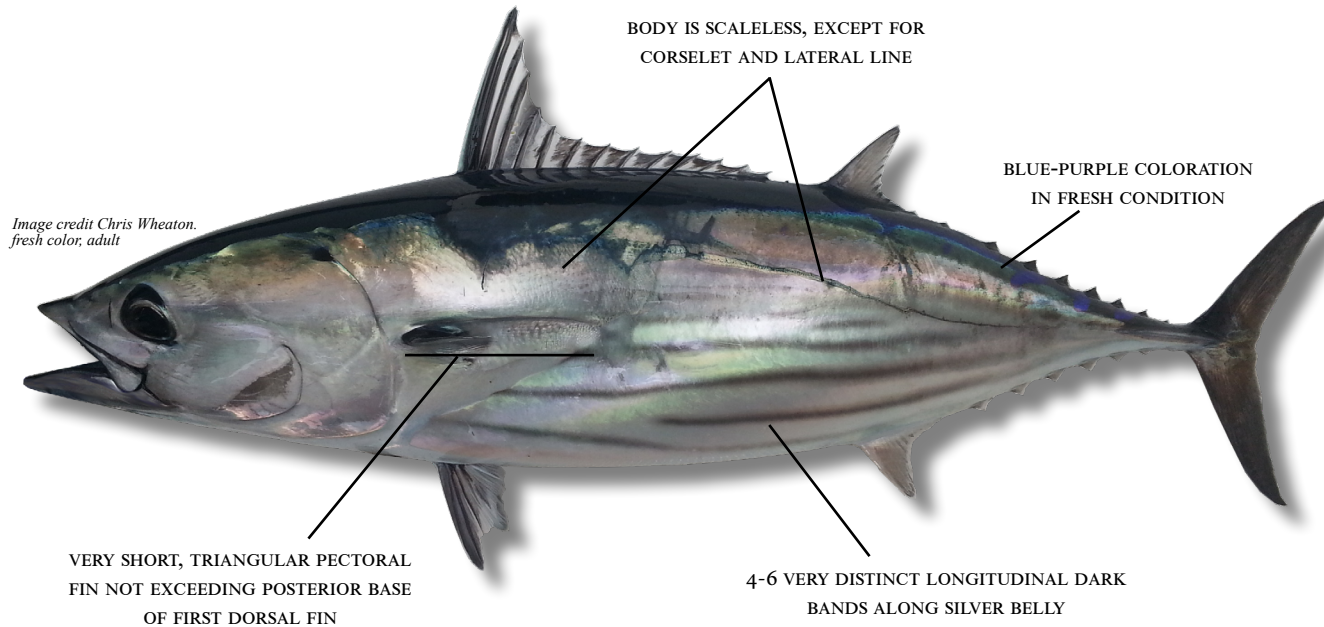
**Fishing:** Longline, live bait hook-and-line, trolling, purse seine. Albacore is the only tuna with pure white meat, making it an extremely valuable commercial target in the U.S., primarily for the canning industry.

**U.S. West Coast seasonal range:** Common in coastal and offshore waters from the U.S.-Canada border to the U.S.-Mexico border. Albacore favor cooler water temperatures and are more common in the most northern range of their west coast distribution, off Oregon and Washington.



# Skipjack tuna (*Katsuwonus pelamis*)

**Description:** Small-bodied and slender; metallic dark blue back with blue-purple coloring along the side of live fish with skin gradually transitioning through silver-purple to silver belly; anal finlets are dark and second dorsal and anal fins are light yellow; the most distinctive features are longitudinal dark lateral bands and live purple coloring.



**Other common names:** Barrilete (Spanish), aku (Hawai'i), katsuo or ha-gatsuo (Japanese)

**Size and reproduction:** Skipjack tuna are relatively small and reach a maximum fork length of 108 cm FL (3.5 ft.). Size at first sexual maturity is around 45 cm FL (1.5 ft.; age 1.5). Average skipjack tuna found off the U.S. West Coast range from 30-90 cm FL (1-3 ft.; 5-25 pounds).

**Habitat:** Skipjack are surface-schooling, epipelagic fish found across the Pacific in tropical and temperate waters, 59-86° F. Skipjack are associated with upwelling, cold and warm water boundaries, oceanic fronts, and convergence zones<sup>3</sup>. Spawning of skipjack tuna greater than 50 cm FL (1.6 ft.) occurs in areas of the EPO in sea surface temperatures of 75.2°-86° F, with more than 75% of spawning occurring in waters 79°-84° F<sup>6</sup>.

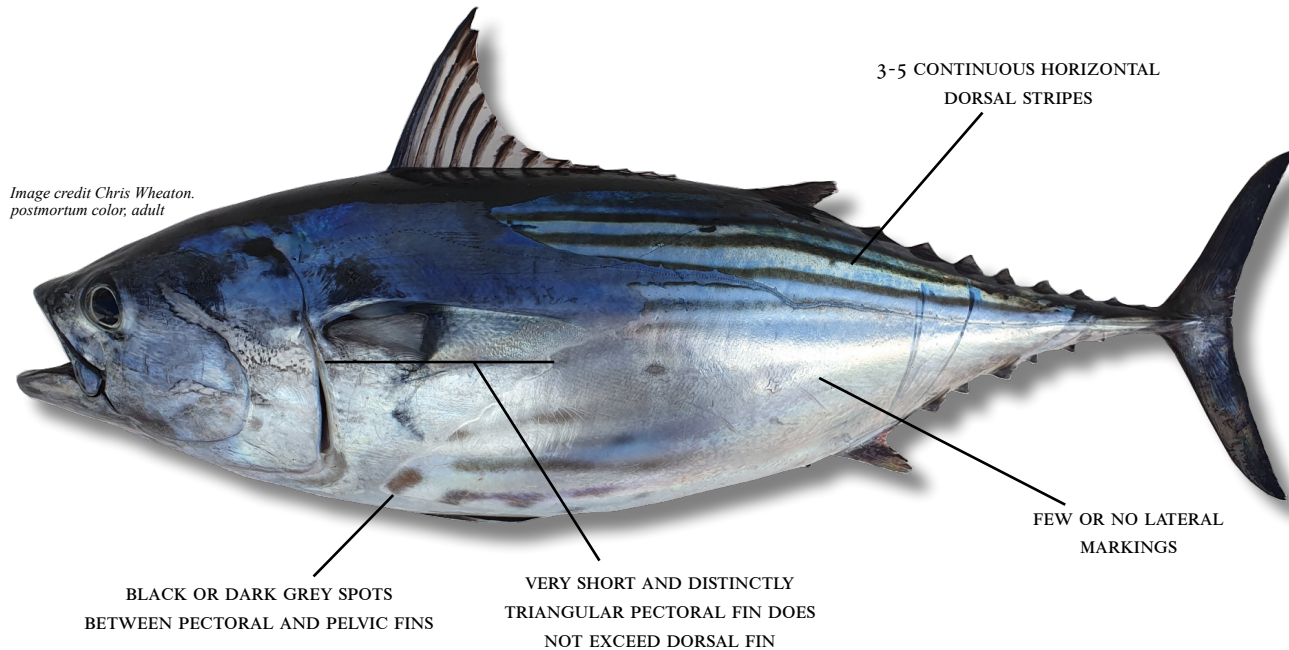
**Diet:** Small pelagic fish, crustaceans, and mollusks. Skipjack are also important prey for larger tuna, billfish, and shark species.

**Fishing:** Purse seine, hook-and-line, gillnet. Skipjack are heavily harvested commercially, making up more than half of the world's commercial tuna harvest.

**U.S. West Coast seasonal range:** Common in coastal and offshore waters from U.S.-Canada border to U.S.-Mexico border.

# Black skipjack tuna (*Euthynnus lineatus*)

**Description:** Metallic dark blue back with faint lateral blue band along the side of live fish; skin gradually transitions through silver-blue to pinkish-silver; anal finlets are dark and second dorsal and anal fins are light yellow; most distinctive features are dorsal horizontal stripes.



**Other common names:** Barrilete negro (Spanish), katsuo (Japanese)

**Size and reproduction:** Black skipjack grows to a maximum size of 84 cm FL (2.7 ft.), with an estimated size at maturity around 47 cm FL (1.5 ft.). While not common in U.S. waters, average sizes found in the Eastern Pacific Ocean are around 60 cm FL (2 ft.).

**Habitat:** Black skipjack tuna are found to school with other species such as skipjack, yellowfin, and mahi mahi<sup>3</sup>. They spawn off Baja California, Mexico during the summer months and are found in waters warmer than 73° F.

**Diet:** Small pelagic fish, crustaceans, and cephalopods. Black skipjack are also important prey species for yellowfin tuna, sharks, and various billfish species.

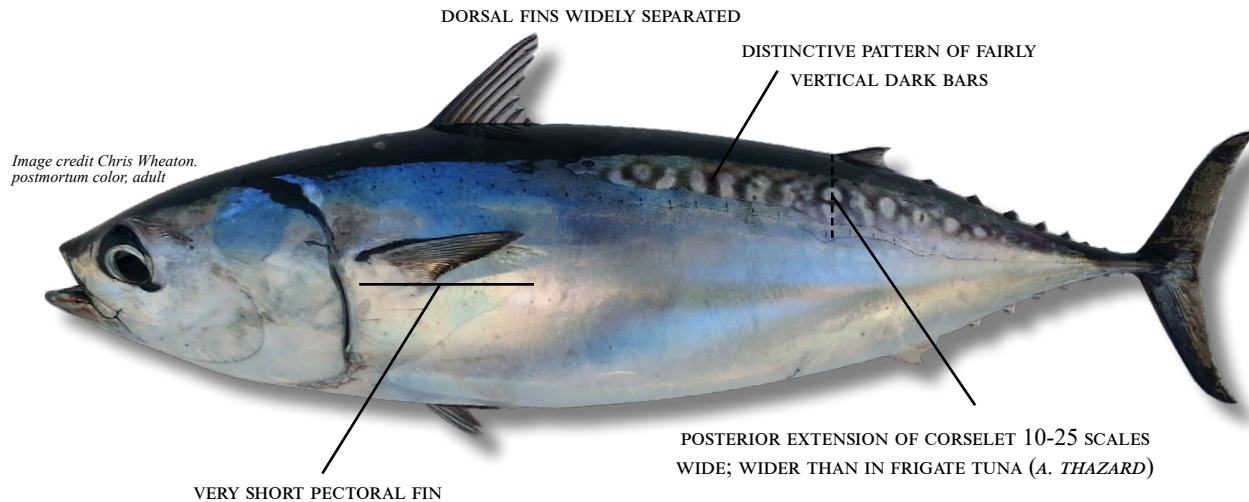
**Fishing:** Bycatch in purse seines, hook-and-line, and trolling operations. Black skipjack are also targeted by purse seine vessels in Mexico, Costa Rica, and Ecuador for canning.

**U.S. West Coast seasonal range:** Uncommon, but range includes coastal and offshore waters from San Simeon, California to the U.S.-Mexico border<sup>3</sup>.



# Bullet tuna (*Auxis rochei*)

**Description:** Dorsal coloration dark blue and bluish-purple transitioning into more true blue; very distinct pattern of 15 or more fairly vertical dark bars on anterior dorsal scaleless area; silver belly has no stripes or spots; much wider corselet than other species of frigate tuna, including *A. thazard*.



**Other common names:** Bullet mackerel, melva (Spanish), mejika (Japanese)

**Size and reproduction:** *Auxis rochei eudorax* is recognized as a distinct Eastern Pacific Ocean subspecies of the worldwide population of bullet tuna, *A. rochei*<sup>7</sup>. Bullet tuna reach a maximum length of 50 cm FL (1.6 ft.), but average lengths range between 15 and 35 cm FL (0.5-1 ft.). Length at sexual maturity is generally reached around 17-24 cm FL (age 1-2 years)<sup>10</sup>.

**Habitat:** Bullet tuna are extremely abundant in the warmer waters of their Pacific-wide range and are considered an important part of the food web.

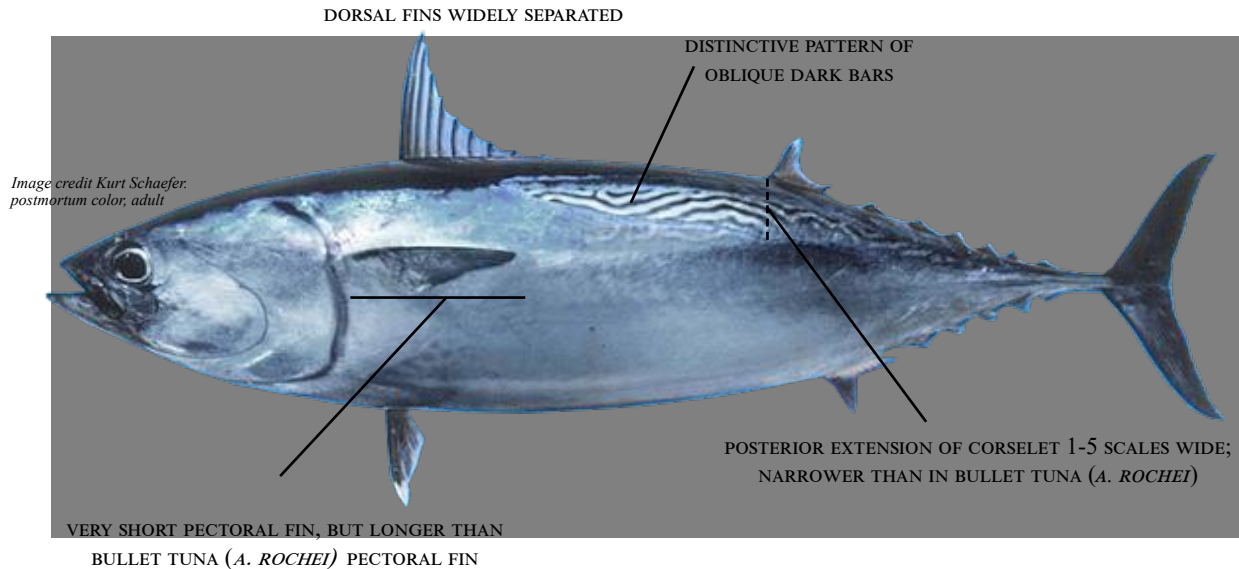
**Diet:** Small fish, particularly anchovies and related species, planktonic crustaceans, and fish larvae.

**Fishing:** Hook-and-line, troll, encircling nets, small-scale longlines, bycatch in purse seine operations. Bullet tuna are a commercial bycatch commodity, usually as bait for larger fish.

**U.S. West Coast seasonal range:** Uncommon, only seasonally entering coastal and offshore waters south of Point Conception to the U.S.-Mexico border when temperatures are warm enough<sup>3</sup>.

# Frigate tuna (*Auxis thazard*)

**Description:** Dorsal coloration dark blue and bluish-purple transitioning into more true blue; very distinct pattern of 15 or more fairly oblique dark bars on anterior dorsal scaleless area; silver belly with no stripes or spots.



**Other common names:** Melva (Spanish), oioi (Hawai'i), hiramejika (Japanese)

**Size and reproduction:** *Auxis thazard brachydorax* is recognized as the Eastern Pacific Ocean subspecies of the frigate tuna, *A. thazard*, found worldwide<sup>7</sup>. Frigate tuna can grow to at least 62 cm FL (2 ft.). *A. thazard brachydorax* grows larger than bullet tuna (*A. rochei*), with size at first maturity between 29-35 cm FL (~1 ft.).

**Habitat:** Frigate tuna are widespread and extremely abundant in warm waters globally. They are often caught alongside *A. rochei* as bycatch in fisheries targeting larger tuna. Similar to *A. rochei*, frigate tuna are considered an important part of the food web due to their sheer abundance<sup>3</sup>.

**Diet:** Small fish, particularly anchovies and related species, planktonic crustaceans, and fish larvae.

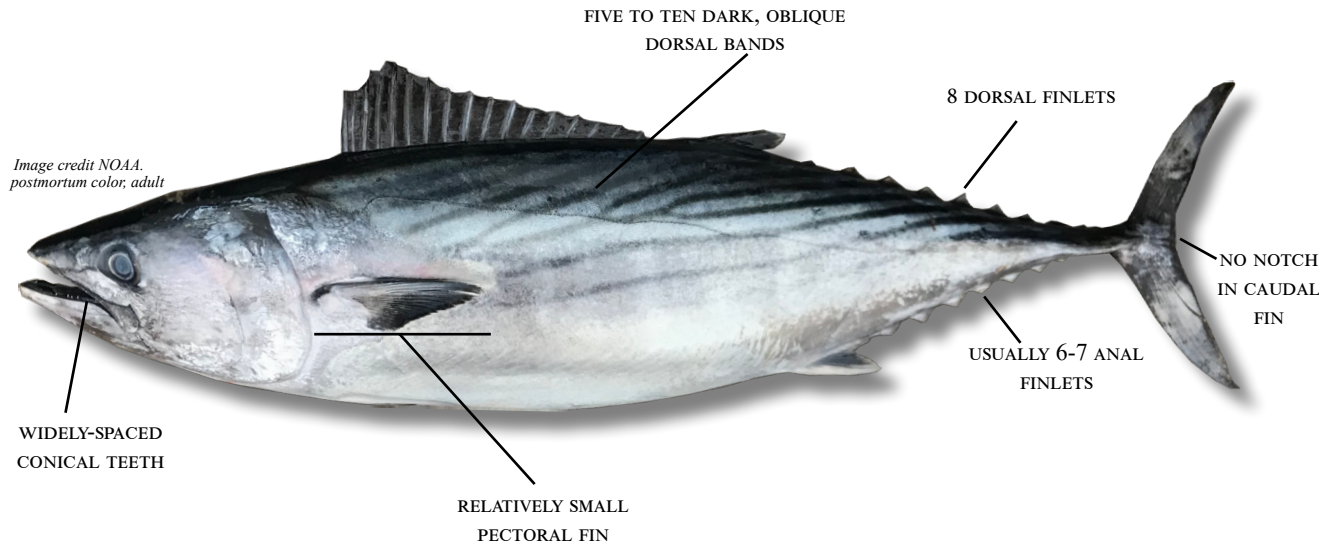
**Fishing:** Hook-and-line, troll, encircling nets, small-scale longlines, bycatch in purse seine operations.

**U.S. West Coast seasonal range:** Uncommon, only seasonally entering coastal and offshore waters south of Point Conception to the U.S.-Mexico border when temperatures are warm enough<sup>3</sup>.



# Pacific bonito (*Sarda chiliensis*)

**Description:** Long and slender body with a moderately large mouth and obvious conical teeth on both upper and lower jaw; distinct oblique dorsal bands.



**Other common names:** Striped bonito, bonito (Spanish), katsuo (Japanese)

**Size and reproduction:** Pacific bonito reach sexual maturity in California at 50 cm FL for males (1.6 ft.; age 1-2 years) and 56 cm FL for females (1.8 ft.; age 2 years)<sup>10</sup>. While they can reach a maximum size of more than 102 cm FL (3.3 ft.), average sizes off the U.S. West Coast range from 30-65 cm FL (1-2 ft.).

**Habitat:** Of the four species of *Sarda*, the Pacific bonito species has two subspecies in the Eastern Pacific Ocean: a southern *Sarda chiliensis chiliensis* found from Peru to Chile, and the more northern *Sarda chiliensis lineolata*, found from Alaska to the tip of Baja California, Mexico<sup>3</sup>.

**Diet:** Small schooling fish, squids, shrimps, and pelagic crustaceans.

**Fishing:** Bycatch in purse seines, hook-and-line, and trolling operations.

**U.S. West Coast seasonal range:** Common in coastal and offshore waters from the U.S.-Canada border to the U.S.-Mexico border.

# Literature Cited

1. NOAA Fisheries. "Historical Overview: Tuna Fishing & Canning in San Pedro – Terminal Island." NOAA Fisheries West Coast Region.
2. Block, B.A and E.D. Stevens, eds. 2001. *Tuna: Physiology, Ecology, and Evolution*. Vol. 19. Gulf Professional Publishing.
3. Collette, B.B. and C.E. Nauen. 1983. FAO Species Catalogue. Vol. 2 Scombrids of the world. An annotated and illustrated catalogue of tuna, mackerels, bonitos and related species known to date. *FAO Fish. Synop.* 125 (2), 137 p.
4. Okochi, Y., Abe, O., Tanaka, S., Ishihara, Y., and A. Shimizu. 2016. Reproductive biology of female Pacific bluefin tuna, *Thunnus orientalis*, in the Sea of Japan. *Fisheries Research*, 174, 30-39.
5. Kitagawa, T., Kimura, S., Nakata, H., and H. Yamada. 2004. Diving behavior of immature, feeding Pacific bluefin tuna (*Thunnus thynnus orientalis*) in relation to season and area: the East China Sea and the Kuroshio–Oyashio transition region. *Fisheries Oceanography*, 13 (3), 161-180.
6. Schaefer, K.M and D.W. Fuller. 2019. Spatiotemporal variability in the reproductive dynamics of skipjack tuna (*Katsuwonus pelamis*) in the Eastern Pacific Ocean. *Fisheries Research*, 209, 1-13.
7. Collette, B.B. and C.R. Aadland. 1996. Revision of the frigate tunas (*Scombridae*, *Auxis*), with descriptions of two new subspecies from the Eastern Pacific. *Fish. Bull.* 94 (3): 423-441.
8. Itano, D.G. 2005. *Handbook for the Identification of Yellowfin and Bigeye Tunas in Fresh Condition. English version 2. Pelagic Fisheries Research Program*. JIMAR. University of Hawaii, USA. <http://www.issfguidebooks.org/species-guides>.
9. Collette, B.B., Acero, A., Canales Ramirez, C., Cardenas, G., Carpenter, K.E., Di Natale, A., Guzman-Mora, A., Montano Cruz, R., Nelson, R., Schaefer, K., Serra, R. and E. Yanez. 2011. *Euthynnus lineatus*. *The IUCN Red List of Threatened Species* 2011: e.T170320A6747016.
10. Collette, B. and J. Graves. 2019. *Tunas and Billfishes of the World*. John Hopkins University Press.
11. Schaefer, K.M. 1999. Comparative study of some morphological features of yellowfin (*Thunnus albacares*) and bigeye (*Thunnus obesus*) tunas. *Inter-Amer. Trop. Tuna Comm., Bull.*, 21(7): 489-526.
12. Hawaii Fishing News. 2001. Hawaii's Offshore Hunters. First Edition. Hawai'i Fishing News, Honolulu, Hawai'i.
13. Chen, K. S., Crone, P. R., and C.C. Hsu. 2010. Reproductive biology of albacore *Thunnus alalunga*. *Journal of Fish Biology*, 77(1), 119-136.
14. Boustany, A., Matteson, R., Castleton, M., Charles Farwell, C. and B. Block. 2010. Movements of Pacific bluefin tuna (*Thunnus orientalis*) in the Eastern North Pacific revealed with archival tags. *Progress in Oceanography* 86 (1-2), 94-104.
15. Kitagawa, T., Boustany, A., Farwell, C., Williams, T., Castleton, M. and B. Block. 2007. Horizontal and vertical movements of juvenile bluefin tuna (*Thunnus orientalis*) in relation to seasons and oceanographic conditions in the eastern Pacific Ocean. *Fisheries Oceanography* 16(5) 409-421.

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