

Edibility Characteristics of Fish Species from NT Waters

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RESEARCH OBJECTIVE

To establish the predominant edibility characteristics of commercially important fish species from the Northern Territory.

RESEARCH METHOD

Twenty-two Northern Territory fish species were analysed from frozen samples for their edibility characteristics by QDPIF, Centre for Food Technology (Table 1).

Three fish of each species were supplied and, where appropriate, small and large size grades were included. All samples were transported frozen from Darwin to Brisbane and stored at -20°C at the Centre for Food Technology laboratory. Samples were assumed to be of good market quality.

Samples were thawed overnight in a chilled room and prepared for tasting immediately prior to each tasting session. Sensory evaluation was conducted on a round-table basis by a panel of six expert tasters. Each taster evaluated each of the three fish individually, and then a discussion was held to agree on the predominant attributes of that fish species.

Fish fillets were first assessed in the raw state and then cooked by domestic microwave to assess texture and flavour characteristics. Samples were cooked on high power (650W) for predetermined times according to weight, ensuring that the fish flesh was cooked through but retained all natural characteristics. Microwaving was chosen as the cooking method as it is rapid and highly reproducible from sample to sample.

Assessment included initial texture and residual texture (the latter determined after chewing the sample prior to swallowing). This approach was taken as initial and residual texture of some species of fish can show quite different attributes and often this analysis is a good indication of moisture retention of fish muscle.

RESULTS

The gastronomic attributes of a particular fish are primarily dictated by the species of fish. However, the physiological condition of the fish, the method of capture and subsequent post-harvest handling also influence eating quality. These factors should therefore be considered when comparing one fish with another, both within a species and between species.

The predominant attributes are described for the specific fish supplied. It should be noted that the same species of fish supplied at another time may have been assessed slightly differently, due to the variable factors, which can affect eating quality. Larger fish generally have less flavour and are more likely to be dry and of coarse texture. Dark flesh present on any fillet will often be more strongly flavoured and may have a more oily taste in some fish species than does the white flesh.

Water retention of cooked fish flesh is highly dependent on cooking method. Microwaving is a "wet" cooking method and hence, species such as shark which rated as moist in the evaluation, may be considered less so when cooked by "dry" cooking methods such as barbequing.

There was noticeable variability between the three fish for each species, particularly relating to colour (both raw and cooked flesh) and acidity. Where fish were not fully bled, flesh colour was noticeably pink, and when tasted, had a distinct metallic/acid flavour. This is likely to be due to lactic acid present in the blood remaining in the fish flesh. For the purposes of this investigation the detection of this flavour was disregarded as it was apparently due to insufficient bleeding.

It was noticed that "fighting" fish such as shark, trevally and queen fish also had a distinct sharp, acid aftertaste. This was most probably due to lactic acid accumulated during the stress of capture. The term "tangy" was included in the description as it was thought this would often be a typical characteristic. Interestingly, mackerel did not have this aftertaste.

The rating of acceptability (how much the tasters liked the sample) is based on a 1 to 5 scale with 5 being excellent. It should be noted that ratings may not be indicative of general consumer taste, as acceptability is a very subjective parameter and the ratings given are those of experienced fish tasters.

A total of 22 species were evaluated and edibility characteristics are presented in the form of a quick reference guide (Table 2) followed by a more detailed analysis of each species.

Table 1. Northern Territory fish species analysed for edibility characteristics

COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
Barramundi	<i>Lates calcarifer</i>	Mackerel	<i>Scomberomorus commersoni</i>
Barramundi-Aquacultured	<i>Lates calcarifer</i>	Mangrove Jack*	<i>Lutjanus argentimaculatus</i>
Black Tip Shark	<i>Charcharinus limbatus</i>	Mullet-Diamond Scale	<i>Liza vaigiensis</i>
Blue Lined Emperor*	<i>Lethrinus fraenatus</i>	Painted Sweetlip*	<i>Diagramma pictum</i>
Catfish	<i>Arius thalassinus</i>	Queen fish	<i>Scombroides commersonionus</i>
Cod-Yellow Spotted	<i>Epinephelus areolatus</i>	Red Emperor*	<i>Lutjanus sebae</i>
Coral Trout	<i>Plectropomus spp.</i>	Red Snapper*	<i>Lutjanus erythropterus</i>
Golden Snapper	<i>Lutjanus johnii</i>	Saddletail Snapper*	<i>Lutjanus malabaricus</i>
Gold Band Snapper	<i>Pristipomoides multidens</i>	Sharp tooth Snapper	<i>Pristipomoides typus</i>
Golden Trevally	<i>Gnathanodon speciosus</i>	Stripey	<i>Lutjanus carponotatus</i>
Jewfish	<i>Protonibea diacanthus</i>	Threadfin Salmon	<i>Polynemus sheridani</i>

* These species were trawled. It should be noted that this may have affected the texture, despite only being caught in a 1/2-hour trawl.

Table 2. Quick reference guide to the edibility characteristics of fish from NT waters

SPECIES	IDENTIFICATION		COMMENTS
	RAW	COOKED	
Barramundi <i>Lates calcarifer</i>	Translucent, creamy-pink flesh large texture	Pale cream, large flake, soft, moist, succulent flesh, delicate meaty, fish flavour	Often slightly earthy flavour
Barramundi-Aquacultured <i>Lates calcarifer</i>	Translucent, creamy medium texture flesh	Very white medium flaked, soft/tender very moist, fleshy, succulent texture with a delicate flavour. Fine veins obvious in fillet	
Black Tip Shark <i>Caracharinus libartus</i>	Slightly translucent pink flesh	Cream, fine texture, moist, tender flesh with a slightly tangy, sea flavour of moderate intensity	More suited to wet cooking methods: a tendency to dryness
Blue Lined Emperor <i>Lethrinus fraenatus</i>	Translucent creamy-white medium textured flesh	White flesh easily separated into medium sized flakes. Moist and succulent with a good sea flavour	
Catfish <i>Arius thalassinus</i>	Translucent oyster-pink fine textured flesh	Very white, moist, slightly coarse flesh with a characteristic flavour	Suit soups, casseroles, curries and kebabs
Cod-Yellow Spotted <i>Ephinephelus areolatus</i>	Slightly translucent creamy oyster pink, large textured flesh	White, large flaked flesh, very moist and soft textured. Mild appealing sea flavour	
Coral Trout <i>Plectropomus spp.</i>	Very white translucent flesh medium/large texture	Snow white, flaky flesh with a firm, moist succulent texture and a delicate refreshing sea flavour	
Gold Band Snapper <i>Pristipomoides multidens</i>	Translucent creamy pink flesh large texture	Pale cream, chunky flesh with a moist succulent texture and a full fish flavour	
Golden Snapper <i>Lutjanus johnii</i>	Translucent cream- pink medium textured flesh	White/pale cream, moist, flaky, soft, succulent flesh with a distinctly sweet fish flavour	
Golden Trevally <i>Gnathanodon speciosus</i>	Slightly translucent pink/dark flesh	Dark fleshed, juicy, flaky, slightly resilient texture with a distinctly tangy fish flavour	Has a tendency to dryness
Jewfish <i>Protonibea diacanthus</i>	Translucent creamy-pink, large textured flesh	Palest oyster colour with a large flake, firm fleshy texture with a slight tendency to dryness. Mild slightly meaty/fish flavour	
Mackerel <i>Scomberomorus commerson</i>	Translucent grey/pink medium textured fish	Very white, medium to large flake. Firm, moist, smooth texture and a rich sea flavour	
Mangrove Jack <i>Lutjanus argentimaculatus</i>	Slight translucent pink - grey large textured flesh	Cream, medium/large flake, juicy, firm texture with a mild chicken-like flavour	Sometimes has a slightly earthy flavour
Mullet-Diamond Scale <i>Liza vaigiensis</i>	Slightly translucent creamy/pink flesh medium/large texture	Dark pearly flesh with a large flake; firm moist, fleshy texture with a slight oiliness and a full fish flavour	Moderate to strong flavoured fish
Painted Sweetlip <i>Diagramma pictum</i>	Translucent creamy-pink flesh medium/large texture	Pale oyster, medium flaked, firm textured flesh that becomes friable on chewing. Has a moderate and distinct fish flavour	Most suitable for soups and curries
Queen fish <i>Scombricides commersonionus</i>	Slightly translucent creamy/pink flesh large texture	Pales oyster colour flesh. Initially moist then soft and dry textured with a mild, meaty, fish flavour	Ideal for numus, curries etc
Red Emperor <i>Lutjanus sebae</i>	Translucent white flesh medium texture	Very white flesh with a medium to large flake. Moist and succulent with an excellent sweet, sea flavour	
Red Snapper <i>Lutjanus erythropterus</i>	Translucent pink flesh medium texture	Medium flaked, oyster coloured flesh, moist, firm and slightly chewy texture with a distinct flavour	Most suitable for soups and curries
Saddle tail Snapper <i>Lutjanus malabaricus</i>	Translucent cream pink flesh medium/large texture	Pale cream, moist, firm, succulent flesh that flakes readily. Sweet, rich sea flavour	
Sharp Toothed Snapper <i>Pristipomoides typus</i>	Translucent creamy pink large texture	Pale cream, chunky flesh with a moist succulent texture and a full fish flavour	Very similar to Gold Band Snapper
Stripey <i>Lutjanus carponotatus</i>	Slightly translucent flesh creamy/ Oyster/pink small texture	Fine, pale oyster coloured flesh, soft, slightly dry, course texture with a mild flavour	Popular table fish
Threadfin Salmon <i>Polynemus sheridani</i>	Translucent creamy-pink/slightly yellow flesh, large texture.	Very white, large flaked flesh. Moist, soft and flaky texture, similar to crab meat. Has a sweet sea flavour	

BARRAMUNDI

Lates calcarifer

Predominant attributes

Raw	Translucent creamy pink with a large texture.
Cooked	Large flake size, creamy oyster coloured, and veins obvious in flakes juicy/moist soft fleshy succulent, slight dry residual moderately strong meaty/chicken fish flavour.
Comment	No expected earthiness in ocean barra?
Rating	3.7

Description: Pale cream, large flake, soft, moist, succulent fleshiness with a delicate meaty fish flavour, sometimes has a slightly earthy flavour.

BARRAMUNDI - AQUACULTURED

Lates calcarifer

Predominant attributes

Raw	Very translucent cream medium textured fish.
Cooked	Medium flake size, very white fleshed soft/tender very moist fleshy succulent texture moderate flavoured, predominant fish but mildly earthy.
Comment	Very positive reaction (only labelled as small barra) distinct veins visible in cooked flesh samples.
Rating	4.3

Description: Very white medium flaked, soft/tender, very moist, fleshy, succulent texture, with delicate fish taste. Excellent eating quality.

BLACK-TIP SHARK

Carcharhinus limbatus

Predominant attributes

Raw	Slightly translucent pink flesh, very fine/close texture.
Cooked	Small/fine flake, creamy, oyster coloured flesh soft, moist, fleshy, tender, a little crumbly, afterwards dry slightly sharp/tangy sea flavour, moderate intensity.
Comment	Suitable for wet cooking methods and/or serving with sauce plain dry methods would be too dry.

Description: Translucent pink flesh prior to cooking. Cream, fine/close texture, moist, tender flesh with a slightly tangy sea flavour of moderate intensity.

BLUE-LINED EMPEROR

Lethrinus fraenatus

Predominant attributes

Raw	Translucent creamy white with a medium texture.
Cooked	Medium flake size, uniformly white flesh moist, succulent, flaky, firm flesh, flaky but a little crumbly and dry later; moderately intense, slightly salty, sea flavour.
Rating	2.6

Description: White flesh with medium flakes that separate easily, moist and succulent texture with a good sea flavour.

CATFISH

Arius thalassinus

Predominant attributes

Raw	Fine textured, translucent oyster pink coloured (boneless) very closed structure, similar to shark flesh.
Cooked	Fine textured, uniformly very white flesh initially moist/juicy and crumbly, lost moisture a little chewy moderate to strong fish/sea flavour, shellfish/gamey.
Comment	Suits casserole, soup, curry, and kebabs (with sauce). Similar to shark especially in texture and a little in flavour
Rating	2.3

Description: Very white, fine textured fish, moist but slightly coarse flesh with a characteristic flavour.

COD-YELLOW SPOTTED

Epinephelus areolatus

Predominant attributes

Raw	Slightly translucent creamy oyster-pink flesh, large texture lateral lines obvious.
Cooked	Large flakes white/cream coloured flesh; very moist/juicy, fleshy, slightly resilient flesh, but lost moisture rapidly and was a little crumbly and dry later; very mild/bland (delicate) fish/sea flavour
Rating	2.4 (due to little flavour)

Description: White, large flaked flesh, very moist and soft textured. Has a mild, appealing sea flavour.

CORAL TROUT

Plectropomus sp.

Predominant attributes

Raw	Very white translucent flesh with medium to large muscle blocks.
Cooked	Medium to large flake size uniformly very white (snow white) flesh. Firm but flaky and moist, succulent mild to moderate, sweet sea flavour (bland fish flavour).
Comment	Suits any cooking method.
Rating	3.6

Description: Snow white, flaky flesh with a firm, moist, succulent texture and a delicate refreshing sea flavour.

GOLD BAND SNAPPER

Pristipomoides multidens

Predominant attributes

Raw	Translucent creamy pink with large texture.
Cooked	Very large flake size, white/cream coloured flesh soft moist/juicy and texture goes slightly fibrous after strong chicken/meaty flavour similar to sharp tooth snapper.
Rating	3.4

Description: Pale cream, chunky fleshed fish with a moist succulent texture and a full fish flavour. Excellent eating qualities.

GOLDEN SNAPPER

Lutjanus johnii

Predominant attributes

Raw	Translucent cream-pink tinged flesh with medium texture.
Cooked	Medium flake size, uniformly pale cream, a little flaky, soft moist/juicy, and fleshy succulent moderate sweet sea/fish flavour.
Rating	3.9

Description: White/pale cream, moist, flaky, soft, succulent flesh with a distinctly sweet fish flavour.

GOLDEN TREVALLY

Gnathanodon speciosus

Predominant attributes

Raw	Slightly translucent pink/dark fleshed with indeterminate texture.
Cooked	Medium flaked white/dark, oyster coloured flesh juicy, chewy but flaky, dry and fibrous afterwards.
Comment	Don't need lemon juice when cooking/eating this species. Similar to very similar to tuna/bonito in all attributes.
Rating	2.6

Description: Dark fleshed fish with a medium flake, juicy, flaky, slightly resilient texture with a tendency to dryness. Has a rich tangy fish flavour.

JEW FISH

Protonibea diacanthus

Predominant attributes

Raw	Translucent cream/pink flesh, large texture.
Cooked	Very large flake size white/cream oyster coloured flesh moist fleshy/flaky firm chewy texture, stringy/dry/fibrous later moderate meaty/chicken flavour.
Rating	3.3

Description: Palest oyster colour with a large flake, firm fleshy texture with a slight tendency to dryness. Has a fish flavour with a slight meaty taste.

MACKEREL

Scomberomorus commerson

Predominant attributes

Raw	Translucent greyish/pink flesh, medium texture.
Cooked	Medium to large flake size, very white flesh firm flaky, moist, smooth texture moderately intense fish/sea flavour.
Rating	4.2

Description: Pearly pink flesh prior to cooking. Cooked flesh very white with a medium to large flake and a firm, moist, smooth texture with a rich sea flavour.

MANGROVE JACK

Lutjanus argentimaculatus

Predominant attributes

Raw	Slightly translucent pink/greyish flesh with large texture.
Cooked	Moderate flake size creamy/oyster coloured flesh juicy, firm but crumbly flesh texture, dry/floury residual mild chicken flavour, but earthy.
Rating	1.8. Texture not acceptable.

Description: Cream, large to medium flaked fish, juicy and firm textured with a mild chicken-like flavour. Can sometimes have a slight earthy taste, depending on where the fish was caught.

MULLET - DIAMOND SCALE

Liza vaigiensis

Predominant attributes

Raw	Slightly translucent creamy/pink flesh, medium to large texture.
Cooked	Large flaked, uniformly dark creamy flesh - pearly grey firm, flaky, moist, fleshy, and a little chewy. Residual with an adhesive mouth feel, moderate to strong meaty and earthy flavour.
Rating	3.1

Description: Dark, pearly flesh with a large flake; firm, moist, fleshy texture with a slight oiliness and full fish flavour.

PAINTED SWEETLIP

Diagramma pictum

Predominant attributes

Raw	Translucent creamy pink flesh with medium to large texture.
Cooked	Medium flake size cream/pale oyster coloured flesh, distinct lateral lines. Firm flaky and crumbly, moist initially and dry afterwards. Mild to moderate flavour chicken fish flavour. Slightly bitter.
Comment	Texture makes this fish most suitable for wet-cooking methods.
Rating	2.6

Description: Creamy pink when raw, turning pale oyster coloured when cooked. Medium flaked with a firm texture becomes a little friable upon chewing. Has a moderate yet distinct fish flavour.

QUEENFISH

Scombroides commersonionus

Predominant attributes

Raw	Slightly translucent cream/pink flesh, with large texture.
Cooked	Flakes indeterminate cream/oyster coloured flesh moist soft crumbly almost mushy texture mild meaty fish/sea flavour.
Comment	Falls apart readily
Rating	2.3

Description: Pale oyster coloured flesh initially moist then soft and dry textured with a mild meaty fish flavour.

RED EMPEROR

Lutjanus sebae

Predominant attributes

Raw	Translucent white flesh, medium texture.
Cooked	Medium flake size, uniformly very white flesh juicy/moist soft succulent texture sweet moderately strong sea flavour.
Rating	3.7

Description: Very white flesh with a medium to large flake, moist and succulent with a distinct sweet sea flavour.

RED SNAPPER

Lutjanus erythropterus

Predominant attributes

Raw	Medium textured translucent pink fleshed.
Cooked	Medium flake size; dark cream/oyster coloured flesh firm, chewy, tough, moist (very firm texture) moderate chicken/meaty flavour (similar to mushrooms); resilient, slightly bitter after taste. Not similar to saddle tail snapper.
Rating	1.8

Description: Medium flaked, oyster coloured flesh, moist, firm and slight chewy texture with a distinct flavour.

SADDLETAIL SNAPPER

Lutjanus malabaricus

Predominant attributes

Raw	Translucent cream, very slightly pink flesh with medium large texture.
Cooked	Medium flake white/cream very slight oyster coloured flesh moist/juicy, flaky, firm but succulent flesh (stays that way); sweet moderate to strong chicken/meaty fish flavour.
Rating	4.2

Description: Pale cream, moist, firm, succulent flesh that flakes readily. Sweet rich flavoured flesh tasting of the sea. Exceptionally good eating.

SHARP TOOTH SNAPPER

Pristipomoides typus

Predominant attributes

Raw	Translucent, creamy pink, with a large texture.
Cooked	Very large flake size white cream coloured flesh soft, moist/juicy, fleshy, succulent texture - very slightly dry after. Moderately to strong chicken/meaty fish flavour.
Comment	Indistinguishable from gold band snapper
Rating	3.3

Description: Pale cream, chunky fleshed fish with a moist succulent texture and a full fish flavour. Excellent eating qualities.

STRIPEY

Lutjanus carponotatus

Predominant attributes

Raw	Slightly translucent creamy/oyster/pink colour, small textured lateral lines obvious.
Cooked	Very small flake size, pale oyster coloured flesh initially soft and moist, but crumbly and dry after mild fish flavour, a little bland.
Comment	If not bled properly a metallic/acid flavour becomes obvious.
Rating	2.6 (low due to texture)

Description: Fine, pale oyster coloured flesh, soft, slightly dry, coarse texture with a mild flavour.

THREADFIN SALMON

Polynemus sheridani

Predominant attributes

Raw	Translucent creamy-pink very slightly yellow with a large texture.
Cooked	Moderate to large flake size, very white flesh (looks like ling) moist soft flaky, almost crab-like texture sweet slightly salty sea/fish flavour.
Comment	Had a bicarbonate of soda feeling on the tongue.
Rating	4

Description: Very white large flaked flesh. Moist, soft and flaky similar to crabmeat; has a sweet sea flavour.

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