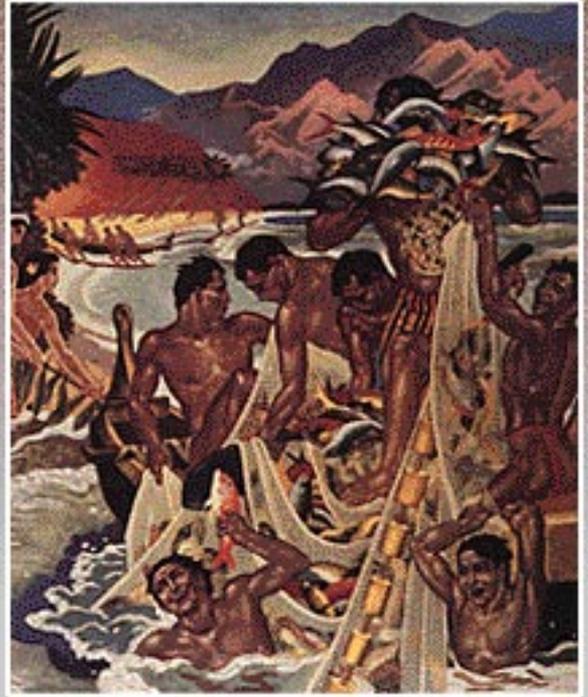




Hawaii Seafood

BUYERS' GUIDE



The Hawaii Seafood Buyers' Guide is comprised of two sections: Introduction and Species Descriptions. The introduction and each of the 16 species descriptions are separate pages of this Guide. The Introduction provides summary information and tabular data for four major groups of Hawaii's fish species: 1) Tuna; 2) Billfish; 3) Other Open Ocean Species; and, 4) Bottomfish. The Introduction is intended as a technical reference for buyers' information, including seasonal availability, shelf life, product forms and yields, suggested quantities of purchase and methods of preparation of the major species. The Species Descriptions provide more popularized background information about biology, availability, fishing methods, catch distribution, substitution potential, quality control, color, taste, texture, and preparation for 16 major species. The Species Descriptions include photographs of each species in whole and filleted forms, and of selected species in food preparations. Seafood buyers could prepare their own point-of-sale promotional material by combining information from the Species Descriptions with new or existing photographs. Negatives of the photographs contained in the Buyers' Guide are available for this purpose.

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The Hawaii Seafood Buyers' Guide

Fresh seafood has been popular in Hawaii since the first Hawaiians arrived by canoe. Today, as a result of ethnic preferences and the abundance and diversity of high quality seafood products, Hawaii's consumers eat twice as much seafood as the U.S. per capita national average. This Buyers' Guide was prepared to aid potential buyers and consumers of Hawaii's seafood products in their selection and preparation.

This Guide focuses only on the most popular and available species. Many other Hawaiian species are as versatile in their uses and just as good tasting, but unfortunately, their supplies are limited. Even supplies of most of the more abundant species fluctuate seasonally, and during the off-season, substitution is often necessary. Seasonality in landings of the species included in this Guide are summarized in Table 1.

To the uninitiated buyer, prices for fresh seafood from Hawaii may seem high. Pricing, however, is directly related to the limited supplies and high demand for island fish and the willingness of buyers to pay a premium for the higher product grades. General indicators of quality in Hawaiian fish are summarized in Table 2, which was adapted from material originally presented in "The Seafood Handbook" published by Seafood Business.

There are two principle factors which contribute to high quality in Hawaii's seafood products: (a) the sale of a large percentage of the islands' seafood harvest at auctions where there is an opportunity for visual inspection of quality and competitive bidding; and, (b) the demand of the sashimi market in which fish are purchased to be eaten raw by very discriminating consumers.

Hawaii's Fish Auctions

Fish auctions represent one of several possible marketing avenues open to Hawaii's commercial fishermen. Other options are to contract with buyers at set prices (as often occurs in continental U.S. fisheries) or to sell their own catch, either individually or through an association. Fish auctions in Honolulu and Hilo are the only systems in the U.S., other than the Fulton Street Market in New York and a newly-opened auction in Portland, Maine, set up to allow an inspection of the product prior to bidding. Hawaii's fish auctions are characterized by wide daily and seasonal fluctuations in prices which depend on the current balance of supply and demand; the buyers' assessment of product quality; and, other factors. Fish are delivered to the auctions by the fishermen themselves for storage overnight or by the auction companies' trucks, which meet the larger boats at the dock in the early morning.

Tuna caught by long-line are displayed in the round, with wedges or flesh exposed near the tail for inspection by the buyers. Large tunas not caught by the longline method are displayed with one lengthwise quarter removed from the whole fish so that the core flesh is fully visible for inspection. Marlins have their bills removed and the larger fish are halved crosswise to display their flesh. The tunas and billfish are auctioned first, followed by smaller species (which are displayed in the round), including bottomfish, reef fish, mackerel species, mahimahi, ono, crab, lobster and occasionally limpet (a shellfish). After the auctioneer announces the weight and species of the product about to be sold, he elicits an initial bid from one of the dozen or more fish dealers gathered around him. The bid is raised (in increments of ten cents or more per pound) until the highest bid is determined. All of the regular bidders are attuned to upcoming demand from their customers, and the morning trip to

the auction provides them with a sense of the day's supply of fish to meet that demand. The auction process sorts out competing demands and directs the available supply toward the highest-priced markets.

The “Sashimi” Market

Much of the large tuna marketed in Hawaii is destined for use as raw fish, mostly as sashimi (bite-sized pieces of raw fish often served with soy sauce and wasabi, Japanese horseradish), but also on top of finger-shaped servings of rice (sushi). Sashimi is a traditional Japanese dish in which presentation is an art form. The various colors of different fish or different cuts of the same fish are arranged in combinations that are pleasing to the eye, as well as to the palate. Sashimi is rapidly gaining popularity outside its traditional ethnic consumer base.

On a per capita basis, Hawaii's consumption of raw tuna is second in the world only to Japan's, and the lure of high prices provides the incentive for Hawaii's fishermen to seek large tunas suitable for the sashimi market. High prices, however, are paid only for top-quality, well-handled tuna. Poor quality or poorly handled fish are unacceptable for sashimi. Prices paid for large tunas vary greatly, depending on many factors, such as the amount and type of tunas arriving in the market; the demand in Hawaii and in export markets; the season of the year, moon phase and other conditions affecting catchability; the fishing methods; and the overall quality of the product.

Several species of fish caught off the Hawaiian Islands are suitable for use as sashimi. The bigeye tuna (*Thunnus obesus*), which predominates in longline catches during the winter, is highly valued for sashimi. Large tuna (ahi over 100 pounds) are preferred because they yield a greater percentage of sashimi from the total weight of the fish, but fish as small as 30 pounds may be acceptable, especially if not much else is available. Other tunas and marlins listed in the Guide may also yield good sashimi if the fat content and the color of the flesh are acceptable. Onaga (ruby snapper), opah (moonfish) and other species are used for sashimi to a lesser extent than tuna or marlin.

The importance of sashimi to consumers has produced a market that is both discriminating and complex. Only the top grades of fish enter this market. Fish are individually examined before their sale and, if sold at auction, are bid on individually.

The qualities which render a fish suitable for sashimi include texture, firmness, taste, color, and moisture content of the flesh, but by far the most important is fat content, which should be high. Fat content is a natural phenomenon which varies with species as well as with the movements of the fish, its feeding behavior prior to capture and the characteristics (mainly water temperature) of its natural habitat.

Sashimi consumers differentiate quality from among various sizes and species of fish, as well as among the various cuts of an individual fish. The major differentiation is between the fattier, outer layer of the flesh (closest to the skin) called toro and the inner part of the flesh called akami. In most fish markets in Hawaii, tuna are sold by loin section, and a tuna cross-cut will yield both toro and akami.

Buyers' Summary

The following portions of the Introduction provide summary information useful in buying and preparing Hawaii's major fish species. The approximate shelf life of these species from the time of capture is estimated in Table 3.

It should be remembered that variations in handling and in ocean and weather conditions will cause individual fish to vary in shelf life from the generalized estimates. Table 4 reviews the most readily available product forms for the major fish species. Table 5 summarizes the typical landed size of these species and the approximate yield (as percentage of round weight of the most readily available product forms). Table 6 provides general advice on appropriate quantities of fish to buy depending on intended use.

Most of Hawaii's fish products may be used in a variety of ways. Table 7 indicates the most common methods of preparation for the major products included in the Guide. Table 8 provides nutritional and dietary information about selected species.

Hawaii's Tuna

Four species of tuna are landed in substantial quantities in Hawaii:

- Albacore tuna (*Thunnus alalunga*) or tombo ahi;
- Bigeye tuna (*Thunnus obesus*) or ahi;
- Skipjack tuna (*Katsuwonus pelamis*) or aku; and,
- Yellowfin tuna (*Thunnus albacares*) or ahi.

Tuna caught off the Hawaiian Islands belong to stocks which migrate long distances across the Pacific Ocean, and their availability in Hawaiian waters is seasonal. In Hawaii, the peak season for most tuna species is summer (April-September), but in contrast, the heaviest landings of bigeye tuna occur in winter (October-March).

The major quality factors over which fishermen have control include: freshness (which varies with length of fishing trips and initial handling of the catch); initial handling (rough handling, dragging, bending or dropping will ruin the general appearance of the fish, as well as cause the flesh to lose its firm consistency or to crack); and, time the fish is left in the water after capture (too long a time will bleach out the original bright body colors and cause a loss of flesh color).

The initial quality of the tuna when hooked is not under the control of the fisherman. Many natural factors influence initial quality. One of the most important is spawning. Prior to the spawning, tunas (and most other fish species) feed voraciously and increase their body fat content substantially. After spawning, their fat content is very low and the water content of the muscle is high, rendering the quality of the fish inferior. Shelf life is relatively lower, even under ideal storage conditions, in tuna and other fishes having red muscle tissue. Pigmented muscle is rich in iron and copper, two minerals that promote oxidative rancidity. Removal of blood with its iron containing pigments that foster oxidation will extend the keeping time of fresh tuna. Therefore, if tunas are landed while still alive, they should be bled. After bleeding, they should be submerged in an ice-seater brine to bring down the core temperature of the fish. After the core temperature is reduced or if the fish is landed dead (as is often the case in longlining), the catch should be individually packed on ice. As with all seafood products, conscientious handling and proper icing of tuna are prerequisites for a high quality product.

Buyers look for the following indicators of good quality in fresh whole tuna:

- bright, clean appearance with little or no loss of original body colors;
- clear, moist eyes with black pupils;
- skin and scales unbroken;
- damage to the fish's head by gaff is tolerated, but other mutilation or evidence of ulcers, parasitic worm infestation, or physical injury lower the market value;
- moist, firm rigid skin elastic to the touch; and,
- abdominal walls smooth, clean and intact.

Proper care by the buyer or distributor involves grilling and gutting fish (if this has not been done at sea) and repacking in ice for cold storage at temperatures of 28 to 32 degrees F. To avoid bleaching of the flesh, loins, steaks or fillets produced from a whole tuna should be wrapped in plastic so that there is no direct contact with ice or water.

Hawaii's Billfish

Four species of billfish are caught in substantial quantities off the Hawaiian Islands:

- Pacific blue marlin (*Makaira nigricans*), kajiki or a'u;
- Shortbill spearfish (*Tetrapturus angustirostris*) or hebi;
- Striped marlin (*Tetrapturus audax*), nairagi or 'au;
- Broadbill swordfish (*Xiphias gladius*) or shutome.

With the exception of shutome, billfish are harvested in the open ocean by the same fleets which land fresh tuna and they enter the same markets as tuna. Seasonality of species is evident, with Pacific blue marlin most available during the summer months, striped marlin most available in the spring and fall, and shortbill spearfish most available in the summer and fall. Shutome is predominant in spring and summer.

The same general procedures for proper care of tuna also apply to billfish. However, a handling problem specific to billfish is their susceptibility to gaping or "cracking" if the fish is bent.

In a gutted billfish, buyers can determine freshness not only by examination of the exposed flesh, but by squeezing the corner of the belly flap between thumb and forefinger. A rubbery texture indicates freshness, but if the fingers penetrate the flesh, quality is lower. Another indicator of lower quality in marlin is whether the small, finely-pointed scales break off or stick out after running a hand across the skin. Gutted marlin, like gutted tuna, will keep better if the belly cavity is well iced. Loined marlin should be bagged to protect the flesh from air and dehydration in cold storage. To extend the shelf life of gutted marlin, the blood line should be completely removed. If oxygen from the blood remains in contact with the flesh for a long time, the flesh may take on a somewhat rancid taste. Blood denatures quickly, so removal of the blood line will also improve the life of fresh fillets.

Hawaii's Other Open Ocean Species

In addition to tuna and billfish, a few other species are harvested in the open ocean waters off Hawaii. The best known of these species are the mahimahi (dolphinfish), ono (wahoo), monchong (bigscale or sickle pomfret), and opah (moonfish). These fish are from different families and are discussed individually in the Species Descriptions.

Hawaii's Bottomfish

Hawaii's commercial bottomfish catch is comprised of a dozen species of snappers and groupers. Three snappers and one grouper, and one jack account for about 75% of the landings:

- Snapper or Jobfish (*Aprion virescens*) or uku;
- Grouper (*Epinephelus quernus*) or hapu'upu'u;
- Crimson snapper (*Pristipomoides filamentosus*) or opakapaka; and,
- Ruby snapper (*Etelis coruscans*) or onaga.

Most bottomfish species in Hawaii are caught along the drop-off between the narrow terraces and the steep slopes that surround the islands and banks. The small amount of suitable habitat limits potential bottomfish yields.

Small bottomfish (less than 5 pounds), are the preferred size for the household retail market and for certain types of restaurants, where fish are often served with the head on. Medium to large bottomfish (over 5 pounds) are preferred for the restaurant fillet market because the percent yield of edible material is high, handling costs per unit weight are lower, and more uniform portions can be cut from the larger fish.

Bottomfish landed from the main Hawaiian Islands are marketed through fish auctions in Honolulu and Hilo, through intermediary buyers on all islands, and directly from fishermen to retail stores and restaurants. Bottomfish landed from the Northwestern Hawaiian Islands are marketed predominantly through the Honolulu fish auction. The portions of the Hawaiian chain known as the main Hawaiian Islands and the Northwestern Hawaiian Islands are shown in Figure 1.

The preferred method of maintaining good quality of bottomfish is to place the fish in an ice-seawater brine slush immediately after landing to super-chill it in a straight position before packing in ice. Fish which are bent in the brining procedure may have cracked fillets. To prevent fading of the attractive natural skin colors, the brine must be periodically replenished with seawater, and the fresh melted ice water must be drained.

If bottomfish are not chilled to the core (by brining) immediately after capture, or if they are stored in the round for too long, the viscera will swell and the gills will turn brown and emit a bad odor, reducing the market value of the fish. Properly chilled bottomfish stored in the round, however, will retain the desired firm texture longer than bottomfish that are processed immediately after capture.

The signs of a good quality bottomfish are:

- body stiff, straight, and firm;
- skin colors natural and bright with no fading or bleach spots;
- fins not split;
- scales intact;
- eyes convex, clear, and firm; and,
- gills red with no odor.

Most of the bottomfish catch is landed as whole, iced fish, so that buyers can assess fish quality by examining the clarity of the eyes, the color of the gills and body firmness.

Species Descriptions

Readers are referred to the following sections of the Guide for further information about the best known and most available of Hawaii's diverse fishes. Four species of tuna, four species of billfish, four other open ocean species, and four species of bottomfish are described.

Tuna

Aku (*Katsuwonus pelamis*)

Skipjack Tuna

French: Bonite A Ventre Raye

German: Echter Bonito

Italian: Tonnetto Striato

Spanish: Listado, Barrilete

Japanese: Katsuo

Hawaii names: Aku

Ahi, Bigeye (*Thunnus obesus*)

Bigeye Tuna

French: Thon Obese

German: Grossaugenthun

Italian: Tonno Obeso

Spanish: Patudo

Japanese: Mebachi

Hawaii names: 'Ahi po'o nui; 'Ahi

Tombo (*Thunnus alalunga*)

Albacore Tuna

French: Germon

German: Weisser Thun

Italian: Tonno Bianco, Alalunga

Spanish: Albacora, Atun Blanco

Japanese: Bincho; Binnaga; Tombo

Hawaii names: 'Ahipalaha

Ahi, Yellowfin

(*Thunnus albacares*)

Yellowfin Tuna

French: Albacore

German: Gelbflossenthun

Italian: Tonno Albacora

Spanish: Rabil

Japanese: Kihada

Hawaii names: 'Ahi

Billfish

Shutome (*Xiphias gladius*)

Broadbill Swordfish

French: Espadon

German: Schwertfisch

Italian: Pesce Spada

Spanish: Pez Espada

Japanese: Mekajiki

Hawaii names: A'u ku; A'u

Hebi (*Tetrapturus angustirostris*)

Shortbill Spearfish

French: Makaïre A Rostre Court

German: Speerfisch

Italian: Aguglia Imperiale

Spanish: Marlin

Japanese: Fuuraikajiki

Hawaii names: A'u

Kajiki (*Makaira nigricans*)

Pacific Blue Marlin
 French: Makaïre Bleu
 German: Blauer Marlin
 Italian: Marlin Azzurro
 Spanish: Marlin Azul
 Japanese: Kurokajiki
 Hawaii names: A'u ki; A'u

Nairagi (*Tetrapturus audax*)

Striped Marlin
 French: Marlin Raye
 German: Gestreifter Marlin
 Italian: Pesce Lancia Striato
 Spanish: Marlin Rayado
 Japanese: Makijiki
 Hawaii names: A'u

Open Ocean**Mahimahi (*Coryphaena bippurus*)**

Dolphin Fish
 French: Coryphene
 German: Goldmakrele
 Italian: Lampuga
 Spanish: Lampuga, Dorado
 Japanese: Shiira
 Hawaii names: Mahimahi

Ono (*Acanthocybium solandri*)

Wahoo
 French: Thazard Batard
 German: Peto, Wahoo
 Italian: Maccarello Striato
 Spanish: Peto
 Japanese: Kamasu-sawara
 Hawaii names: Ono Malani

Opah (*Lampris regius*)

Moonfish
 French: Opah, Assiette
 German: Gotteslachs
 Italian: Pesce Re
 Spanish: Brosmio
 Japanese: Akamanbo; Mandai
 Hawaii names: *

Monchong (*Taractichthys steindachneri*)

Bigscale or Sickie Pomfret
 French: Castagnole Fauchoir; Cosmopolite
 German: Brachsenmakrele
 Italian: Pesce Castagna
 Spanish: Castenete; Japuta; Palometa Negra
 Japanese: Monchong; Hire Jiro Monchong
 Hawaii names: Mukau

Bottom Fish**Hapu'upu'u**

Grouper or Sea Bass
 French: Merou
 German: Zackenbarsch
 Italian: Cernia; Sciarrano
 Spanish: Mero; Cherna; Garoupa
 Japanese: Mahata
 Hawaii names: Hapu'upu'u

Onaga (*Etelis coruscans*)

Ruby or Long-tail Snapper
 French: Vivaneau
 German: Schnapper
 Italian: Lutiano
 Spanish: Huachinango
 Japanese: Onaga; Hamadai
 Hawaii names: 'Ula'ula koa'e

Opakapaka (*Pristipomoides filamentosus*)

Crimson Snapper
 French: Vivaneau
 German: Schnapper
 Italian: Lutiano
 Spanish: Huachinango
 Japanese: Kinme Himedai; Ohimedai
 Hawaii names: Paka

Uku (*Aprion virescens*)

Snapper or Jobfish
 French: Vivaneau
 German: Schnapper
 Italian: Lutiano
 Spanish: Huachinango
 Japanese: Aochibiki
 Hawaii names: Ukupalu

Aku



I. Biological Description

Aku (*Katsuwonus pelamis*) is commonly known as skipjack tuna. Other names for this species include striped tuna, oceanic skipjack and katsuo. This near-surface schooling tuna is widely distributed across the Pacific Ocean.

II. Of Special Interest For Buying/Distributing

Availability and Seasonality: Aku is historically the most important single commercial fish species in terms of landed weight and value in Hawaii, as well as throughout much of the central and western Pacific. Hawaii's aku fishery, however, is characterized by wide annual and seasonal fluctuations in landings. Aku caught in Hawaii routinely range between 4 and 15 pounds in round weight, but larger fish (16 to 30 pounds in round weight), move into Hawaiian waters during the summer season of increased abundance (April-September).

Fishing Methods: Most of the aku catch in Hawaii is landed by commercial pole-and-line fishermen who induce aku to bite on feathered hooks by chumming with live bait. The pole-and-line catch is sorted according to fish size and is initially stored and sold in tubs head down so that blood drains away from the flesh. Trollers and longline boats land the remainder of the aku catch.

Distribution: Troll-caught aku is marketed through fish auctions in Honolulu and Hilo, through intermediary buyers on all islands, and by peddlers from the roadside. The pole-and-line aku, fleet, which is centered on the island of Oahu, markets its catch through intermediaries who sell to fresh fish outlets.

Substitution: Although ahi are often the preferred species for sashimi, aku can be substituted and, in fact, is preferred by some. When cooked, the red-fleshed aku lightens considerably in color, so it is interchangeable with ahi and a'u in broiled or fried forms. Aku, ahi, and a'u are also interchangeable for dried and smoked products, but due to their larger size, ahi and a'u offer better yields.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Even with the best care, aku has a relatively short shelf life as a high quality product and is generally consumed within 6-7 days after landing (See Table 3). Aku which has been caught by trolling or pole-and-line is fresher and, hence, has a longer shelf life than that caught by longline boats, which make longer fishing trips.

Aku keeps longer if it is stored whole (especially if head down) and is not filleted until shortly before use. Larger summer fish (16-30 pounds in round weight) keep better than smaller fish. The first evidence of deterioration is a transformation of the deep red color of the meat to a brownish-red or rainbow color, accompanied by loss of firm texture.

It is not uncommon to find small worms in the belly flaps of aku. Studies have shown that these parasites present little, if any, health hazard, and they can be easily removed or destroyed by cooking.

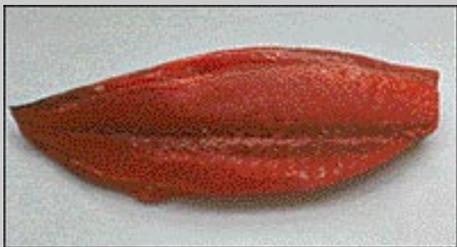


Product Forms And Yields: Aku is sold in various forms: whole fish, fillets, steaks, in raw fish preparations or as dried fish sticks. Much of the aku catch is sold fresh, but surpluses caught during the peak summer season are sometimes processed. Some of the excess summer fish are dried. The yield of fillet from whole fish varies from 45% for small aku to 60% for large aku (see Table 5).

Filleting Aku: Remove the dorsal fin, head, gills and guts. Cut into the fish from both sides to establish slits along the backbone. Join these slits at the narrowest part of the fish (the tail) and fillet along the bone all the way to the collar.

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Good quality aku has firm flesh that is deep red in color. Flesh color varies with the size of the fish, with smaller fish having a lighter red color than larger fish; hence, larger aku are preferable for raw fish preparations requiring a red flesh. Larger aku have a greater fat content than smaller aku and this is another desirable attribute for raw fish dishes. Cooking causes the flesh to become lighter in color.



Aku has a more pronounced taste than ahi or a'u. This is an advantage in satisfying local ethnic taste preferences, but it may not be as desirable in other markets.

Preparations: Aku is the preferred species for many ethnic seafood dishes, especially poke, raw fish served in bite-sized pieces with various spices and condiments. Many Japanese and Hawaiian consumers prefer sashimi prepared from large

aku to that from ahi. "Aku bone" (the backbone of a filleted fish which retains thin strips of flesh) is a favorite food among certain ethnic groups in Hawaii, as are aku roe and dried aku.

Aku can be cooked in many different ways, but is usually broiled over hot coals, sauted or fried in a skillet. The meat cooks quickly and can easily dry out if overcooked.

V. Historical Note

Aku figures prominently in Hawaiian legends. According to one legend, while voyaging to settle in Hawaii from the south seas, a chief and his party were caught in a storm which threatened to swamp their canoes. In response to the prayers of the sailors, a school of aku appeared and calmed the rough waters. To honor this fish, it was forbidden for Hawaiians to eat aku for a few days each year.

T U N A

Bigeye



I. Biological Description

Bigeye tuna (*Thunnus obesus*) is one of two species known in Hawaii simply as ahi. Similar in general appearance to yellowfin tuna (the other species known as ahi), the bigeye may be recognized by its plump body, its larger head and its unusually large eyes.

Adult bigeye tuna are the deepest occurring of all tuna species, with the depth range of greatest concentration at 150 to 250 fathoms. Smaller bigeye (20-30 pounds) may be encountered in shallower waters in the vicinity of seamounts or floating objects, including fish aggregation buoys.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: The availability of bigeye tuna in Hawaii has increased as a result of an expansion of the domestic longline fleet and an extension of the fleet's fishing range to as far as 800 nautical miles from port.

The peak in Hawaii's landings of bigeye tuna occurs during the winter season (October-April), which is the off-season for harvesting other tuna species.

Fishing Methods: Bigeye tuna is harvested in Hawaii primarily by longline boats which set hooks at the deep swimming depths of this species. Bigeye tuna is a minor component of the catch made by the small-boat handline (ika-shibi) fleet off the island of Hawaii. It is rarely caught by trollers.

Distribution: The longline catch of bigeye tuna is marketed primarily through the Honolulu fish auction. Most of the handline (ika-shibi) catch is sold through the fish auction in Hilo and through the intermediary buyers on the island of Hawaii. Virtually all bigeye is sold fresh.

Substitution: Caught in deeper, cooler water, bigeye tuna typically has a higher fat content than yellowfin and is preferred over yellowfin by more discriminating sashimi buyers. For less discriminating raw fish consumers, the two species are interchangeable. They are also interchangeable with other tuna and marlin species for grilling purposes.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Bigeye tuna has a longer shelf life than yellowfin tuna, and the natural red flesh is slower to discolor after exposure to air. Longline-caught bigeye rarely develop the "burnt" flesh problems often found in yellowfin taken on handline and trolling gear.

Some longline boats which catch bigeye tuna remain at sea for up to 10-12 days, but with proper care, the fish will retain a high quality for over two weeks after capture (see Table 3). Although not as



old when landed, the quality of handline-caught bigeye is more variable due to differences in handling by small-boat fishermen.

In bigeye which have been stored too long after harvest, the entrails burst, releasing stomach acids and bile into the gut cavity. The gut cavity is stained greenish-yellow as the acids attack the stomach wall and eventually cause the flesh to deteriorate.

Product Forms And Yields: Bigeye tuna landed in Hawaii range from 20 to over 200 pounds in round weight. The smallest fish are usually caught around fish aggregation buoys and over seamount summits, whereas the largest are usually caught in deep open ocean waters. The larger fish are preferred for their typically higher fat content and greater yields. These fish often enter the sashimi market. Smaller fish of good quality may also be used for sashimi, but there is a growing demand for fresh bigeye in the 20-50 pound size range for grilling in up-scale restaurants on the U.S. mainland.

Fresh bigeye may be sold already prepared as sashimi, and it is also marketed as loins, loin sections, or steaks at fish markets or markets with fish counter service or self-service counters. It is usually exported in dressed (headed and gutted) form or as loins. The yield of fillet from a whole ahi varies from 55-65%, depending on fish size (see Table 5).

Quartering Ahi: Remove the ahi's head by sawing beneath the gill plate and through the bone. Next, with the tip of a sharp knife, cut through the thin layers of intermuscular bone laterally connected to the spine. Once these bones have been severed, a clean fillet can be made without tearing the flesh. Fillet cuts should be made as close to the bone as possible.

IV. Of Special Interest To Consumers/Food Service Personnel



Color, Taste, Texture: Bigeye tuna of good quality has reddish-pinkish flesh color. When exposed to air, bigeye tuna flesh will begin to discolor (although at a rate slower than yellowfin flesh). For this reason, bigeye is usually not loined or filleted until shortly before use.

Larger bigeye typically have a higher fat content than smaller bigeye, but even a fish as small as 25-30 pounds may be rich in fat.

Preparations: Bigeye tuna is one of the preferred species for the preparation for sashimi. With a high fat content, bigeye is also among the most desirable species for grilling. Its mild flavor adapts well to numerous applications.

Tombo



I. Biological Description

Tombo ahi (*Thunnus alalunga*) is commonly known as albacore tuna. Other names for this species include Pacific albacore, tombo, and “white meat” tuna. The tombo ahi caught in the vicinity of the Hawaiian Islands are large (over 40 pounds in round weight) adult fish. Smaller, immature tombo migrate extensively throughout the North Pacific far north of the Hawaiian Islands.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Commercial landings of tombo ahi have increased in Hawaii. Tombo ahi is seasonally available in significant quantities, but is scarce in the off-season. The peak in landings usually occurs from May through September. There are also wide fluctuations in the annual catch of tombo ahi. Availability is greatly influenced by oceanographic conditions. Tombo ahi is believed to migrate along ocean temperature “edges” rich in food, hence, disruption of ocean-wide current systems, such as brought about by “El Nino” weather, may affect catch rates in Hawaii.

Fishing Methods: Most of the tombo ahi catch in Hawaii is landed by commercial longline boats which set hooks at the swimming depths of the large tombo (75-150 fathoms). A small portion of the catch is made by the small-boat handline (ika-shibi) fishery based on the island of Hawaii.

Distribution: The longline catch and much of the handline (ika-shibi) catch of tombo ahi is marketed through the Honolulu fish auction. The remainder of the handline catch is sold through the fish auction in Hilo and through intermediary buyers on that island.

Most of the albacore caught in Hawaiian waters consist of mature fish, 40 to 80 pounds in round weight. Most of this fish is sold fresh, but surpluses caught during the peak summer season are sometimes smoked.

Substitution: Despite having a pinkish rather than reddish flesh, tombo ahi occasionally substitutes for other species of ahi or for aku in raw fish preparations. It is completely interchangeable with other ahi or a’u species in broiled or sauted forms, although it may be more susceptible to overcooking than the other species. Tombo is also interchangeable with other tuna and marlin (a’u) for dried and smoked products.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Some longline boats which catch tombo ahi are at sea for up to 10-12 days, but with proper care, the fish will retain a high quality for three weeks after capture (see Table 3). Although not as old when landed, the quality of handline-caught tombo is more variable because of differences in handling by the small-boat tuna fleet.



Product Forms And Yields: The preferred market size of tombo ahi for use in fresh or processed products is greater than 50 pounds in the round. The larger fishes have several advantages: (1) greater yield of finished product — 60-65%, (see Table 5); (2) pinker flesh coloration; and, (3) greater fat content than smaller tombo.

Fresh albacore is also marketed as loins, loin sections, or steaks at fish markets or supermarkets with fish counter service or self-service counters. Tombo is one of the preferred species for gourmet smoked fish products.

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Tombo ahi has flesh that varies from whitish-pink in smaller fish to deep pink in larger fish. Larger tombo ahi have a greater fat content than smaller fish, and this is a desirable attribute for raw fish products, as well as for broiling.



As raw fish, tombo is softer than other ahi or aku and, hence, more difficult to slice into sashimi. The flesh becomes much firmer when cooked than when in the raw state.

Preparations: Restaurants usually grill tombo ahi, but other cooking methods will work as well. Tombo has a tendency to dry out quickly, so it is important to avoid overcooking.

V. Historical Note

Albacore is the only tuna species which can be canned as "white meat" in the U.S. The west coast albacore fishery began in the early 20th century as canning techniques were perfected. However, it was twenty years before albacore became recognized as a premium canned product. With recent cannery closures on the U.S. west coast and wide fluctuations in cannery prices for tombo ahi, an increasing quantity is entering the fresh and fresh frozen restaurant market.

T U N A Yellowfin



I. Biological Description

Ahi refers to two species, bigeye tuna (*Thunnus obesus*) and yellowfin tuna (*Thunnus albacares*). In Hawaii, shibi is another name for yellowfin tuna. The yellowfin gains its name because the soft dorsal and anal fins and finlets are bright yellow in color. The dorsal and anal fins lengthen with age. Yellowfin range from the ocean surface to depths below 100 fathoms.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Caught year-round in Hawaii's waters, yellowfin tuna is usually most abundant during the summer season (May-September). There are wide fluctuations in the annual catch of yellowfin, depending on whether ocean surface temperatures and other oceanographic conditions favor the migration of ahi schools to within fishing range of the Hawaiian Islands.

Fishing Methods: Yellowfin tuna is landed in Hawaii by commercial and sport fishermen. A large part of the commercial catch is harvested by longline boats, which may search for tuna concentrations up to 800 nautical miles from port and set hooks in deep waters. Landings by the handline (ika-shibi) fleet, based largely on the island of Hawaii, are impressive during some years. Trollers contribute the remainder of the commercial catch of yellowfin, as well as all of the recreational catch. Trophy-sized yellowfin tuna are prized catches in gamefishing tournaments held in Hawaii.

Distribution: The longline catch and some of the handline (ika-shibi) catch of ahi is marketed through the Honolulu fish auction. The majority of the handline catch is sold through the fish auction in Hilo and through intermediary buyers on the island of Hawaii. The troll catch may be marketed through fish auctions, intermediaries on all islands, or directly to stores and restaurants, or it may be shared with family and friends.

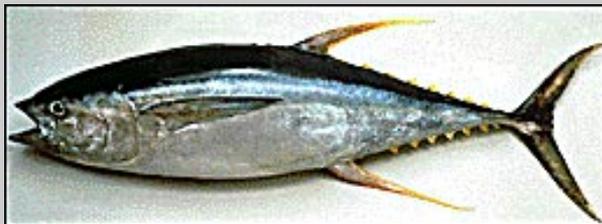
Most ahi is sold fresh, but surpluses caught during the peak summer season are sometimes dried and smoked.

Substitution: Yellowfin and bigeye tuna are completely interchangeable for sashimi and other raw fish preparations. Yellowfin is also interchangeable with other tunas and with a'u for grilling. Yellowfin is processed, interchangeably with ahi and a'u, into smoked and dried products.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Yellowfin is more perishable than either bigeye or albacore tuna (see Table 3). Although the yellowfin's flesh tends to be firmer than that of bigeye tuna, it does not retain the natural red pigmentation as long. The quality of yellowfin caught off Hawaii varies considerably with fishing method, care in handling and other factors.

Seasonal, cyclical changes in flesh characteristics occur in many fish species, but they are very noticeable in mature yellowfin tuna landed in Hawaii. Yellowfin caught near the ocean surface during the summer season frequently have some portion of flesh that lacks the typical bright red pigmentation and is more watery and softer than normal ahi flesh. Fish in this condition are often referred to as “burnt” tuna. The condition may be related to spawning, to overheating as a result of frenzied activity on handlines and trolling lines or to handling techniques by small-boat fishermen after capture.



Burnt flesh reduces the value of a fish in the sashimi market. Except in extreme cases, however, burnt tuna can be cooked without tasting the effects of this condition. This has led many fish buyers to recognize only two grades of yellowfin tuna — sashimi-grade and other — without differentiating between normal and burnt tuna flesh for the purposes of grilling. In fact, there are considerable differences between normal and burnt flesh in terms of fat content and nutritional value. Up-scale restaurants which recognize the differences between normal and burnt yellowfin flesh say that burnt flesh is more likely to dry out on the grill.



Product Forms And Yields: Yellowfin tuna landed in Hawaii range from 3 to over 200 pounds in size. The smallest fish are usually caught around fish aggregation buoys, whereas the largest are often caught by handline. Longlining harvests a wide range of fish sizes, from 20 to 200 pounds or more. The larger yellowfin (over 100 pounds in round weight) are preferred for several reasons: (1) greater yield of finished products - up to 65% (see Table 5); (2) redder flesh pigmentation (if not “burnt”); and, (3) greater fat content than smaller ahi.

Fresh yellowfin is sold already prepared as sashimi, poke (bite-sized pieces of raw fish seasoned with spices and condiments), or smoked strips. It is also marketed as loins, loin sections, or steaks at fish markets or markets with fish counter service or self-service counters. Small ahi may be sold in the round to retail consumers who prepare their own raw fish dishes or smoked fish.

Large quantities of fresh yellowfin are exported, mostly as dressed (headed and gutted) or loined products, from Hawaii to U.S. mainland.

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Yellowfin tuna has flesh coloration that varies from pink in smaller fish to deeper red in larger fish. Larger fish typically have a higher fat content than smaller fish, and this is a desirable attribute for raw fish products, as well as for broiling.

Fresh yellowfin undergoes oxidation of pigmented protein when exposed to air, so exposed flesh changes from a red to a brown color in a matter of days. For this reason, yellowfin is usually not loined or filleted until shortly before use.

Preparations: Yellowfin tuna is widely used as raw fish dishes, especially sashimi. This fish is also excellent for grilling and has become very popular in “blackened” fish preparations featured in Cajun cuisine. With its mild flavor and firm texture, yellowfin adapts well to numerous applications.

Hebi

I. Biological Description

Hebi (*Tetrapturus angustirostris*) is commonly known as shortbill spearfish. Its dorsal fin is shorter than that of other billfish species, and its bill is almost nonexistent. Hebi caught in Hawaiian waters are usually between 20 and 40 pounds in round weight.



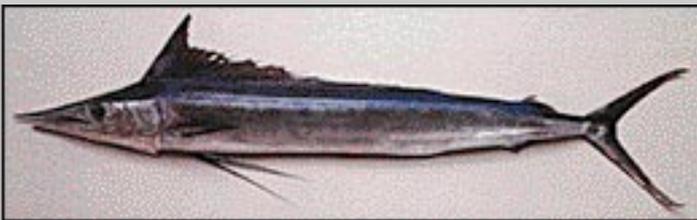
II. Of Special Interest For Buying/Distributing

Availability and Seasonality: Commercial landings of hebi have increased in Hawaii in proportion to the expansion of the longline fleet. Although available year-round, the peak in landings occurs during the summer and fall (June-October).

Fishing Methods: Most of the hebi catch in Hawaii is harvested by commercial longline boats which set hooks in deep water. However, spearfish may strike at surface lures, and a few are landed by trollers.

Distribution: The longline catch of hebi is marketed fresh primarily through the Honolulu fish auction.

Substitution: Hebi is one of several species of billfish which are inter-changed or substituted for tuna as broiled "catch of the day" menu items in up-scale restaurants.



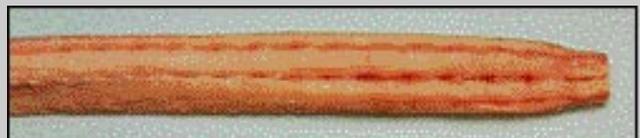
III. Of Special Interest For Preparation/Quality Control

Shelf Life and Quality Control: Although some longline boats which catch hebi remain at sea for up to 10 to 12 days, with proper care, the fish will retain a high quality for about two weeks (see Table 3).

Product Forms and Yields: Hebi is sold whole, dressed (headed and gutted), or filleted for local sale and for export. The yield of fillet from a whole fish averages 45-55% (see Table 5).

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Hebi has amber-colored flesh that is somewhat softer than that of nairagi or kajiki. Its flavor is mild (although more pronounced than ahi).



Preparations: Restaurants usually grill hebi, but other cooking methods will work as well.

Kajiki



I. Biological Description

Kajiki (*Makaira nigricans*) is commonly known as Pacific blue marlin, or a'u, the Hawaiian name applied to all marlin species caught in Hawaii. This species can get as large as 1,600 pounds in round weight, but the usual size of fish marketed is between 80 and 300 pounds in round weight. The kajiki is distinguished from other commonly-caught marlin species by its larger size, heavier bill, and rougher, grey skin. It lacks the obvious stripes of the nairagi.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: The heaviest landings of kajiki are during the summer and fall (June-October), the period when schooling tunas, the favorite prey of kajiki, are often abundant in the waters off Hawaii.

Fishing Methods: A favorite target of sport fishermen, kajiki are also caught commercially by longlining from large boats and by trolling from smaller boats. The bulk of the sport catch comes from the charter fishing fleets operating from Kona and Oahu. The Kona coast is a world famous location for marlin fishing. Trolling usually produces the larger fish, whereas longlining often harvests fish with higher fat content from deeper waters.

Distribution: Sport rollers do not necessarily sell their kajiki catch. The portion that is sold may go directly to retailers, wholesalers, processors, or restaurants, or may be marketed through the fish auctions or intermediaries. Sportfishing tournaments in Kona often select a fish dealer for all the tournament's catch, but trophy-sized fish may be mounted rather than sold.

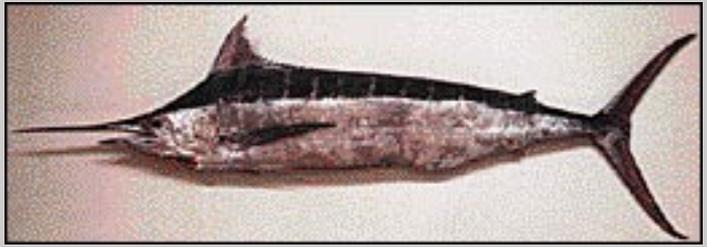
Virtually all of the longline catch and much of the commercial troll catch of kajiki off the island of Oahu is marketed fresh through the Honolulu fish auction.

Substitution: Kajiki with high fat content is substituted for tuna in sashimi and other raw fish dishes. Kajiki is one of many "white fleshed" fishes that are interchanged as a "catch of the day" on restaurant menus, depending on availability and price. Marlin and tuna are also freely substituted as material for smoked fish. Kajiki is among the local species used to make fishcake in Hawaii.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Although some longline boats which catch kajiki are at sea for up to 10-12 days, the quality of the fish is often better than one- or two-day old fish from sportfishing tournaments in which the sales value of the catch is secondary to the recreational value and the fish are not immediately iced (see Table 3).

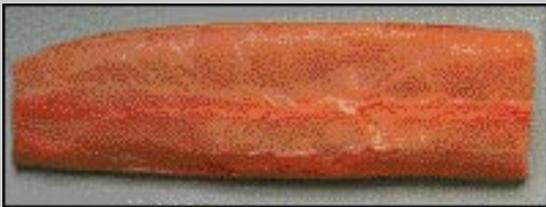
Poorly-handled fish may have cracked (separated) or turbid (burnt) flesh that is opaque with a dull, beige color. The texture is mushy, and the flesh falls apart easily.



In kajiki of over 150 pounds, there is considerable connective tissue between layers of muscle. This tissue is tough and stringy, and its presence is one of the reasons why fish dealers and consumers prefer smaller kajiki.

Product Forms And Yields: Kajiki is marketed in many forms. Kajiki with high fat content may be served as sashimi. Other good quality fresh fish may be filleted or loined for restaurants to serve as “catch of the day” or for sale in fish markets. Dressed, chunked, or loined marlin may be exported (although not to California which prohibits the sale of marlins, except black marlin, from any source). Up to 65% of whole fish weight can be recovered as fillet (see Table 5). Large fish that are less suitable for the fresh market, but yield a high percentage of usable flesh, may be smoked or processed into other forms such as fish burgers.

IV. Of Special Interest To Consumers/Food Service Personnel



Color, Taste, Texture: Kajiki has firm flesh with a mild flavor (although somewhat more pronounced than the flavor of ahi). Flesh color in kajiki is amber, although it varies somewhat from fish to fish. Flesh with high fat content has a naturally lacquered appearance.

Preparations: Marlin is ideal for grilling, but other cooking methods will work as well. Kajiki is also used for sashimi.

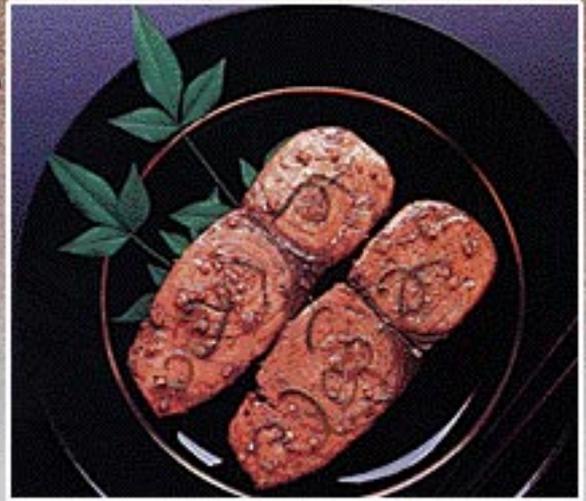
V. Historical Note

Like all of the large billfish (a'u) caught by the ancient Hawaiians, the kajiki was feared because it could pierce a fishing canoe with its heavy bill.

Nairagi

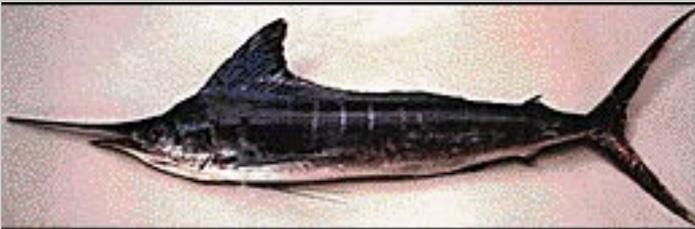
I. Biological Description

Nairagi (*Tetrapturus audax*) is commonly known as striped marlin, barred marlin, and a'u, the Hawaiian name applied to all marlin species caught in Hawaii. Nairagi are usually between 40 and 100 pounds in round weight and are rarely over 130 pounds. In the marlin family, the nairagi has the slenderest bill and the most visible "stripes". Although distinct when first taken from the water, the vertical stripes fade. Other distinguishing characteristics of this species are the high, pointed dorsal fin (higher than the greatest depth of the body) and more compressed sides than other species of marlin.



II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Commercial landings of nairagi have increased in Hawaii with expansion of the local longline fleet. Landings are heaviest during the winter and spring (November-June) and are lightest during the summer. The 40 to 60 pound fish which appear in the spring season of some years are juveniles which migrate through the Hawaiian chain, passing through the islands again in the winter with more weight.



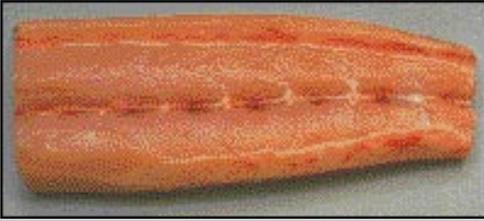
Fishing Methods: Most of the nairagi catch in Hawaii is landed by commercial longline boats fishing in the open ocean. However, nairagi may be caught near shore by slow trolling with live bait or lures during certain times of the year.

Distribution: The longline catch of nairagi is marketed primarily through the Honolulu fish auction, where it is sold fresh.

Substitution: The flesh color of nairagi varies from fish to fish. Nairagi having an orange-red flesh are particularly desired for the sashimi market and are often substituted for ahi. Nairagi with pink to light-colored flesh are commonly substituted for other species of billfish or tuna as broiled "catch of the day" menu items in up-scale restaurants.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Although some longline boats which catch nairagi remain at sea for up to 10-12 days, with proper care, the fish will retain a high quality for up to three weeks after capture (see Table 3).



One of the first indications of a serious loss of quality in nairagi is the appearance of orange parasites, especially in the belly portions. The parasites can be removed or destroyed by cooking, but they are not known to present a health hazard to consumers.

Product Forms And Yields: Fresh nairagi is sold whole, dressed (headed and gutted), or filleted for local sale and for export. Up to 65% of the whole fish weight can be recovered as fillet (see Table 5).

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Nairagi is considered the finest-eating of all marlin species because of its tender flesh. The natural color varies from light pink to orange-red, as previously described.

Preparations: Nairagi is frequently used in raw fish preparations or is cooked in the same manner as tuna and swordfish. The flesh of all marlin species is ideal for grilling, but the more tender nairagi can also be used in cold seafood dishes and salads. Nairagi is popular for gourmet smoked fish products, but high prices usually direct this fish to other uses.

Shutome

I. Biological Description

Swordfish (*Xiphias gladius*), also known as broadbill, broadbill swordfish or shutome in Hawaii, are the most widely distributed of all billfish in the Pacific Ocean. Swordfish are caught in association with frontal zones where ocean currents or water masses meet to create turbulence and sharp gradients of temperature and salinity. Swordfish make vertical migrations through the water column, rising near to the surface at night from deep waters. Swordfish caught around the Hawaiian Islands are from stocks which migrate throughout the North Pacific.



II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Exploratory fishing in 1989 demonstrated the existence of commercial concentrations of swordfish within the range of Hawaii's longline fleet. Concentrations of large swordfish around the Hawaiian Islands north of Oahu produce catches from April through July. Commercial catches are possible for several months preceding this period, usually at farther distances north of the Hawaiian Archipelago. Swordfish availability in this region may be related to the migration patterns of squid, known to be a major component of the swordfish diet. While searching for concentrations of swordfish, longliners often set gear along temperature gradients ("breaks") indicative of intersecting water masses.

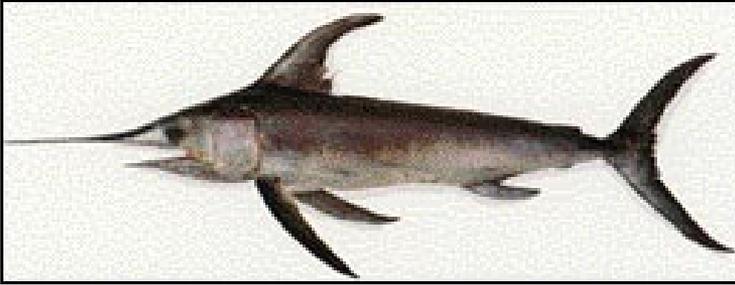
Distribution: All of Hawaii's swordfish are landed and marketed fresh. Much of the catch is exported to the U.S. east coast, where domestic-quality swordfish can bring a premium price. Hawaii can already claim a major share of the U.S. market for domestic swordfish. Hawaii swordfish is superior in quality and is preferred over foreign imports by customers who have high standards.

Much of the landings are sold at the Honolulu fish auction, where most primary processors acquire their fish for export. Alternatively, some boats market and export their catch directly from dockside.

Most east coast buyers order entire airline containers (LD-#) of swordfish (2,500-3,000 pounds per shipment). The containers are well-insulated, and bagged swordfish are arranged carefully in layers with larger fish on the bottom and smaller fish on the top. Swordfish shipped in this manner can be sent only to cities which are served by widebody aircraft capable of carrying containerized cargo.

Substitution: Consumers intent on purchasing swordfish are not likely to be satisfied by substitute species. Unscrupulous fish dealers may attempt to substitute mako shark, whose flesh bears a slight resemblance to that of swordfish, but this is fraudulent.

Blue marlin (kajiki) and striped marlin (nairagi) are sometimes incorrectly retailed in Hawaii supermarkets under the name "Hawaiian swordfish." Swordfish and marlin have the same general biological attributes and habitats, but they are not alike as seafood. Marlin has a more fibrous flesh than



swordfish and tends to become firm and dry if overcooked. Swordfish tends to have a higher oil content, a richer flavor and has a texture similar to that of premium cuts of beef.

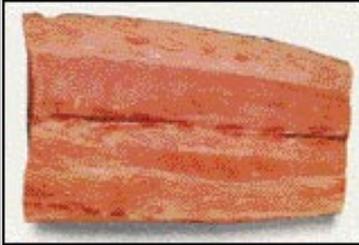
Fishing Methods: Swordfish are targeted by longline boats when they swim near the surface at night.

Monofilament longlines baited with squid and illuminated with chemical lightsticks are set overnight. The gear is set near the surface, in contrast to tuna longline gear, which is typically much deeper. Adoption of these techniques has developed an entirely new Hawaii longline fishery capable of landing at least 2 million pounds of swordfish annually.

Swordfish are occasionally caught at night by small-boat fishermen who are handlining or trolling with lights. Swordfish are also taken as a by-catch in tuna fisheries throughout the island chain.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Swordfish has an excellent shelf life as a fresh product, lasting up to 3 weeks after capture with proper handling. To ensure good quality and prices for their catch, most Hawaii swordfish longliners take extra precautions. These include dressing the fish, removing the kidneys, cleaning the belly cavity, and storing the fish in ice. After this initial processing, the fish is often bagged before being stored in ice.



Saltwater ice is used by some boats. If swordfish is stored on its back in ice, it will retain a firmer body and will have a better overall appearance. If the fish's head is removed just behind the eye, enough head

area will remain for gaffing, resulting in less damage to the body.

The highest quality dressed swordfish is firm and retains rough, grooved skin (sandpaper texture) and metallic silver in its skin color. Flesh exposed along the collar and tail will have red blood lines. The body is undamaged from handling but may show natural marks originating from several causes. For example, longitudinal scratches along the body may be left by sea lampreys, or very shallow oval wounds ("cookie cuts") may be caused by a species of small shark. These marks do not usually penetrate to the flesh. Swordfish caught by longlines can be attacked by larger sharks, which tend to mutilate large portions of flesh. Occasionally, parasites occur that render the adjacent flesh unusable for aesthetic reasons. Simple trimming can correct this problem.

Product Forms And Yields: All sizes of swordfish (10 to 600 pounds) are captured on longline gear. The predominance of 100-300 pound fish in current landings is not surprising because the stock had never been effectively targeted previously.

Most of the Hawaii swordfish catch is exported to secondary processors as a fresh, dressed product without tails (known as "Boston cut"). Although it is common for longliners to market their entire catch at one price, domestic swordfish marketers recognize price differentials for three size classes:

- 100-250 pounds, or more, dressed weight (known as “markers”) — this size is strongly preferred by restaurants because uniform-sized dinner portions can be cut with a minimum of offcuts and odd-sized portions — the center sections of large loins are the premium cuts;
- 50-99 pounds dressed weight (“pups”) — this size is less expensive than markers and the yield of uniformly-sized portions is smaller;
- 25-49 pounds dressed weight (“rats”) — this size is the least expensive but is generally not used by food service or retail buyers who require large portions of uniform size.

Secondary processors provide restaurants and food service distributors with loins or “wheels” (large bone-in sections cut through the swordfish body). They also custom-pack loin sections for retail and food service chains. “Wheels” have a longer shelf life than loins.

Due to high water content, dressed swordfish can lose a significant amount of weight through drip loss (up to 3% of initial weight for markers, 2% for pups, and 1% for rats).

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: The flesh of swordfish may vary from pale to pinkish, probably depending on diet prior to capture. In either case, good quality is indicated by red blood lines (i.e., blood meat) bordering the loin or fillet. Swordfish has a firm texture. When cooked, the flesh is tender and very mild in taste, except for the rind area just under the skin. Swordfish can vary greatly in fat content: fish landed in Hawaii are considered to be comparable in fat content to swordfish from the middle Atlantic region of the U.S.A., where much of the domestic supply originates. Fat content is a more important determinant of swordfish quality and market value in Japan than in the U.S.A.

Preparations: Ideal for grilling, swordfish is in great demand in restaurants and retail markets across the U.S.A., especially along the east coast. Swordfish is one of many species prepared as sashimi in Japan, and its use in raw fish dishes is increasing in Hawaii.

V. Historical Note

Because of the long, distinctive bills which they use to slash prey, swordfish have a well-deserved reputation for ferocity. Several Hawaii fishermen bear scars from landing struggling swordfish. The ancient Hawaiians feared swordfish because they would strike and sometimes pierce fishing canoes.

Mahimahi



I. Biological Description

Mahimahi (*Coryphaena hippurus*) is commonly known as dolphin (the fish, not the mammal), dolphinfish, or dorado. When a mahimahi takes the hook, its colors are brilliant blue and silver dappled with yellow. These fade quickly when the fish dies. Large aggregations of mahimahi are common around flotsam drifting at sea and off fish aggregation buoys.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: The supply of locally-caught mahimahi is extremely limited and seasonal considering the high demand for this species. Although available most of the year, mahimahi catches usually peak in March-May and September-November. Most of the fish are between 8 and 25 pounds, but larger fish are caught by trollers and smaller fish by the pole-and-line skipjack tuna fleet.

Fishing Methods: About 80% of the commercial mahimahi landings in Hawaii are by trollers. The remainder is caught on longline gear or by aku fishermen using live bait in the pole-and-line fishery.

Although mahimahi have been raised successfully in tanks, the high cost has made commercial production unfeasible to date.

Distribution: The popularity of fresh mahimahi in the tourist industry has created a steady demand and consistently good prices. Troll-caught mahimahi is marketed through fish auctions in Honolulu and Hilo, through intermediary buyers on all major islands, and directly to restaurants. The longline catch is sold primarily through the Honolulu auction.

Substitution: Hawaii's mahimahi is a highly-regarded product which is best eaten when fresh. Local mahimahi is superior in quality to the available substitutes — lower-priced fresh mahimahi from Latin America and imported frozen fillets from Taiwan, Japan, and Latin America.

Many tourists were first introduced to Hawaii's fish species through their initial experience with a fresh mahimahi. Some restaurants offer locally-caught ono as a substitute, however the flesh lacks the sweet flavor of mahimahi and is drier. All of the "white-flesh" local species served in restaurants are subject to seasonal fluctuations in availability, so chefs rely on a combination of species which alternate as "catch of the day" based on their availability and affordability.

The bulk of the fast-food and general public restaurants in Hawaii cannot afford to put high-priced, fresh mahimahi on their menus, but large imports of frozen mahimahi fillets from Taiwan, Japan, and Latin America have made low-budget mahimahi dinners feasible for such establishments. The fresh and frozen products each have separate niches, with little overlap or conflict.

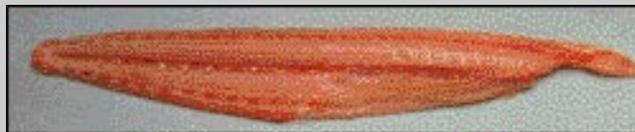
III. Of Special Interest For Preparation/Quality Control



Shelf Life And Quality Control: Fresh mahimahi has a shelf life of 10 days if properly cared for (see Table 3). The fish caught by trolling (or incidentally by the pole-and-line aku boats) are only one or two days old and, hence, are typically fresher than the mahimahi caught by longline boats on extended trips.

The first external evidence of deterioration in a whole mahimahi is softening and fading of bright skin colors. In a dressed fish, discoloration of the flesh exposed around the collar bone would indicate a loss of quality. Mahimahi retains better quality if it is not filleted until shortly before use. Imported mahimahi fillets of low quality may have high levels of histamines. Naturally-occurring spoilage bacteria probably act on the plentiful amount of histamine in mahimahi to produce biologically active histamines. When ingested in sufficient quantities, histamines give rise to an allergic-type reaction. Histamine problems can be avoided by properly chilling pelagic species from the time of capture to processing and consumption.

Product Forms And Yields: Local fishermen market their mahimahi as fresh, whole fish. Most are purchased by up-scale restaurants in Hawaii and on the mainland. Some restaurants buy fillets from intermediary suppliers, but others prefer to receive the fish whole or grilled and gutted to retain good quality.



Mahimahi over 15 pounds in body weight is the preferred market size. The average yield of fillet from whole fish ranges from 40-45% (see Table 5). A better yield can be recovered from large fish and from females than from small fish or males (which have bigger heads).

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Mahimahi is thin-skinned with firm, light pink flesh. It has a delicate flavor that is almost sweet. There is less strong-tasting "blood meat" in mahimahi than in tuna and billfish.

Preparations: Mahimahi is ideal for a variety of preparations. However, care should be taken not to overcook mahimahi. It should be cooked until it flakes and no longer.

V. Historical Note

No fish is better known in the up-scale restaurant market than Hawaii's fresh mahimahi, which has become synonymous with tourism. Among visitors, mahimahi has assumed the position of the State's best known fish.

Monchong

I. Biological Description

Two species of pomfret, also known as monchong in Hawaii, are harvested in small quantities by the tuna longline and bottomfish handline fisheries. The predominant species is *Taractichthys steindachneri*, known as the sickle or bigscale pomfret, because of the forked shape of its fins and large scales. Longline fishermen from Japan refer to monchong as “utopia fish.” The large black scales covering the entire body of this species distinguish it from *Eumegistus illustris*, or lustrous pomfret, which has bronze skin color, larger eyes, and a thicker body. The lustrous pomfret also has a scaleless area behind and above the eyes lacking in the sickle pomfret. The lustrous pomfret accounts for less than 5% of monchong landings in Hawaii.



Monchong are usually caught in deep waters (greater than 150 fathoms), often in the vicinity of seamounts. The lustrous pomfret has been caught on seabed slopes over 250 fathoms deep. Not much is known about the biology or habitat of these species.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Only small quantities of monchong are available because it is not usually targeted by fishermen. The largest supply is the by-catch from the tuna longline fleet, especially boats which fish deep waters around seamounts. There are no well-defined seasonal trends in availability. Monchong can range from about 4 pounds to over 25 pounds, but the prime market sizes are fish over 12 pounds.

Like several other species harvested in Hawaii primarily as by-catch, monchong has gained an identity as an exotic fish which can add variety to restaurant menus.

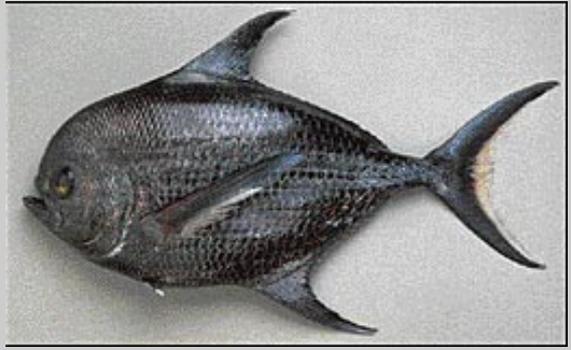
Distribution: Monchong are landed and marketed fresh. Most of the catch is sold at the Honolulu fish auction to a few primary processors who are experienced in marketing pomfret. Restaurants are the primary customers for monchong in Hawaii and the rest of the U.S.A.

Substitution: Monchong can be substituted for deep water snappers, such as opakapaka, onaga, and uku. When ocean conditions are unfavorable for bottomfishing and restaurants face rising prices for premium snappers, demand often increases for monchong landed by the longline fleet.

Fishing Methods: Most monchong are taken as a by-catch by tuna longliners. Fishermen using handlines for bottomfish also catch monchong at great depths (over 200 fathoms), but it is not a primary target species. Targeting by a few handline fishermen has shown that monchong is a limited resource.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Monchong has an excellent shelf life as a fresh product, lasting up to 3 weeks after capture with proper handling. Fish are landed and iced whole until final processing. It is not uncommon for parasites to occur in monchong. This condition may render the adjacent flesh unusable for aesthetic reasons, but simple trimming can correct this problem.



Product Forms And Yields: Most monchong is sold to restaurants as skinless fillets. The large, hard scales make skinning the only practical product form. The yield of skinless fillet from the whole weight is about 45%. A thick rib bone which covers a large portion of the belly flap is trimmed off fillets.

Small monchong are sold whole or gutted, as are some larger fish.

IV. Of Special Interest To Consumers/Food Service Personnel



Color, Taste, Texture: Monchong has clear, white flesh with pinkish tones. It is firm in texture and moderate in flavor. The highly transparent flesh, high oil content and good shelf life makes this versatile fish very attractive for restaurant use.

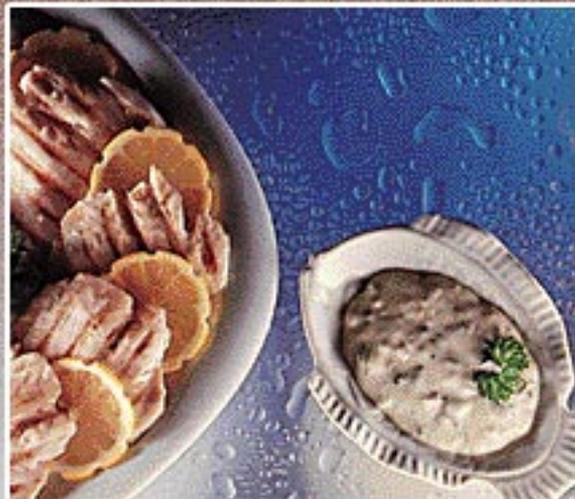
Preparations: Because of its high oil content, monchong is well suited for grilling but it can also be broiled, sauted, or baked, Monchong has been well received as a white-flesh sashimi, but is rarely used in raw fish dishes in Hawaii.

Ono

I. Biological Description

Ono (*Acanthocybium solandri*), commonly known as wahoo, is a close relative of the king mackerel. Unlike true mackerel, ono rarely school, but groups may be found around fish aggregation buoys. Surface catches indicate that ono associate with banks, pinnacles and flotsam. However, longline catches suggest that this species is also widely distributed in the open ocean.

Ono may grow to more than 100 pounds in round weight, but the usual size of the fish caught in Hawaii is 8 to 30 pounds in round weight.



II. Of Special Interest For Buying/Distributing

Availability And Seasonality: The supply (and price) of fresh ono is as limited and erratic as that of locally-caught mahimahi. Not an especially abundant fish, ono is most available in Hawaii during the summer and fall (May-October).

Fishing Methods: About 80% of the commercial ono landed in Hawaii is caught by trollers. The remainder is caught on longline gear. Among sport fishermen, ono is popular as a light-tackle gamefish.

Distribution: Troll-caught ono is marketed through fish auctions in Honolulu and Hilo, through intermediary buyers on all major islands, and directly to restaurants. The longline catch is sold primarily through the Honolulu auction.

Substitution: It is not possible for restaurants to offer fresh mahimahi throughout the year, so chefs have looked to other white-fleshed species, including ono, as substitutes. Thus, ono often keeps company with mahimahi as a popular entree on the menus of restaurants in Hawaii and the U.S. mainland. Although ono is used as a substitute for mahimahi, mahimahi is more moist and sweeter than ono.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: The shelf life of fresh ono is relatively short — 10 days when properly cared for (see Table 3). Ono keeps longer if stored whole (especially if hung head down) and not filleted until shortly before use. When the fish is headed and gutted, the collar bone and belly areas are exposed to bacteria which can then cause accelerated deterioration of the remaining flesh.

The first external evidence of deterioration in a whole ono is discoloration of the skin around the head and gill plates and a general softening of the flesh. In a dressed fish, discoloration of the flesh

exposed around the collarbone would indicate a loss of quality. Poor quality fillets have opaque, milky flesh or they may be cracked.

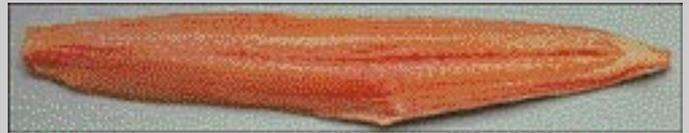


Product Forms And Yields: Local fishermen market their ono as fresh, whole fish. Most is purchased by up-scale restaurants in Hawaii and on the mainland. Some restaurants buy fillets from intermediary suppliers, but others prefer to receive the fish

headed and gutted to retain better quality. About 60 to 65% of whole fish weight can be recovered as fillet (see Table 5). Although one of the best fish for smoking, ono is too expensive to be put to this use in Hawaii.

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Ono flesh is whiter, flakier, and has a more delicate texture than the meat of other fast-swimming, pelagic species. Although ono may make oceanic migrations as far as those of tuna and marlin, it contains less of the strong-tasting “blood meat” muscle that the latter species use for long-distance swimming.



Preparations: Although ono is versatile in its uses, cooking methods suitable for “lean” fish (those with low fat content) are recommended so that the flesh does not dry out when cooked. One way to retain moisture in a lean fish is to poach.

V. Historical Note

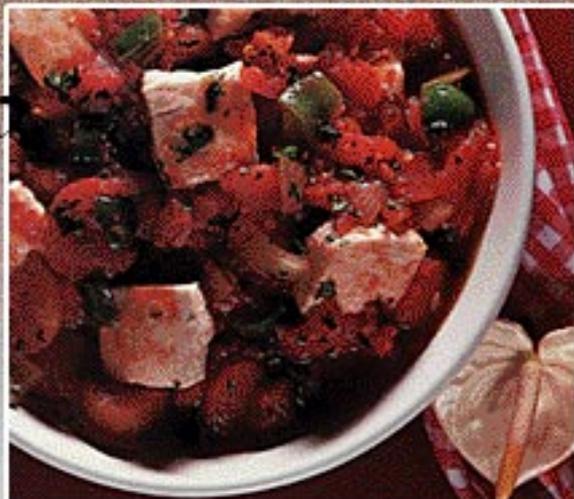
Ono is a Hawaiian word meaning “good to eat.” The ono was said by the ancient Hawaiians to be the parent of the opelu, a mackerel scad of great importance to the subsistence of the early Hawaiians.

The European explorers who first mapped the Hawaiian Islands found ono to be plentiful off the island of Oahu. Maps of the time indicate that a very common spelling of the word “Oahu” was “Wahoo,” and this is believed to be the origin of the fish’s other name.

Opah

I. Biological Description

Opah or moonfish (*Lampris regius*) is one of the most colorful of the commercial fish species available in Hawaii. A silvery-grey upper body color shades to a rose red dotted with white spots toward the belly. Its fins are crimson, and its large eyes are encircled with gold. The moonfish's large, round profile may be the origin of its name. Moonfish landed in Hawaii range from 60 to over 200 pounds in round weight. A pelagic wandering species, it is often found in the company of tunas and billfish.



II. Of Special Interest For Buying/ Distributing

Availability And Seasonality: Opah are not found in schools, and thus are not caught in any quantity. However, individual fish are regularly hooked by longline boats fishing over seamounts. Landings follow no set pattern in any particular area, but the presence of opah at the depths of longline fishing gear may be related to vertical migrations from the deep up the slopes of seamounts in search of food. Opah are taken on longline gear year-round, but landings seem to peak in April-August.

Fishing Methods: All of the opah landed in Hawaii are caught by longlining over seamounts.

Distribution: Virtually all opah landed by longliners is sold fresh through the Honolulu fish auction.

Substitution: Rising demand for fresh fish, particularly in the restaurant trade, has increased the interest in previously underutilized species, like the opah. This species has found a place on restaurant menus as a "catch of the day," particularly when more popular species are unavailable.

III. Of Special Interest For Preparation/Quality Control

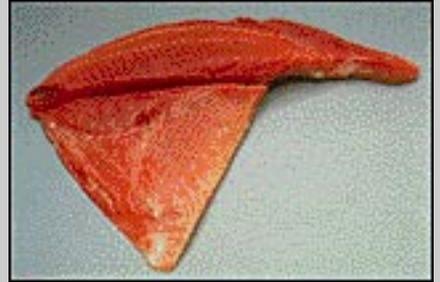
Shelf Life And Quality Control: The shelf life (3 weeks) is apparently as long as that of some fresh tuna species landed by the longline fleet (see Table 3). The first outward signs of deterioration are faded skin colors and softness.

Product Forms And Yields: The entire opah catch is marketed as whole, fresh fish. Most is filleted for restaurant use, both in Hawaii and for export to the U.S. mainland. Between 30 and 40% of the round weight can be recovered as fillets, and the average yield is 35% (see Table 5).

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: An opah has four types of flesh, each a different color. Behind the head and along the backbone is an orangish flesh. Toward the belly, the flesh pales to a pink color and is somewhat stringy. The fish's cheeks yield dark red flesh. These types of flesh all cook to a white color. Inside the fish's breastplate is another, smaller section of flesh, comprising a very small percentage of a 100-pound moonfish. A bright ruby red or liver color, this flesh cooks to a brown color and is somewhat stringy and difficult to fillet.

Preparations: The opah's large-grain flesh is rich and fatty, with a versatility of use that is attractive to restaurants. Opah is used for sashimi, for broiling, and occasionally for smoking.



V. Historical Note

In Hawaii, the opah has historically been an incidental catch of longline gear. Only recently has this species become commercially important. The opah was viewed as a good luck fish by old-time longline fishermen, who would give it away as a gesture of goodwill rather than sell it.

Hapu'upu'u



I. Biological Description

Hapu'upu'u (*Epinephelus quernus*), commonly called grouper or sea bass, is only known to occur in the Hawaiian Islands and at seamounts just northwest of Hawaii. Members of the grouper fish family are able to change skin colors to blend into their natural habitat, and the hapu'upu'u is no exception. Most hapu'upu'u seen in the market are black, but fish captured in certain locations may be brownish or reddish.

Hapu'upu'u is a deep water bottomfish usually caught at between 50 and 150 fathoms. In general, larger fish are caught at greater depths.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: The largest landings of hapu'upu'u usually occur in the fall and winter (October-December) and in the spring (February-April). The majority of the hapu'upu'u catch in recent years has come from the Northwestern Hawaiian Islands.

Most of the hapu'upu'u caught off the main Hawaiian Islands are from 5 to 10 pounds in size, whereas the waters around the Northwestern Hawaiian Islands yields fish mostly in the 10 to 30 pound size range.

Fishing Methods: Hapu'upu'u is frequently caught incidentally in the hook-and-line fishery for deep water snappers. However, knowledgeable fishermen are capable of targeting this species, which is an aggressive feeder that readily takes baited hooks.

Distribution: Hapu'upu'u caught off the main Hawaiian Islands are sold through the fish auctions, through intermediary buyers on the major islands, and directly to restaurants. Most of the Northwestern Hawaiian Islands' catch is sold through the Honolulu fish auction.

Substitution: Hapu'upu'u is often substituted for more expensive fishes, such as the kumu or goatfish, in Chinese restaurants which feature steamed fish. Although hapu'upu'u is primarily sold to ethnic retail and restaurant markets, its popularity as a "catch of the day" (interchangeable with other white-fleshed bottomfish) in non-ethnic restaurants is increasing.

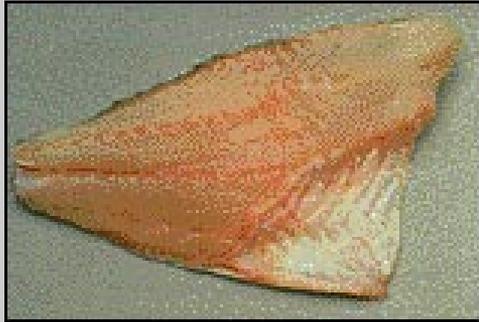
III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Hapu'upu'u keeps well (2 weeks) when properly brined and iced after capture (see Table 3). The only quality problem which may arise is the occasional presence of sac-like parasites in hapu'upu'u flesh. The sac may be cut out of the flesh and is harmless if eaten.

Product Forms And Yields: Most of the hapu'upu'u is landed as whole, iced fish. The fish is initially sold head-on so that buyers can assess product quality by the clarity of the eyes and the color of the gills. The ethnic and household retail market components have a strong preference for smaller fish (1 to 5 pounds in round weight) that can be steamed head-on. The larger-sized fish harvested in the Northwestern Hawaiian Islands are filleted for the restaurant market. Although the skin is tough, the flesh is easy to fillet due to the lack of small bones. However, the waste factor is higher for hapu'upu'u, due to its large head, than for substitute species, and the lower yield (40% of round weight) has discouraged wider use by restaurants (see Table 5).



IV. Of Special Interest To Consumers/Food Service Personnel



Color, Taste, Texture: Hapu'upu'u is noted for its clear white flesh that is almost as delicate in taste as that of Hawaii's deep-sea snappers.

Preparations: Steaming is a favorite method of preparing hapu'upu'u, especially small fish, in Hawaii. Hapu'upu'u is also used in ethnic restaurants to make sweet-and-sour fish and fish head soup. Hapu'upu'u is suitable for steaming, baking, poaching, deep frying with batter, and is sometimes served raw (as ceviche).

Onaga



I. Biological Description

Onaga (*Etelis coruscans*) is one of Hawaii's fish better known by its Japanese name than by its Hawaiian name, ula'ula. It is also called ruby snapper or longtail snapper. This bottomfish is caught in deep waters (100-180 fathoms), especially around outcroppings along rocky bottoms. Most of the onaga caught off the Hawaiian Islands range in size from 1 to 18 pounds. Onaga caught in the South Pacific are often larger.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Onaga is Hawaii's second most important bottomfish in terms of total landed weight and value. Although onaga is harvested mainly during the fall and winter months (October-March), its availability peaks during the month of December when demand (and prices) for red-colored snappers among Hawaii's Japanese population is at its peak.

Commercial landing of onaga have increased markedly during the 1980's, due to escalating prices and fishing pressure. Until recently, onaga were caught mostly at depths between 100 and 120 fathoms. Commercial fishermen are now fishing at greater depths (150 fathoms) to exploit previously underutilized stocks.

Although onaga is harvested off the Northwestern Hawaiian Islands as well as off the main Hawaiian islands, the shorter shelf life of this species compared to opakapaka limits the range of onaga fishing for the fresh market.

Fishing Methods: Onaga is harvested exclusively with vertical hook-and-line gear.

Distribution: Onaga caught off the main Hawaiian Islands is sold at the fish auctions, through intermediary buyers on the major islands, and directly to retail fish markets and restaurants. The Northwestern Hawaiian Islands' catch is sold primarily through the Honolulu fish auction.

Substitution: Substitutions are possible among the deep water snapper species available in Hawaii. Although a more valuable fish (in terms of price per pound) for local consumption, onaga has not yet gained the reputation of the opakapaka in the up-scale restaurant trade. Some up-scale restaurants are substituting onaga for opakapaka or are serving both species. Other small bottomfish (opakapaka, gindai, etc.) can be substituted for small onaga in the household retail market.

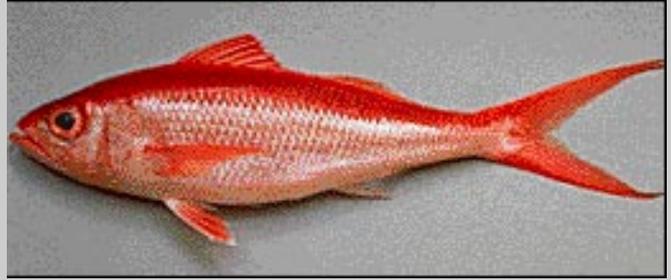
III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Onaga does not keep as long as opakapaka, but if well handled, it has a shelf life of about 10 days (see Table 3). Onaga caught off the main Hawaiian Islands are

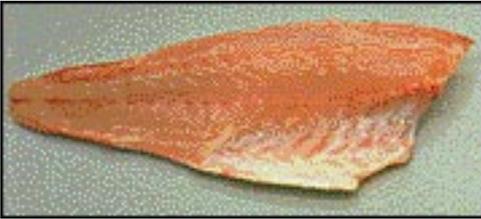
marketed within a few days, whereas the fish taken in Northwestern Hawaiian Islands in some cases may not reach the market for 7-8 days.

Product Forms And Yields: All of the onaga catch is landed as whole, iced fish.

Onaga is filleted to supply a growing demand for Hawaii-caught snappers in up-scale restaurants. The average yield of fillet from a whole fish is about 45% (see Table 5). However, restaurant buyers often request whole fish for display and to prolong the shelf life of their onaga purchases.



IV. Of Special Interest To Consumers/Food Service Personnel



Color, Taste, Texture: Onaga has clear, light pink flesh similar to that of the opakapaka but somewhat softer and moister. Fish caught during the winter months seem to have a higher fat content than those caught in the summer; hence onaga yield the best sashimi during the winter season. Onaga harvested during the summer months of warmest ocean temperatures occasionally may have “burnt” flesh.

Preparations: Hawaii’s residents have a strong culturally-oriented demand for red snappers for ceremonial occasions such as the New Year’s season and weddings, when onaga sashimi is traditionally served.

Small onaga (less than 5 pounds) are often prepared in Hawaii by steaming the fish with the head on. The heads are also popular for making soup.

Onaga has a delicate flavor which is enjoyed when served raw, (sashimi style) or when baked, steamed, or prepared in a host of other ways.

Opakapaka



I. Biological Description

Opakapaka (*Pristipomoides filamentosus*) is commonly known as crimson snapper or Hawaiian pink snapper, although its skin is light brown. Opakapaka are usually caught at depths between 30 and 100 fathoms. Fish caught over hard bottoms have brighter skin colors than those caught over soft bottoms.

Although this species occurs throughout the tropical Pacific, nowhere does it grow as large as in the Hawaiian Islands. When a new opakapaka fishing area is discovered, the initial size of fish caught may be 12 to 18 pounds. Opakapaka of this size could be at least 10 years old.

II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Although opakapaka are caught year-round in the Hawaiian Islands, there is a distinct peak in landings during the winter season (October-February), particularly in the fishery around the main Hawaiian Islands. Most of the Opakapaka caught off the main Hawaiian Islands are from 1 to 5 pounds in round weight, whereas the waters around the Northwestern Hawaiian Islands yield fish mostly from 3 to 12 pounds in round weight or larger.

Distribution: Opakapaka harvested from the main Hawaiian Islands, is sold at the fish auctions, through intermediary buyers on the major islands, and directly to retail fish markets and restaurants. The Northwestern Hawaiian Islands' catch is marketed primarily through the Honolulu fish auction.

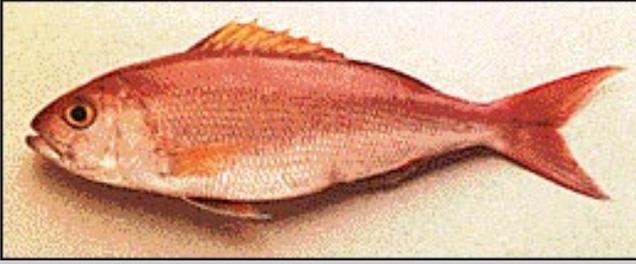
Substitution: Substitutions are possible among the deep water snapper species available in Hawaii. However, no other snapper has gained the reputation of the opakapaka, and there is only weak substitutability for opakapaka in the up-scale restaurant market. Nevertheless, uku is sometimes substituted for opakapaka during the summer months when the former species is most available and the latter species is least available.

Fishing Methods: Opakapaka is caught principally by vertical hook-and-line gear. Small fish which migrate into relatively shallow depths are sometimes trapped.

III. Of Special Interest For Preparation/Quality Control

Shelf Life And Quality Control: Opakapaka caught off the main Hawaiian Islands are marketed within a few days, whereas the fish taken in the Northwestern Hawaiian Islands in some cases may not reach the market for 10 days. When properly cared for, opakapaka has a long shelf life — almost two weeks after capture (see Table 3).

Product Forms And Yields: The ethnic and household retail market components have a strong preference for small (1 or 2 pound) opakapaka. The larger-sized fish are filleted (usually leaving the



skin on to allow buyers to identify it as true opakapaka) for the restaurant market. The yield of fillet from a whole fish averages about 45% (see Table 5).

Opakapaka is exported in whole and filleted form to supply a growing demand in U.S. mainland restaurants. The quality of opakapaka can be maintained better by shipping it whole,

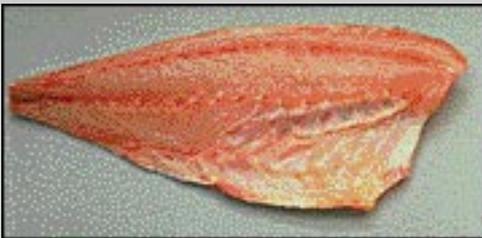
but this advantage is offset by higher per unit air freight costs.

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Opakapaka has a clear, light pink flesh that is firm in texture. Its delicate flavor has gained the opakapaka a reputation as Hawaii's premium table snapper. Fish caught during the winter months seem to have a higher fat content than those caught in the summer, and opakapaka yields the best sashimi during the winter season.

Preparations: The smaller-sized fish harvested off the main Hawaiian Islands are directed toward the ethnic restaurant and household retail markets in Hawaii, where opakapaka is often prepared by steaming or baking fish with the head on. In these markets, opakapaka is also used to make sashimi and fish head soup.

Opakapaka fillets are well suited for an array of preparations, including baking, poaching and sauteing.



V. Historical Note

The popularity of opakapaka as a "catch of the day" is not entirely a recent development. Opakapaka was one of the most common fish served in Hawaii's restaurants prior to World War II. For nearly a century, opakapaka has been the most important bottomfish species in terms of total landed weight and value in Hawaii.

Uku

I. Biological Description

Uku (*Aprion virescens*) is commonly known as a snapper or jobfish. Among the three most popular deep water snapper species in Hawaii, uku occurs at the shallowest depths, usually no deeper than 60 fathoms.

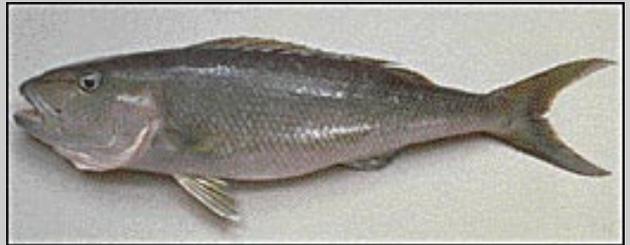
Most of the uku catch is between 4 and 18 pounds round weight. Fishermen rarely catch uku less than 1-2 pounds or over 30 pounds.



II. Of Special Interest For Buying/Distributing

Availability And Seasonality: Although uku is caught year round in Hawaii, the greatest availability is during its spawning season (May-July).

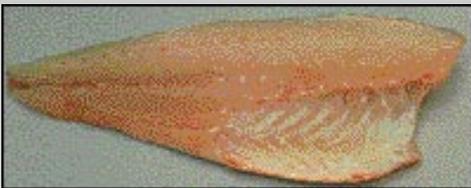
Fishing Methods: Uku is harvested mostly with vertical hook-and-line gear, however it is the only snapper in Hawaii regularly caught near the surface with trolling lures. Commercial fishermen have also used special bottom longline rigs to capture uku.



Distribution: Fishermen sell uku through the fish auctions, through intermediary buyers on the major islands, and directly to retail fish markets and restaurants.

Substitution: The summer uku season is entirely out of phase with the winter peak for other deep water snappers (opakapaka, onaga), offering numerous substitution opportunities.

III. Of Special Interest For Preparation/Quality Control



Shelf Life And Quality Control: Most uku are harvested in the main Hawaiian Islands, hence, the catch is marketed while it is still very fresh. When properly cared for, uku has a long shelf life, comparable to that of opakapaka (see Table 3).

Product Forms And Yields: Virtually all of the uku catch is landed as whole, iced fish, so that buyers can assess fish quality by examining the clarity of the eyes and the color of the gills. Several processors fillet uku for up-scale restaurants. The yield of fillet from a whole fish is about 45% (see Table 5). Whole fish are sold for display.

IV. Of Special Interest To Consumers/Food Service Personnel

Color, Taste, Texture: Like other snappers from Hawaii, uku has clear, pale pink flesh that is delicately flavored, moist, and firm. Some chefs say that uku is slightly stronger flavored than the very delicate opakapaka.

Preparations: As it is sometimes a substitute for opakapaka, uku is prepared in the same ways, including baking, broiling, sauteing and steaming.

Uku harvested during the summer spawning season is often rich in natural fat, a desirable attribute for sashimi.

Table 1 - Seasonal Availability of Hawaii's Major Fish Species

Species Name	J	F	M	A	M	J	J	A	S	O	N	D
Tuna												
Aku (Skipjack Tuna)					●	●	●	●	●	◐		
Bigeye Ahi (Bigeye Tuna)	●	●	●	●						●	●	●
Tombo (Albacore Tuna)				●	●	●	●	●	●	◐		
Yellowfin Ahi (Yellowfin Tuna)				◐	●	●	●	●	●			
Billfish												
Hebi (Shortbill Spearfish)						●	●	●	●	●		
Kajiki (Pacific Blue Marlin)	●	●	●	●	●	●	●	●	◐			●
Nairagi (Striped Marlin)		●	●	●	●	●					●	●
Shutome (Broadbill Swordfish)			●	●	●	●						
Open Ocean												
Mahimahi (Dolphinfish)			●	●	●				●	●	●	
Monchong (Bigscale Pomfret)	●	●	●	●	●	●	●	●	●	●	●	●
Ono (Wahoo)					◐	●	●	●	●	●		
Opah (Moonfish)				●	●	●	●	●				
Bottomfish												
Hapu'upu'u (Grouper)		●	●	●						●	●	●
Onaga (Ruby Snapper)	●	●	●								●	●
Opakapaka (Crimson Snapper)	●	●								●	●	●
Uku (Snapper or Jobfish)				◐	●	●	●					

This is a generalized representation of availability. Individual years and months may not conform to the general pattern due to variations in ocean or weather conditions.

Key: Light Landings Heavy Landings

Table 2 - Assessing Quality in Fresh Seafoods from Hawaii

Fresh Whole Fish	Good Quality	Poor Quality
Eyes	Clear, bright, bulging, black pupil	Dull sunken, cloudy, grey pupil
Gills	Bright red, free of slime	Brown, slimy, sour odor
Skin	Shiny, bright; no superficial scars/scrapes	Dull discolored, bruises, bite marks, gaff marks, lesions penetrating to flesh
Body	Stiff, straight, firm and resilient when touched	Soft, retains indentation when touched
Odor	Ocean-fresh, slight seaweed scent	Ammonia, putrid smell
Scales	Adhere tightly to skin, bright color, few missing	Dull, large quantities missing
Belly cavity (if gutted)	Evisceration complete, flesh tight to bone	Cuts, incomplete evisceration, bones loose from flesh, belly flap stained greenish-yellow
Halves, Quarters, Fillets of Fresh Fish		
Color	Varies with species but should be consistent/bright	Bruising, red spots, yellowing or browning at edges
Smell	Ocean-fresh, slight seaweed scent	Ammonia, putrid smell
Flesh	Firm, unseparated, moist, clean-cut	Soft and mushy, "cracked", dried out, ragged-cut

Table 3 - Shelf Life of Hawaii's Major Fish Species from Time of Capture

Species Name	For Sashimi	For Cooking
Tuna		
Aku (Skipjack Tuna)	Lg: 4, Med: 3, Sm: 2 days	7 days
Bigeye Ahi (Bigeye Tuna)	12 days	17 days
Tombo (Albacore Tuna)	15 days	22 days
Yellowfin Ahi (Yellowfin Tuna)	10 days	15 days
Billfish		
Hebi (Shortbill Spearfish)	10 days	15 days
Kajiki (Pacific Blue Marlin)	12 days	15 days
Nairagi (Striped Marlin)	12 days	20 days
Shutome (Broadbill Swordfish)	—	21 days
Open Ocean		
Mahimahi (Dolphinfish)		10 days
Monchong (Bigscale Pomfret)	—	21 days
Ono (Wahoo)		10 days
Opah (Moonfish)	13 days	20 days
Bottomfish		
Hapu'upu'u (Grouper)	8 days	15 days
Onaga (Ruby Snapper)	5 days	10 days
Opakapaka (Crimson Snapper)	7 days	12 days
Uku (Snapper or Jobfish)	7 days	12 days

Generalized estimates are based on the experience of selected fishermen, wholesalers, and retailers. Shelf life of individual fish may vary from the general, due to differences in handling and storage techniques.

Table 4 - Product Forms Available for Hawaii's Major Seafood Species

Species Name	Round	Dressed	Loined	Filleted/Steak	Poke	Sashimi	Dried/Smoked Strips
Tuna							
Aku (Skipjack Tuna)	●	●	●	●	●	●	●
Bigeye Ahi (Bigeye Tuna)	●	●	●	●	●	●	
Tombo (Albacore Tuna)	●	●	●	●		●	●
Yellowfin Ahi (Yellowfin Tuna)	●	●	●	●	●	●	●
Billfish							
Hebi (Shortbill Spearfish)	●	●		●			
Kajiki (Pacific Blue Marlin)	●	●	●	●	●	●	●
Nairagi (Striped Marlin)	●	●	●	●	●	●	
Shutome (Broadbill Swordfish)		●	●	●			
Open Ocean							
Mahimahi (Dolphinfish)	●	●		●			
Monchong (Bigscale Pomfret)	●	●		●			
Ono (Wahoo)	●	●		●			
Opah (Moonfish)	●			●		●	
Bottomfish							
Hapu'upu'u (Grouper)	●	●		●			
Onaga (Ruby Snapper)	●			●		●	
Opakapaka (Crimson Snapper)	●			●			
Uku (Snapper or Jobfish)	●			●			

Table 5 - Round Weight or Yield (% of Round Weight)

Species Name	Round	Dressed	Loined	Filletted/Steak	Poke	Sashimi	Dried/Smoked Strips
Tuna							
Aku (Skipjack Tuna)	3-30 lbs	75%	55-65% (Lg)	45-60%	Variable	35% (Lg)	12% (Dried)
Bigeye Ahi (Bigeye Tuna)	10-250 lbs	75-80%	55-65%	55-65%	Variable	35%	
Tombo (Albacore Tuna)	40-80 lbs	80-85%	60-65%	60-65%	Variable	35%	30% (Smoked)
Yellowfin Ahi (Yellowfin Tuna)	3-250 lbs	75-80%	55-65%	55-65%	Variable	35%	30% (Smoked)
Billfish							
Hebi (Shortbill Spearfish)	20-40 lbs	70-80%		45-55%			
Kajiki (Pacific Blue Marlin)	80-300 lbs	80%	65%	65%	Variable	40%	30% (Smoked)
Nairagi (Striped Marlin)	40-130 lbs	75%	65%	65%	Variable	40%	
Shutome (Broadbill Swordfish)		78-80%	55-65%	55-65%			
Open Ocean							
Mahimahi (Dolphinfish)	7-25 lbs	75%		40-50%			
Monchong (Bigscale Pomfret)	4-25 lbs			45%			
Ono (Wahoo)	8-30 lbs	75%		60-65%			
Opah (Moonfish)	60-200 lbs			35%		25%	
Bottomfish							
Hapu'upu'u (Grouper)	5-30 lbs	66%		40%			
Onaga (Ruby Snapper)	1-18 lbs			40-50%		30%	
Opakapaka (Crimson Snapper)	1-15 lbs			40-50%			
Uku (Snapper or Jobfish)	4-18 lbs			45%			

Generalized estimates are based on the experience of selected wholesalers, retailers and fishcutters.

Table 6 - How Much to Buy

Species Name	For Sashimi	For Cooking
Tunas (all species)	Prepared: 1 lb/10 persons Loined/filleted: 16 lbs/100 persons Round: 29 lbs/100 persons	Prepared: 1/3 lb/person Loined/filleted: 3-4 lbs/10 persons Dressed: 45-50 lbs/100 persons Round: 60-65 lbs/100 persons
Billfish (all species)	Prepared: 1 lb/10 persons Loined/filleted: 16 lbs/100 persons Round: 25 lbs/100 persons	Prepared: 1/3 lb/person Loined/filleted: 3-4 lbs/10 persons Dressed: 40-45 lbs/100 persons Round: 55/60 lbs/100 persons
Open Ocean		
Mahimahi (Dolphinfish)		Prepared: 1/3 lb/person Loined/filleted: 3 1/2 lbs/10 persons Dressed: 60 lbs/100 persons Round: 80 lbs/100 persons
Monchong (Bigscale Pomfret)		Prepared: 1/3 lb/person Loined/filleted: 75 lbs/100 persons Round: 75 lbs/100 persons
Ono (Wahoo)		Prepared: 1/3 lb/person Loined/filleted: 3 1/2 lbs/10 persons Dressed: 45 lbs/100 persons Round: 60 lbs/100 persons
Opah (Moonfish)	Prepared: 1 lb/10 persons Loined/filleted: 14 lbs/100 persons Round: 40 lbs/100 persons	Prepared: 1/3 lb/person Loined/filleted: 3 1/2 lbs/10 persons Round: 100 lbs/100 persons
Bottomfish		
Hapu'upu'u (Grouper)		Prepared: 1/3 lb/person Loined/filleted: 3 1/2 lbs/10 persons Dressed: 56 lbs/100 persons Round: 85 lbs/100 persons
Snappers	Prepared: 1 lb/10 persons Loined/filleted: 15 lbs/100 persons Round: 33 lbs/100 persons	Prepared: 1/3 lb/person Loined/filleted: 3 1/2 lbs/10 persons Round: 80 lbs/100 persons

Table 7 - Preparation of Hawaii's Major Fish Species

Species Name	Dry/Smoke	Broil	Bake	Steam	Sauté	Poach	Raw
Tuna							
Aku (Skipjack Tuna)	●	●	●		●		●
Bigeye Ahi (Bigeye Tuna)	●	●	●		●		●
Tombo (Albacore Tuna)	●	●	●		●		●
Yellowfin Ahi (Yellowfin Tuna)	●	●	●		●		●
Billfish							
Hebi (Shortbill Spearfish)	●	●	●		●		●
Kajiki (Pacific Blue Marlin)	●	●	●		●		●
Nairagi (Striped Marlin)	●	●	●		●		●
Shutome (Broadbill Swordfish)	●	●	●	●	●	●	
Open Ocean							
Mahimahi (Dolphinfish)	●		●		●	●	●
Monchong (Bigscale Pomfret)	●	●	●	●	●	●	
Ono (Wahoo)	●	●	●	●	●	●	●
Opah (Moonfish)	●		●	●	●	●	●
Bottomfish							
Hapu'upu'u (Grouper)	●		●	●		●	●
Onaga (Ruby Snapper)			●	●	●	●	●
Opakapaka (Crimson Snapper)			●	●	●	●	●
Uku (Snapper or Jobfish)		●	●	●	●	●	●

Table 8 - Nutrient Content of Selected Fish Species from Hawaii

Species Name	Calories (Kcal)	Protein (gm)	Fat (gm)	Sodium (mg)
Tuna				
Aku (Skipjack Tuna)	131	24.9	2.7	37
Bigeye Ahi (Bigeye Tuna)	171	23.6	7.8	31
Tombo (Albacore Tuna)	158	25.2	7.2	51
Yellowfin Ahi (Yellowfin Tuna)	119	24.5	1.6	37
Billfish				
Kajiki (Pacific Blue Marlin)	109	21.1	2.7	—
Nairagi (Striped Marlin)	121	23.1	3.2	—
Shutome (Broadbill Swordfish)	122	19.4	4.4	90
Open Ocean				
Mahimahi (Dolphinfish)	94	19.3	1.1	88
Ono (Wahoo)	124	24.1	2.3	82
Bottomfish				
Onaga (Ruby Snapper)	102	20.9	1.5	64
Opakapaka (Crimson Snapper)	102	21.9	0.9	54

Data from Joyce Nettleton Seafood Nutrition, Osprey Books, ©1985 and U.S.D.A. Handbook #8-15 Composition of Foods: Finfish and Shellfish Products.

Per 100 Grams (3 1/2 oz.) Raw Fillet