

What kind of mullet is that?

When walking along the shoreline, have you ever seen a school of mullet shimmering in the water and asked yourself what kind of mullets are they and how do they taste? Hawai'i has three species of mullet: two of them, the 'ama'ama and the uouoa are native and the third one, known as kanda, is introduced. With the mullet season already underway, it's good to know what species they are and how to identify them and/or tell them apart.

'Ama'ama

One of the most important food fishes for Hawaiians was the native 'ama'ama or striped mullet, *Mugil cephalus*. 'Ama'ama can be identified by a blue spot at the base of the pectoral fin, silver in overall color with faint lateral stripes, having a blunt snout, and an adipose eyelid (thick transparent skin covering the front and back of the eye). As the largest of the mullet species in Hawai'i, 'ama'ama reach 27 inches in fork length (FL) and a weight of close to ten pounds. They are found in all habitats from estuaries, reef, marine, coastal, and to streams and rivers. 'Ama'ama are able to live in shallow water with high temperatures, very low dissolved oxygen, and very low salinity (DLNR's Division of Aquatic Resources (DAR) has documented them two miles upstream in Waimea and Hanapēpē rivers on Kaua'i in freshwater!). Their diet mainly consists of soft algae and organic detrital material that is floating or attached to the bottom. An unusual feature of the 'ama'ama are its teeth, embedded within their lips, an adaptation that aids in removing algae off of hard substrates. All mullet have a gizzard like stomach that is used for grinding up food particles.

'Ama'ama can be found in large schools that number in the hundreds. Sub-adults and adults tend to jump singly rather than in unison, a behavior that would give away the school's location to attentive fishers. In an uncovered bucket of water 'ama'ama will jump out of the bucket in an attempt to escape, and when fleeing a predator these mullet will take refuge under any available cover heading for shallower water or leaping for safety. As pelagic spawners, 'ama'ama release their gametes into the open ocean during winter through spring months. Their eggs contain an oil globule that helps to keep them buoyant in high salinity water. In a few months the lucky survivors will have grown to about an inch in length and start recruiting into the estuaries. It will then take one and a half to two years for them to reach their L_{50} of 11 inches fork length (FL) - the length at which 50% of them have reached reproductive size with a chance to spawn at least once.

Revered in Hawaiian culture and legends, 'ama'ama is one of the few fish species that can be raised in fish ponds and is still commercially sold to this day. This fish was so significant that names were given to its various growth stages; pua'ama (finger length), kahala (hand length), 'ama'ama (8 to 12 inches), and 'anae (full size 12+ inches) as well as place names such as Wai'anae- mullet water, 'Anaeho'omalū- restricted mullet, and Ke'anae- the mullet. A fabled legend of the 'ama'ama depicts Makoa, an extremely fast runner, running from King Kamehameha I's court in Kawaihae on the north Kohala coast to retrieve the highly esteemed 'ama'ama from Hilo some 60 miles away for the king's dinner. It was said that he accomplished this feat with such speed that the fish was delivered still alive and wriggling. This is just one of the many tales and legends of the 'ama'ama found in Hawaiian folklore.

'Ama'ama was economically important in the 1900's and is still a highly prized food/game-fish in Hawai'i today. The most common ways of catching them are by throw net, lay/cross net, or spearing. 'Ama'ama can also be taken by hook and line using bread for bait although this is a dying art. The mullet fishery in Hilo is unique; using a sensitive bobber, two hooks in tandem, and algae as bait. It is the only place in the world where the filamentous chain diatom, *Melosira moniliformis*, is used as bait to catch

fish. With the popularity of the 'ama'ama fishery in Hilo, stocks began to decline and as a result DAR implemented the Stock Enhancement of Marine Fish in the State of Hawai'i (SEMFISH) project from 1990 to 2000. Each year 30,000 hatchery raised 'ama'ama fingerlings were tagged with coded wire tags (CWT) and released into Waiākea/ Wailoa estuary. The project was deemed successful in its early years with CWT mullet accounting for 4% of the overall population. In latter years, the hatchery released mullet made up 62% of the total population, indicating unhealthy wild stocks. In 2000 the SEMFISH project ended as the goals of stock enhancement should be to augment and not replace wild stocks. A direct outcome of the research was the implementation of new rules regarding the take of 'ama'ama - minimum size was raised from 7 inches to 11 inches FL, the closed season was increased one month from December to March to protect the spawning cycle, no netting of 'ama'ama fingerlings in Waiākea/ Wailoa estuary, no throw nets or spearing in Waiākea/ Wailoa estuary, and in Hilo Bay the bag limit was reduced to ten 'ama'ama per day.

As mentioned earlier, 'ama'ama is a highly prized game fish and makes excellent table fare with moist white meat. It is a versatile fish and can be prepared in many ways such as steamed, fried, dried, or smoked. It is not recommended to be consumed raw due to the presence of an introduced parasitic tapeworm from Asia. My favorite way of eating 'ama'ama is steamed with chung choy, ginger, garlic, green onions, shoyu, and hot peanut oil.

Uouoa

The other native mullet species, *Neomyxus leuciscus*, is commonly known as uouoa or sharpnose mullet. It has a very distinguishable yellow spot at the upper base of the pectoral fin and its lower jaws meet at a sharp angle creating a pointed snout (hence the common name). Uouoa are silver in color and have no adipose eyelid. They are smaller in size reaching 12 inches maximum FL and around a pound in weight. These mullet favor areas of high surge (white water) and are commonly seen with their heads facing towards the shoreline against the receding current. They can be found in marine, coastal, and reef environments and occasionally within estuaries. Uouoa form small fast moving schools and are omnivorous, feeding on algal and organic detrital material as well as small crustaceans. Spawning is presumed to occur in the open ocean by broadcast spawning similar to 'ama'ama. Preliminary data collected by DAR indicates a winter spawning period resulting in late spring through summer recruitment of fingerlings into coastal habitats.

Uouoa are not considered an economically important fish species in Hawai'i due to their small size and difficulty to catch. The most common way to catch them is with a throw net or by shining a flashlight at night (uouoa tend to jump due to the light) and either scooping them up with a net or spearing them. It is very rare to catch one with hook and line.

Uouoa are excellent eating with qualities similar to 'ama'ama and can be prepared in a variety of ways like dried and broiled before serving, fried and raw. If the head is eaten, nightmares or restless sleep may occur. It is said in a Hawaiian tale that Pahulu, the chief of ghosts resides in the heads of uouoa and weke pueo (banded tail goatfish) making them bitter. So if you do eat some uouoa, try not to eat the head.

Kanda

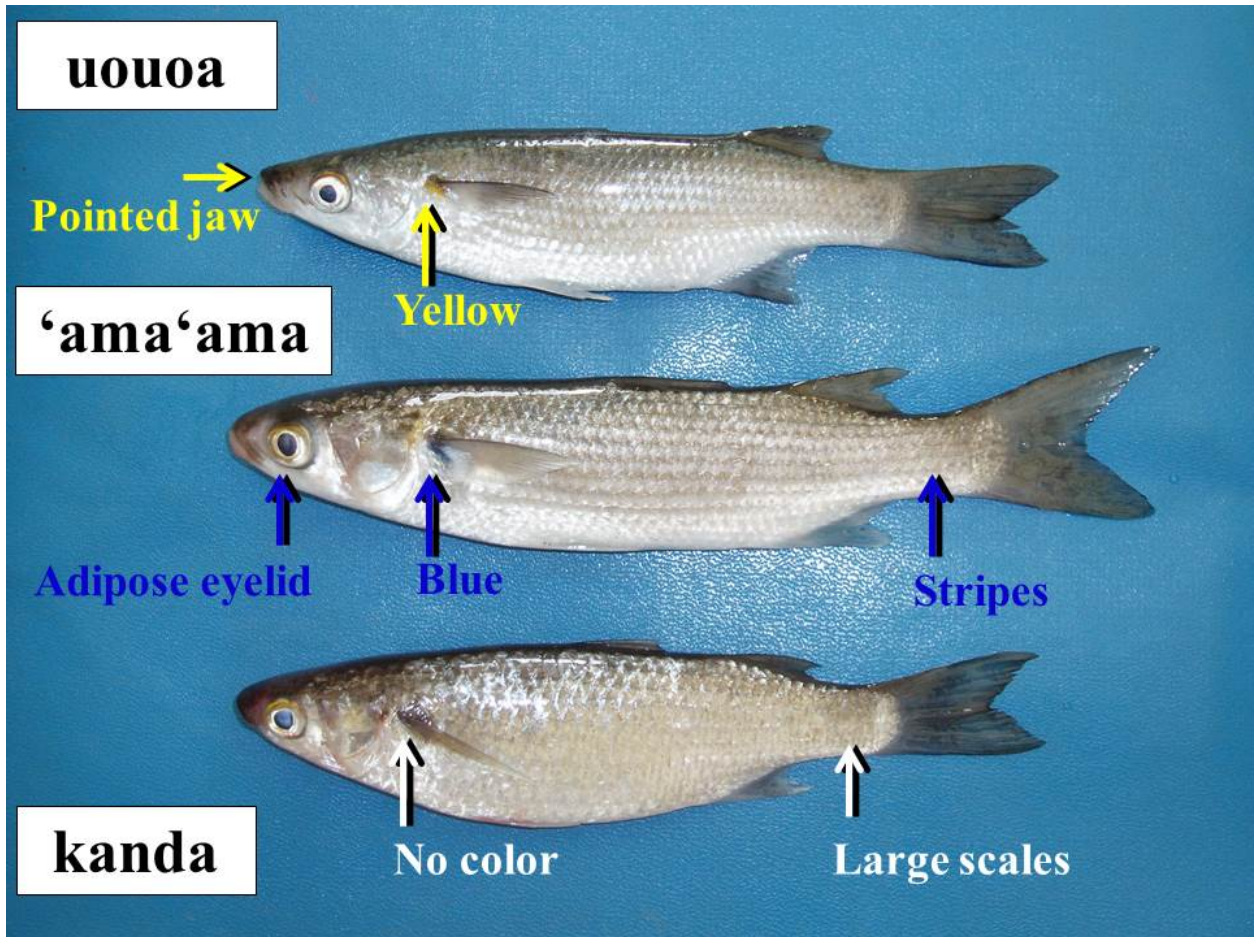
The third mullet species in Hawai'i is the Kanda or Marquesan/Australian mullet, *Moolgarda engeli*. They were inadvertently introduced to Hawai'i with eight shipments of Marquesan sardines, *Sardinella marquesensis*, from Nuku Hiva, Marquesas Islands from 1955 thru 1959. All shipments were released around 'Oahu (Barbers point, Hanauma Bay, 'Ewa Beach, Pōka'i Bay, and Maunaloa Bay). Kanda are now found throughout the State of Hawai'i in estuaries, reefs, streams/ rivers, and marine environments. Very similar in color and shape to 'ama'ama, Kanda have these noticeable differences: no

coloration at the base of the pectoral fin, no lateral stripes, and lacks an adipose eyelid. Kanda also have larger scales and feel rougher to the touch when compared to the other two native species. Maximum size of the introduced mullet is a relatively small 10 inches FL with a maximum weight of around 3/4 pounds. Like all mullets, Kanda can be found in large schools foraging for food consisting of algal and organic detrital material. Unlike other mullets, schools of Kanda can be seen jumping in unison when traveling or evading predators. Another key difference is offshore pelagic spawning occurs all year long with peaks during summer and winter months resulting in large numbers of kanda fingerlings recruiting into the estuaries on a continuous basis. Within one year juvenile kanda become adults at about seven inches FL and are able to reproduce, continuing the life cycle. Indicating kandas have at least a six month head start on reproduction compared to 'ama'ama. These introduced mullet are known to tolerate high water temperatures, low dissolved oxygen levels, and low salinity levels (also found up to two miles upstream in Waimea and Hanpēpē rivers on Kaua'i).

Kanda have no commercial value due to their small size and difficulty to catch. Even large adults will escape a legal meshed two inch sized throw-net. They can be taken with hook and line using bread for bait although uncommon. If you are able to catch some kanda, they are quite flavorful with firm white oily meat. I have tried them deep fried and dried and heard of people pickling them.

Kanda mullets are currently displacing the more sought after 'ama'ama in many places around the state. To learn more about these invasive mullets, the DAR estuarine team is conducting statewide surveys to gather information on the potential impacts of interspecific competition between 'ama'ama and kanda as well as gathering basic life history information.

If you do catch some mullet and can't remember all of this, just remember these few things; if there's blue or yellow at the base of the pectoral fins, it's a native mullet and if there's no coloration, it's the introduced kanda. I hope this guide helps in identifying any mullet that you may come across or catch.



(JPEG Format – 114KB)



'ama'ama



Uouoa



kanda



Fishers from shoreline and on boats fish for 'ama'ama during its heyday in the early 90's at Waiākea Public Fishing Area.



Two tandem hooks baited with limu (*Melosira*) used to catch 'ama'ama in Hilo Bay.



Glenn Higashi with an 'ama'ama he caught using limu (Melosira) for bait.