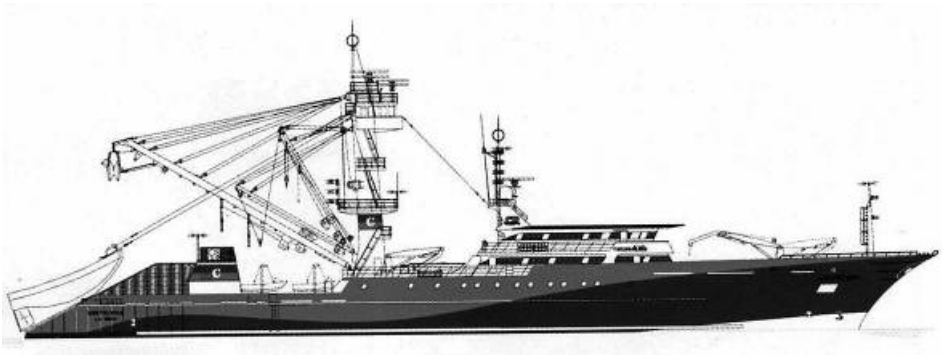
WCPFC–SC1 **FT IP–1**

1st Meeting of the Scientific Committee of the Western and Central Pacific Fisheries Commission
WCPFC–SC1
Noumea, New Caledonia
8–19 August 2005

Handbook for the identification of yellowfin and bigeye tunas in fresh, but less than ideal condition



David Itano & Siosifa Fukofuka

Pelagic Fisheries Research Programme, Honolulu, Hawaii.
Oceanic Fisheries Programme, Secretariat of the Pacific Community, Noumea, New Caledonia.

August 2005

A Handbook for the Identification of Yellowfin and Bigeye Tunas in Fresh, but *less than ideal condition*

Siosifa Fukofuka
Oceanic Fisheries Programme
Noumea
New Caledonia

David G Itano
Pelagic Fisheries Research Program
University of Hawaii, JIMAR
Honolulu, Hawaii
USA

Handbook for the Identification of Yellowfin and Bigeye Tunas in Fresh, but *less than ideal condition*

Siosifa Fukofuka
Oceanic Fisheries Programme
Noumea
New Caledonia

David G Itano
Pelagic Fisheries Research Program
University of Hawaii, JIMAR
Honolulu, Hawaii
USA

for the
1st Meeting of the Scientific Committee
of the
Western and Central Pacific Fisheries Commission
Noumea, New Caledonia, 8-19 August 2005
Fishing Technology Specialist Working Group

FT IP-1

August 2005

The MS Powerpoint version of this ID guide can be made available to fisheries observer programs and agencies for training purposes by contacting the authors directly.

Note: all fish lengths are measured fork length to the nearest centimeter.

Identification of Yellowfin and Bigeye Tuna by Visual Criteria

Identifying fresh tuna is a relatively easy matter compared to distinguishing frozen or iced fish. Even at small sizes, each species has distinct coloration, fin lengths and shape, body markings and morphologies that provide rapid visual keys to positive identification.

Frozen tuna are far more difficult to distinguish due to fin damage, discoloration, skin abrasion and distortion or crushing during the storage process.

Nevertheless, these fish are still easily distinguishable to the trained eye as bigeye (left) and a yellowfin tuna (right).

Identification of Yellowfin and Bigeye Tuna by Visual Criteria

Even though tuna are easiest to distinguish in fresh condition, misidentifications and grouping of both species commonly occurs in surface fisheries. The pictures in this handbook should serve as a "best case" scenario for identifying yellowfin from bigeye tuna at all sizes. The Handbook also compare the ideal VS less than ideal condition for each species

Juvenile yellowfin and bigeye tuna in fresh condition can be reliably identified using a combination of the following features:

➢ Internal characteristics

- liver appearance and morphology
- swim bladder morphology

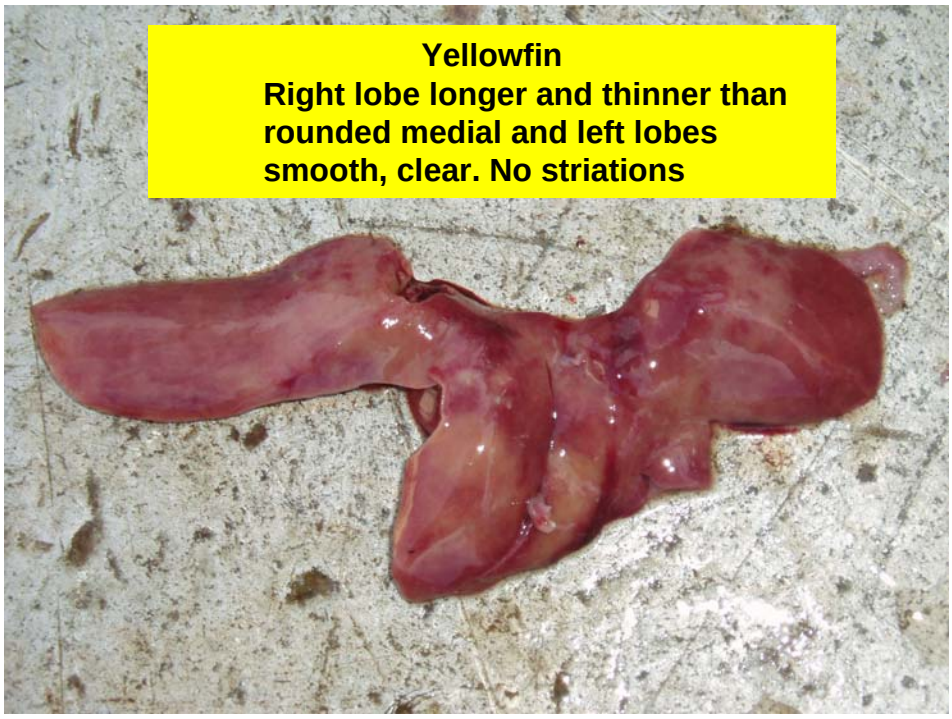
➢ External characteristics

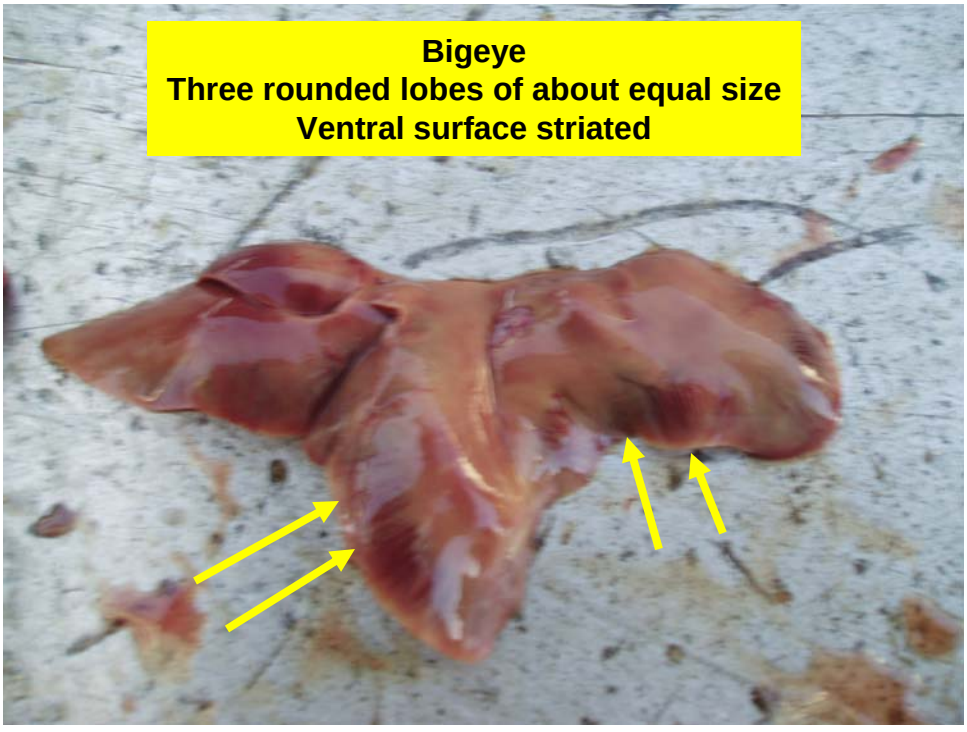
- body markings
- body morphology
- head and eye morphology
- pectoral fin characteristics
- caudal fin characteristics 4
- finlet coloration

Internal Characteristics

Liver morphology and appearance

- **Large, conspicuous organ along anterior, ventral portion of gut cavity**

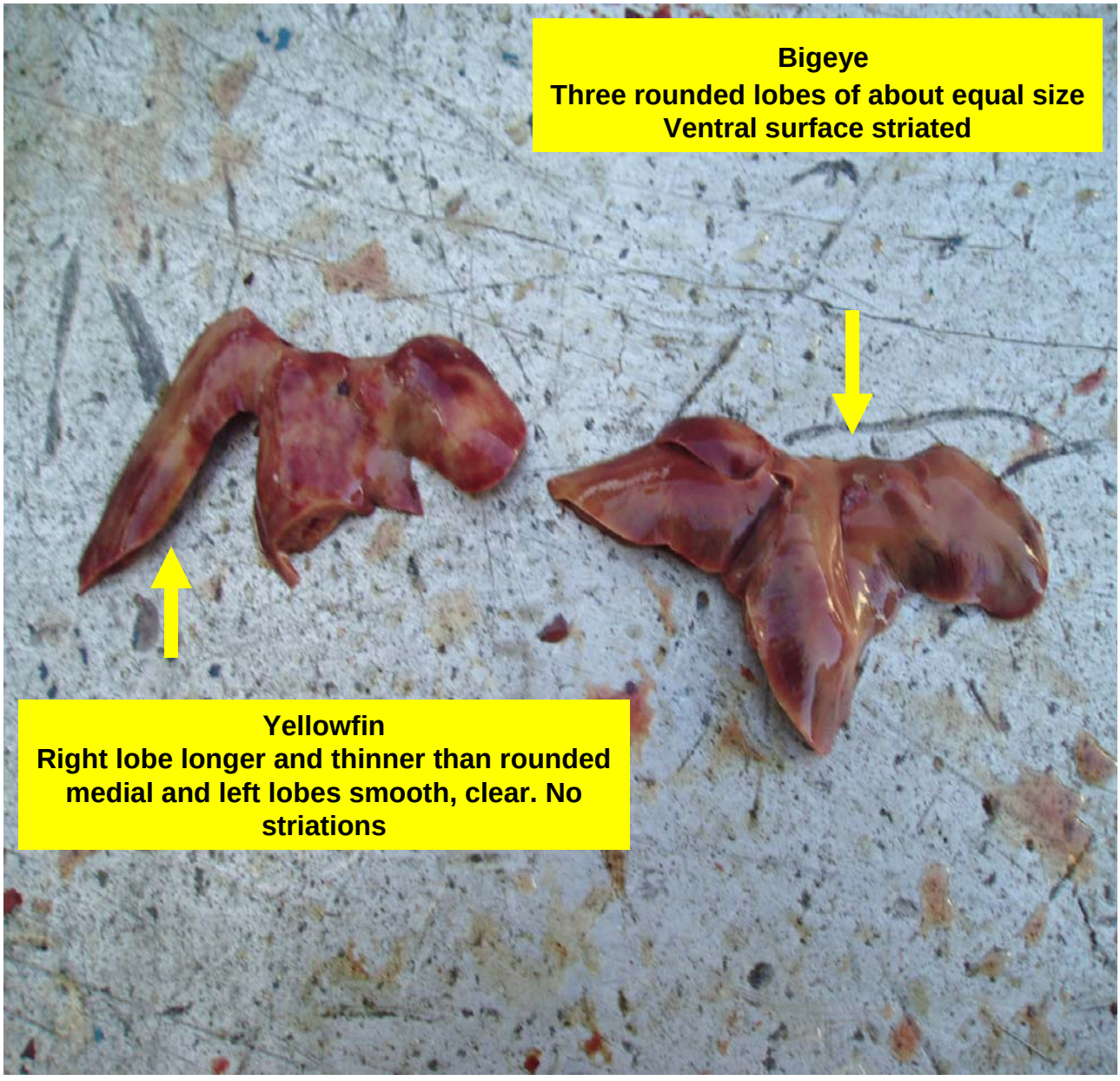




Internal Characteristics

Liver morphology and appearance

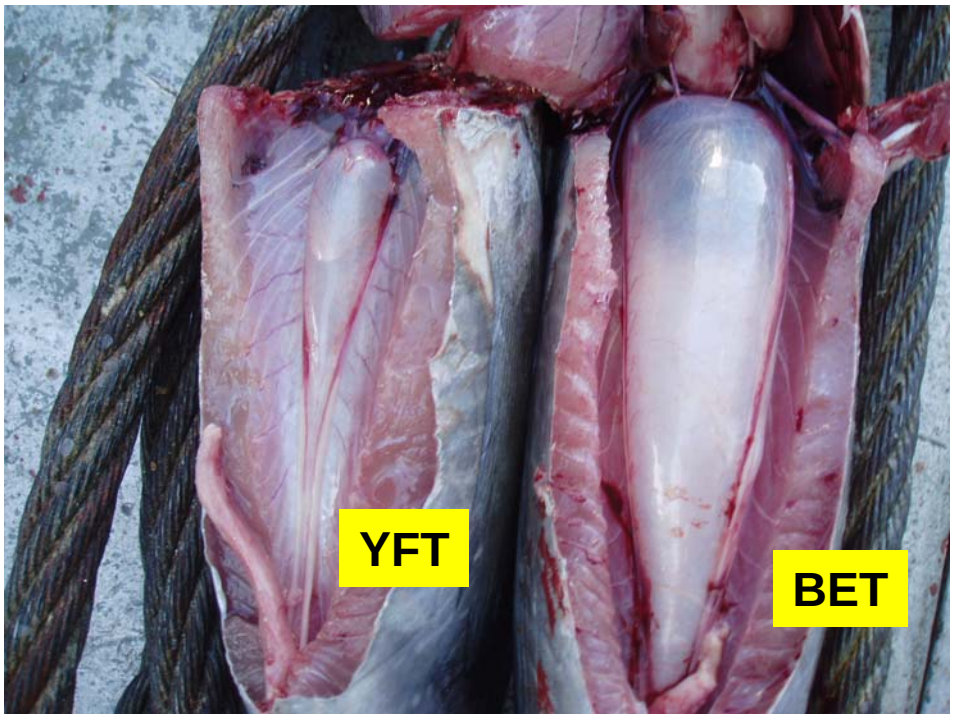
- **Large, conspicuous organ along anterior, ventral portion of gut cavity (yellowfin and bigeye tuna 43 cm)**



Internal Characteristics

Swim bladder - *ideal*

- **Yellowfin (46 cm)**
  - only in anterior half of body cavity
  - inconspicuous, usually deflated or slightly inflated



- **Bigeye (46 cm)**
  - occupies almost entire body cavity
  - large, conspicuous, often inflated

Internal Characteristics

Swim bladder

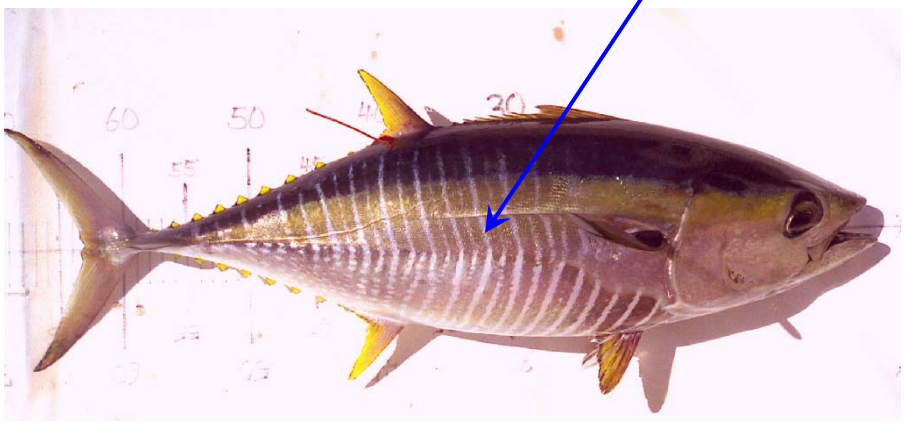
- Yellowfin (43 cm)
- Inflated swim bladder

- Bigeye (43 cm)
- Deflated swim bladder

External Characteristics

Body markings - *ideal*

- **Yellowfin**
  - Vertical lines pattern of closely spaced
  - Dotted lines alternate with rows of dots
  - Line pattern extends from tail, forward to beneath pectoral fin and to above mid-lateral line



- **Bigeye**
  - Irregular vertical, widely spaced white lines or marks
  - Some rows of dots but few and irregular
  - Line pattern irregular, broken, confined mostly to below mid-lateral line

External Characteristics

Body markings – faded

- **Yellowfin (~40 cm)**
  - Lines slightly curved, are evenly spaced and separated by rows of spots
  - Line pattern extends from tail, forward to beneath pectoral fin and to above mid-lateral line

External Characteristics

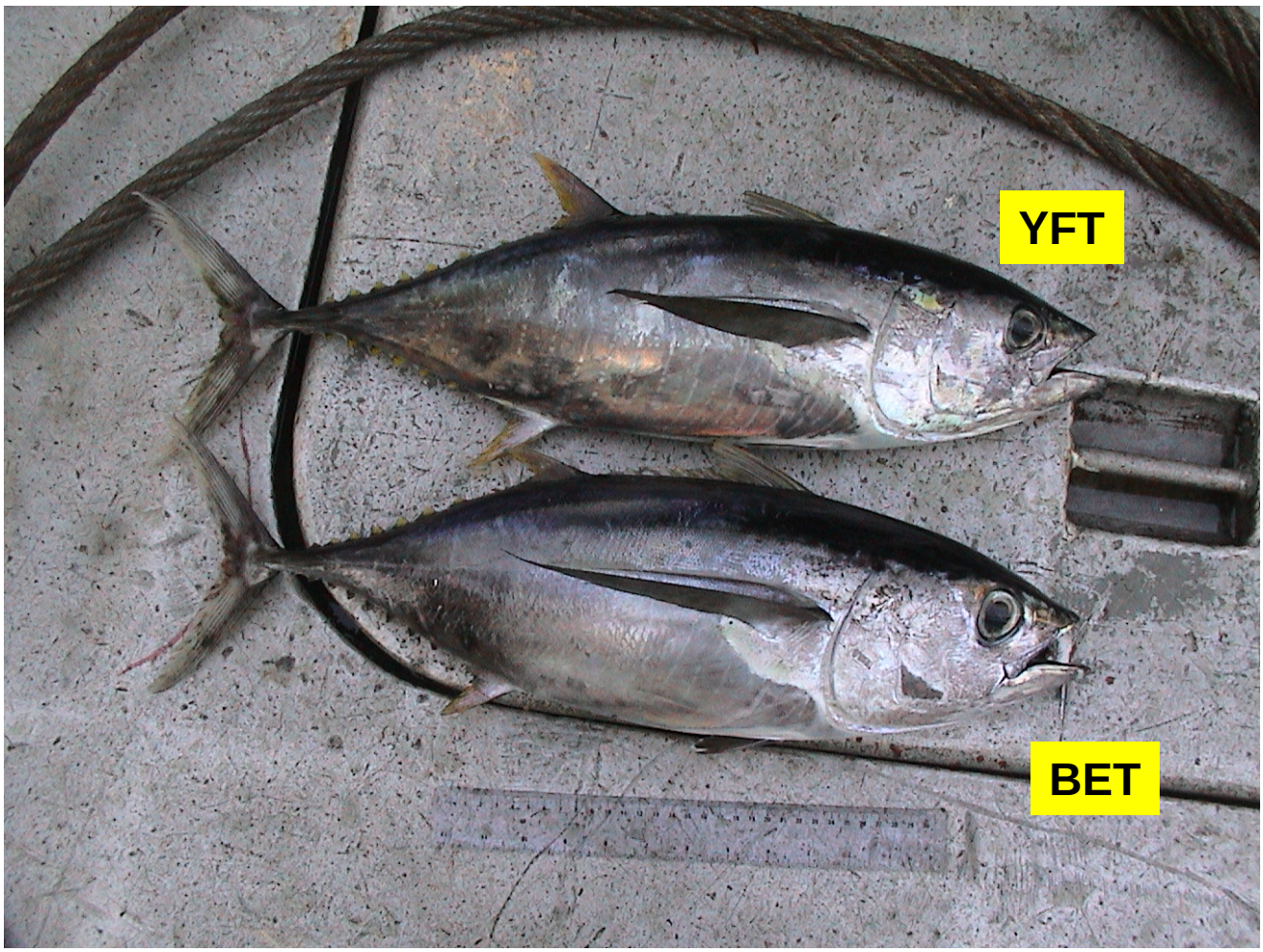
Body markings – faded and disappearing

- **Yellowfin 45 cm and bigeye 45 cm**
  - Lines slightly curved, are evenly spaced and separated by rows of spots extending to below pectoral fin, still obvious and easy to recognize
  - Irregular vertical pale lines on bigeye have faded, but can still be recognized

External Characteristics

Body markings – faded almost completely

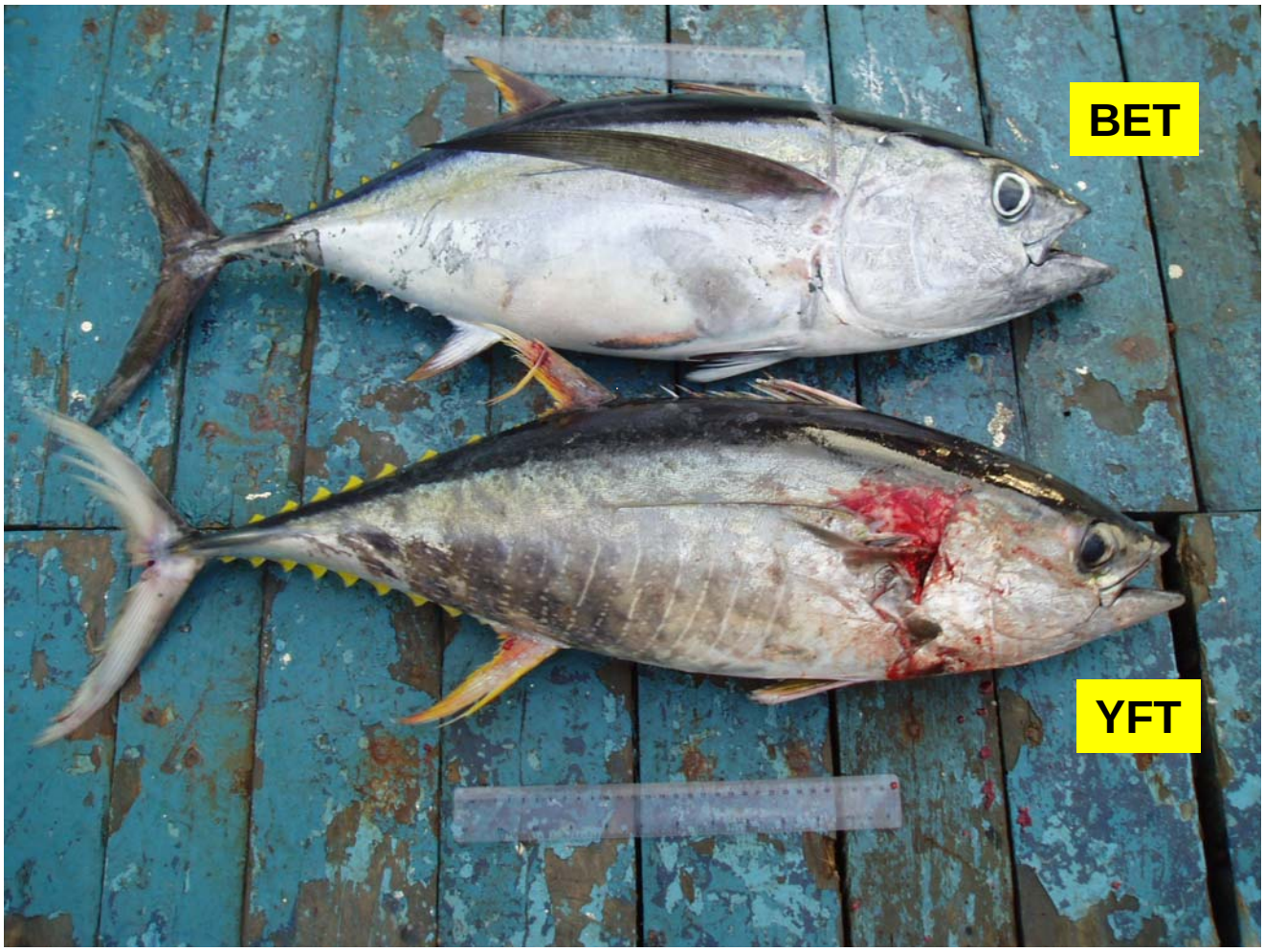
- **Yellowfin 56 cm and bigeye 53 cm**
  - Dotted, vertical lines and markings on yellowfin are still recognizable, mainly below the lateral line and pectoral fin
  - Irregular vertical lines on bigeye have faded and practically gone



External Characteristics

Body markings – faded and disappeared

- **Yellowfin and Bigeye (70 cm)**
  - Irregular vertical lines and body markings on the bigeye have disappeared completely
  - Body markings on yellowfin are still visible, but mainly below the lateral line



External Characteristics

Body markings – faded and disappeared

- **Yellowfin and Bigeye (70 cm)**
  - Body markings on the yellowfin have **disappeared completely**
  - Irregular vertical lines on the bigeye body have also **disappeared completely**

External Characteristics

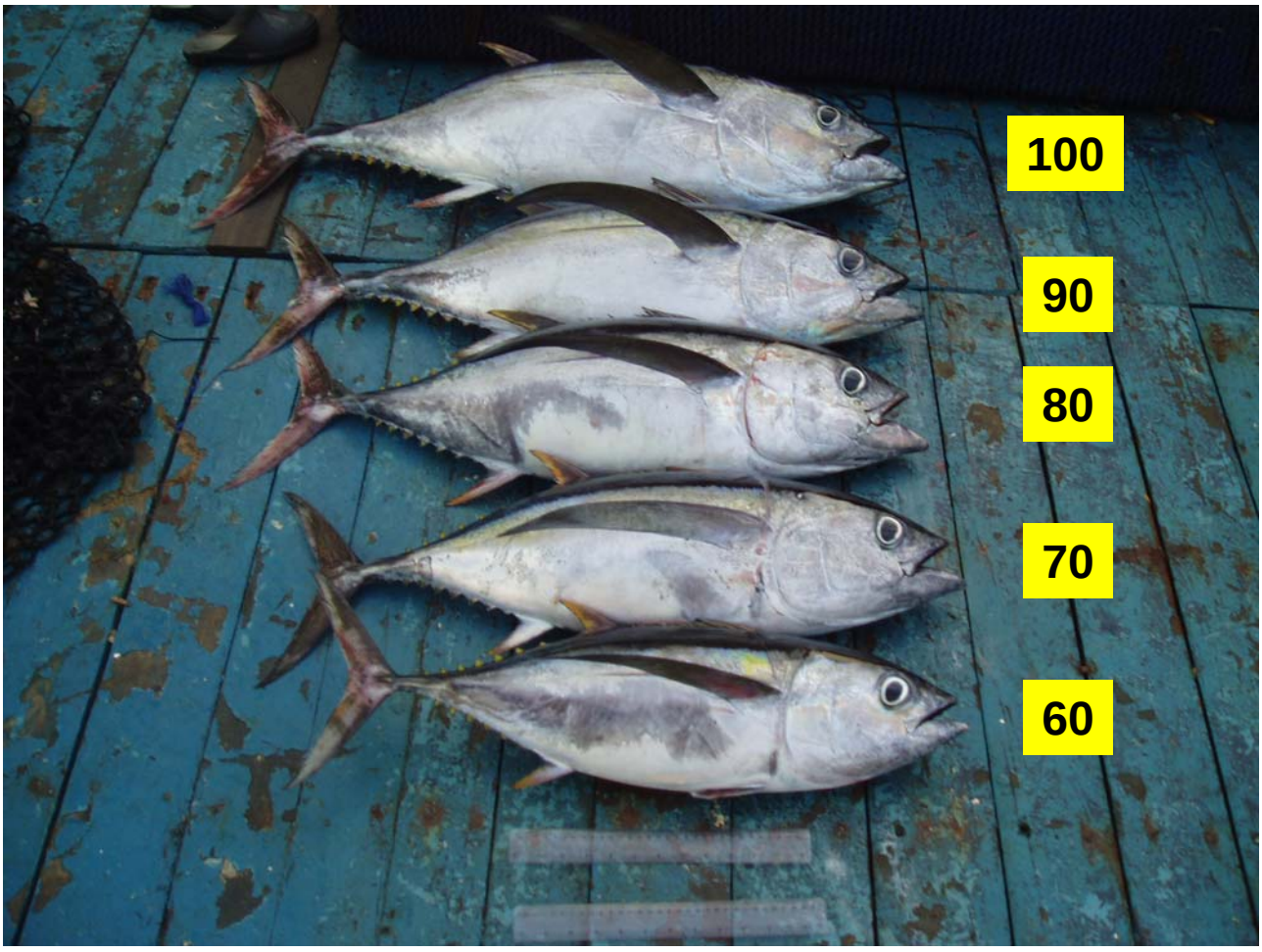
Body markings – faded and disappeared

- **Yellowfin and Bigeye (90 cm)**
  - Both markings on yellowfin and bigeye have completely disappeared

External Characteristics

Body markings – faded and disappeared

- **Bigeye (60 - 100 cm)**
  - No body markings on bigeye tuna are visible
  - Silver white colour remains typical of dead, fresh fish



External Characteristics

Coloration - *ideal*

- **Yellowfin**
  - Fresh yellowfin show a bright yellow mid-lateral band
  - Dark black back may be separated from the gold by a thin blue band
  - Fins yellow to yellowish, anal fin sometimes tinged with silver
  - Flanks and belly silvery white

- **Bigeye**
  - Golden to brassy mid-lateral band, less distinct
  - Dark black back edged with bright metallic blue line
  - Fins dusky yellowish with anal fin tinged with silver
  - Caudal fin often dusky black
  - Flanks and belly pearly white

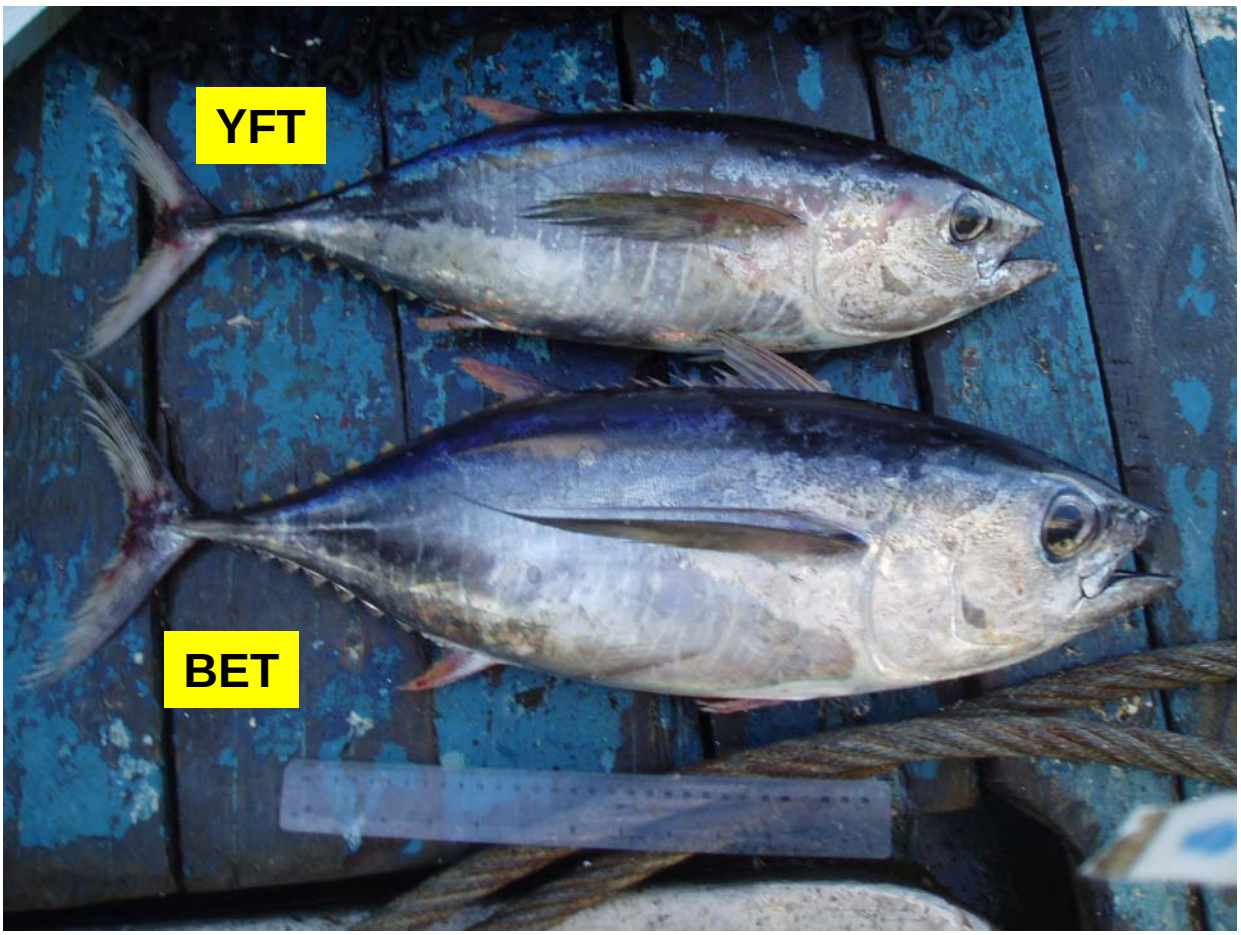
External Characteristics

Coloration:

However, colors fade very quickly after death making both species appear similar in color.

<u>Therefore body colors are not a reliable key to species identification.</u>

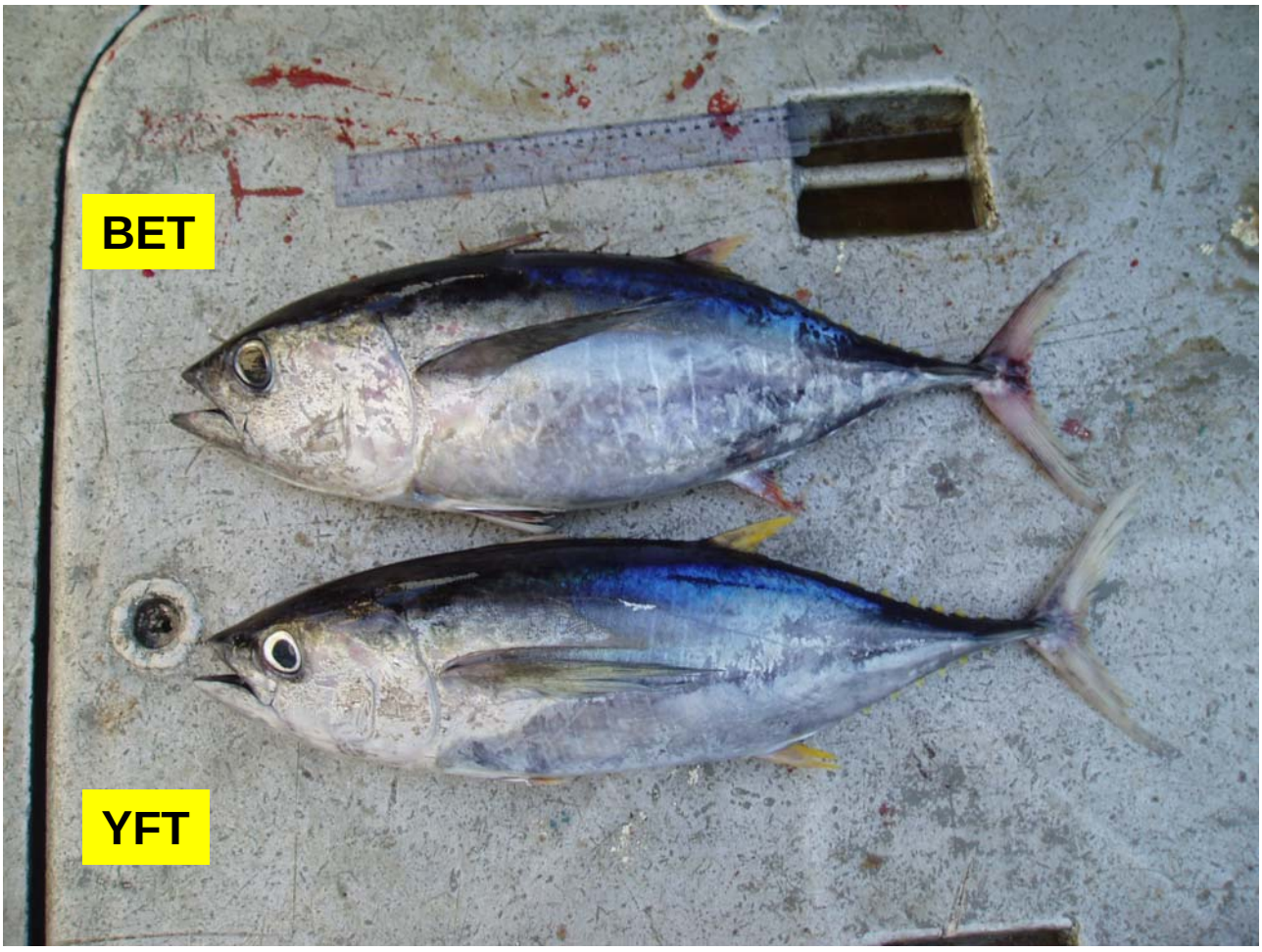
- **Example 1 (YFT/BET 45 cm)**
  - The yellow mid lateral band on the yellowfin is gone
  - Blueish/black colour above the pectoral fin area on both species



External Characteristics

Coloration:

- **Example 2 (YFT 59 cm BET 57 cm)**
  - The yellow band on the yellowfin mid lateral has **disappeared**
  - Blueish black colour above the pectoral fin visible on both species
  - Second dorsal of yellowfin still bright yellow in colour while bigeye fin half yellow with black band near base and front



External Characteristics

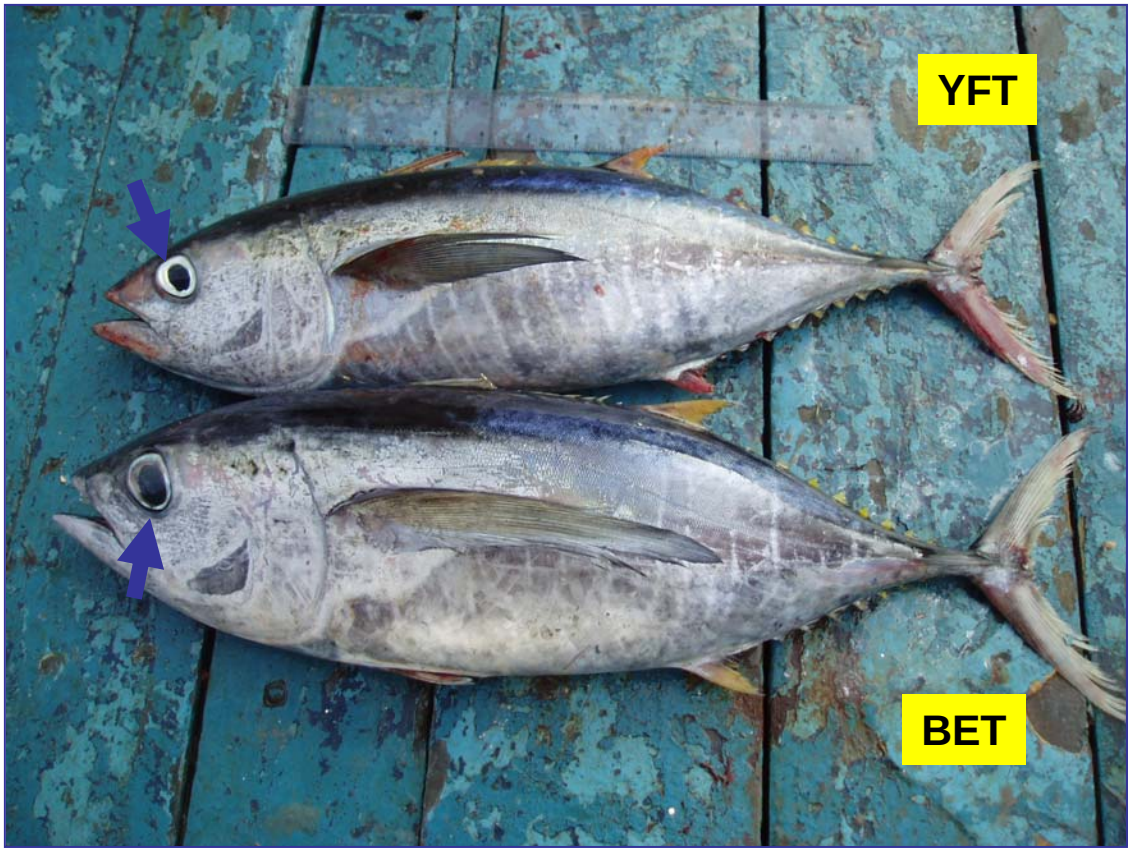
Coloration:

- **Example 3 (YFT 51/BET 56)**
  - The yellow band on both species has **disappeared completely**
  - Blueish colour above the pectoral fin on both species faded to black

External Characteristics

Body and eye morphology

- **Yellowfin (45 cm)**
  - body elongate, long tail section
  - body outline flat between second dorsal and caudal fin and between anal and caudal fin
  - smaller eye diameter compared to bigeye of same Fork Length

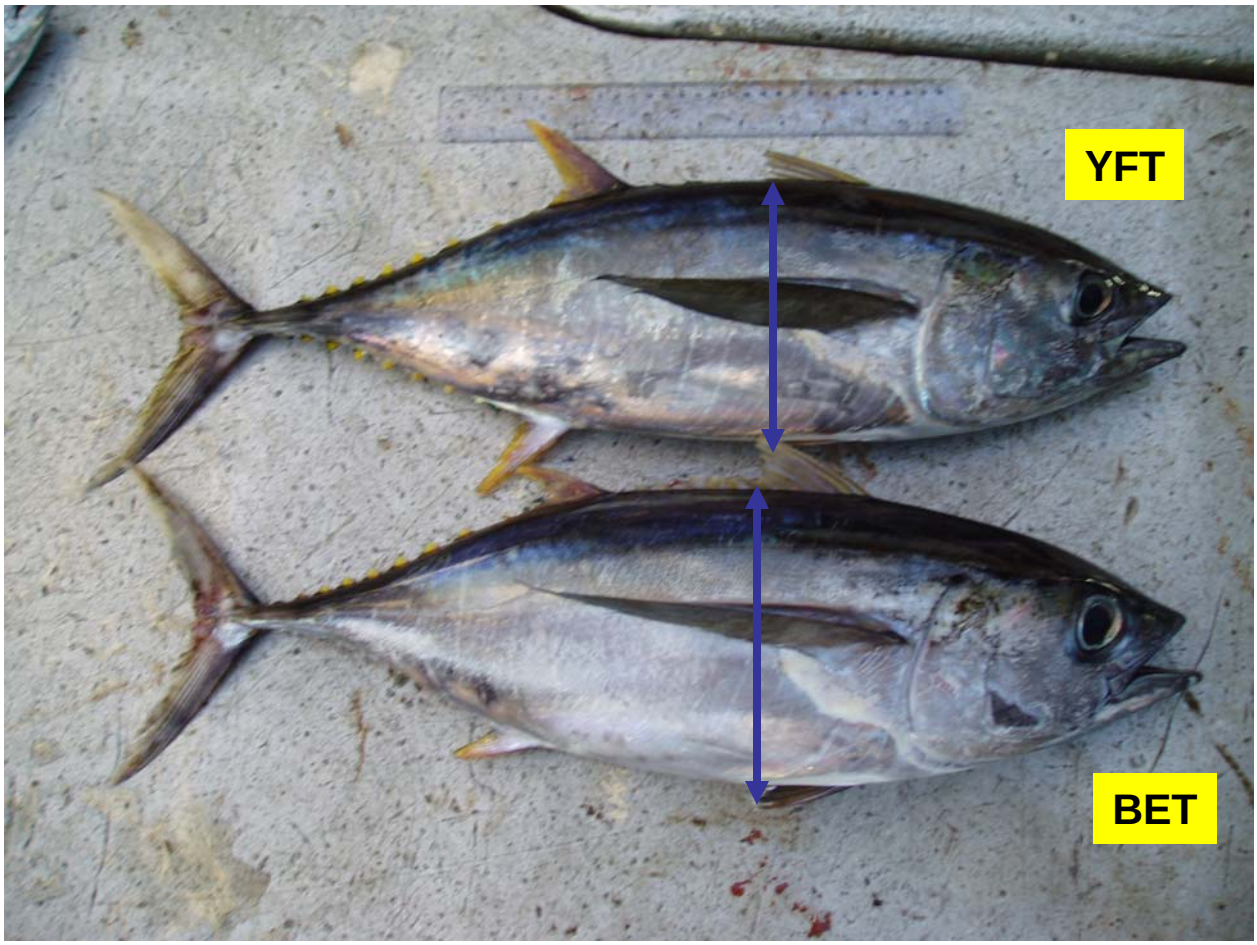


- **Bigeye (45 cm)**
  - body deep, rounded
  - body outline rounded, forming a smooth dorsal and ventral arc between snout and caudal peduncle
  - greater eye diameter compared to yellowfin of same Fork Length

External Characteristics

Body and eye morphology

- **Yellowfin (56 cm)**
  - shorter head length and depth vs Fork Length than bigeye
  - smaller eye diameter compared to bigeye of same Fork Length



- **Bigeye (53 cm)**
  - greater head length and depth vs Fork Length than yellowfin
  - greater eye diameter compared to yellowfin of same Fork Length
  - body deep, rounded

External Characteristics

Head and eye morphology

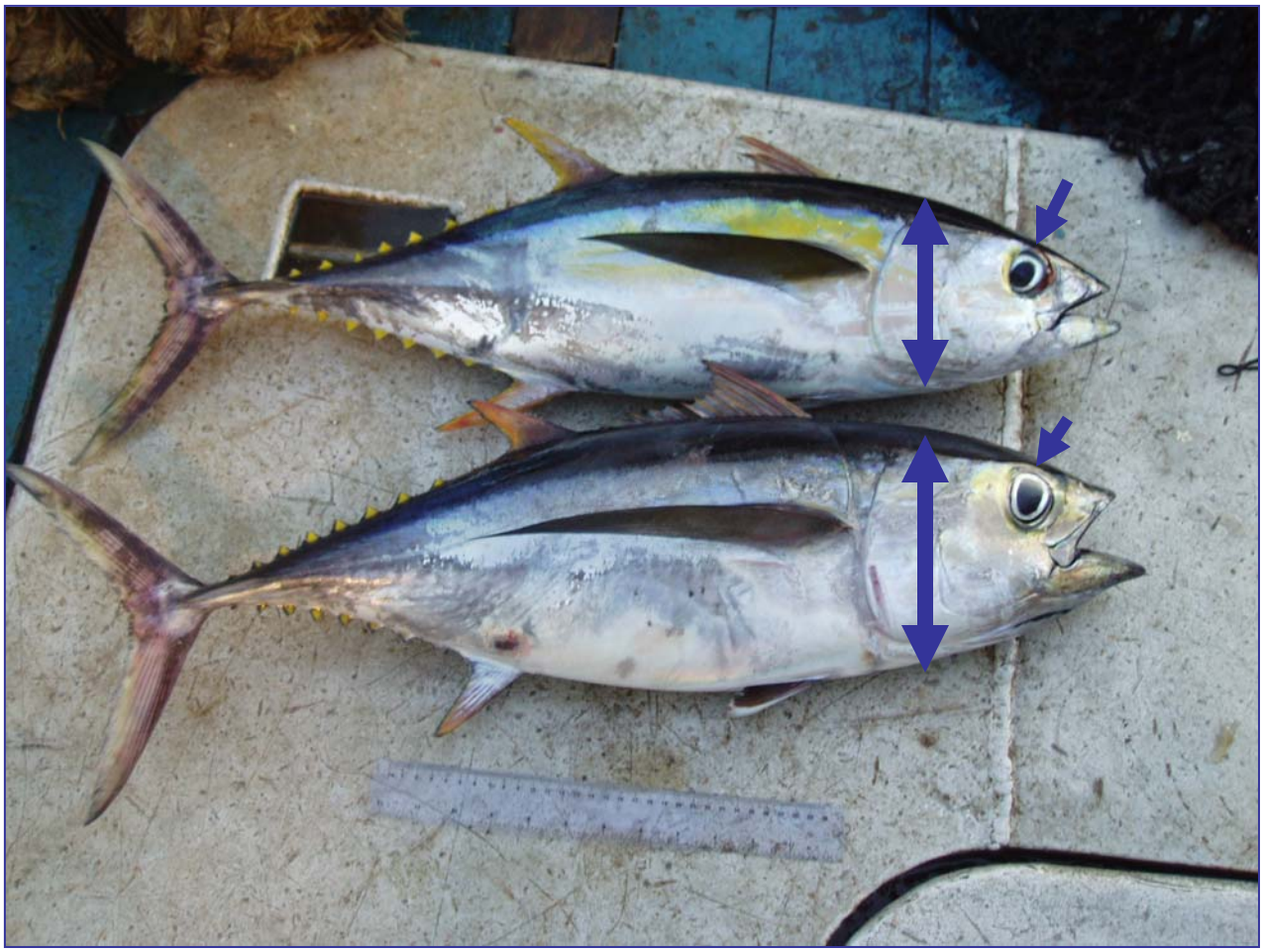
- **Yellowfin (68 cm)**
  - shorter head length and depth vs Fork Length than bigeye
  - smaller eye diameter compared to bigeye of same Fork Length

- **Bigeye (65 cm)**
  - greater head length and depth vs Fork Length than yellowfin
  - greater eye diameter compared to yellowfin of same Fork Length

External Characteristics

Head and eye morphology

- **Yellowfin (70 cm)**
  - shorter head length and depth vs Fork Length than bigeye
  - smaller eye diameter compared to bigeye of same Fork Length



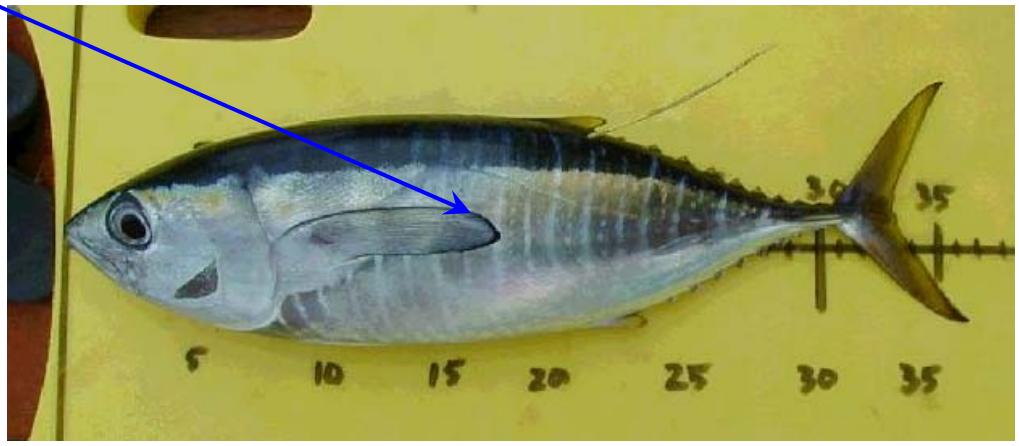
- **Bigeye (70 cm)**
  - greater head length and depth vs Fork Length than yellowfin
  - greater eye diameter compared to yellowfin of same Fork Length

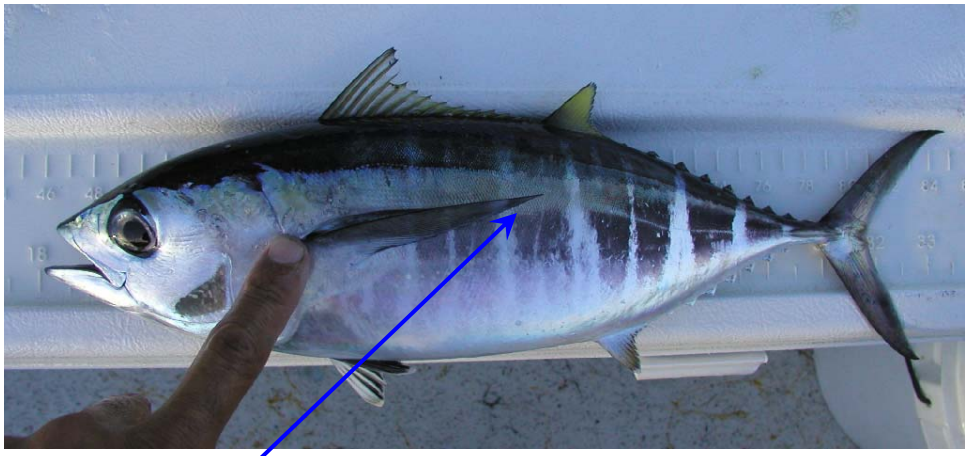
External Characteristics

Pectoral fin length and characteristics

(for small fish less than ~ 40 cm Fork Length)

- **Yellowfin - *ideal***
  - pectoral fin short, just reaching insertion of second dorsal fin
  - pectoral fin thicker, stiffer and rounded at tip





- **Bigeye**
  - pectoral fin slightly longer reaching second dorsal fin
  - pectoral fin thin, flexible and pointed at the tip

However, pectoral fin lengths are not that different in very small fish. Other features are more distinct such as body markings and morphology

External Characteristics

Pectoral fin length and characteristics

- **Yellowfin (45 cm)**
  - pectoral fin short, extending to base of second dorsal fin
  - pectoral fin thicker, stiff, blade-like
  - Pectoral fin tend to split at the tip of the fin

- **Bigeye (45 cm)**
  - pectoral fin long, extending beyond the second dorsal fin base
  - pectoral tapers to thin point, flexible, “feather-like”

For large bigeye and yellowfin above 150 cm, the pectoral fins become similar in size and shape.

External Characteristics

Pectoral fin length and characteristics

- **Yellowfin (70 cm)**
  - pectoral fin short, extending to base of second dorsal fin
  - pectoral fin thicker, stiff, blade-like

- **Bigeye (70 cm)**
  - pectoral fin long, extending beyond the second dorsal fin base
  - pectoral tapers to thin point, flexible, often curves ventrally at side

External Characteristics

Pectoral fin length and characteristics

- **Yellowfin (90 cm)**
  - pectoral fin short, extending to base of second dorsal fin
  - pectoral fin thicker, stiff, blade-like

- **Bigeye (90 cm)**
  - pectoral fin long, extending beyond the second dorsal fin base
  - pectoral tapers to thin point, flexible, often curves ventrally at side

External Characteristics

Pectoral fin length and characteristics

- **Bigeye (60 – 100 cm)**
  - pectoral tapers to thin point, flexible, often curves ventrally at side

External Characteristics

Pectoral fin length and characteristics

Example: smashed fish

- **Bigeye (77 cm)**
  - pectoral fin long, extending beyond the second dorsal fin base, curved ventrally
  - Pectoral fin can be used to identify bigeye although body is damaged

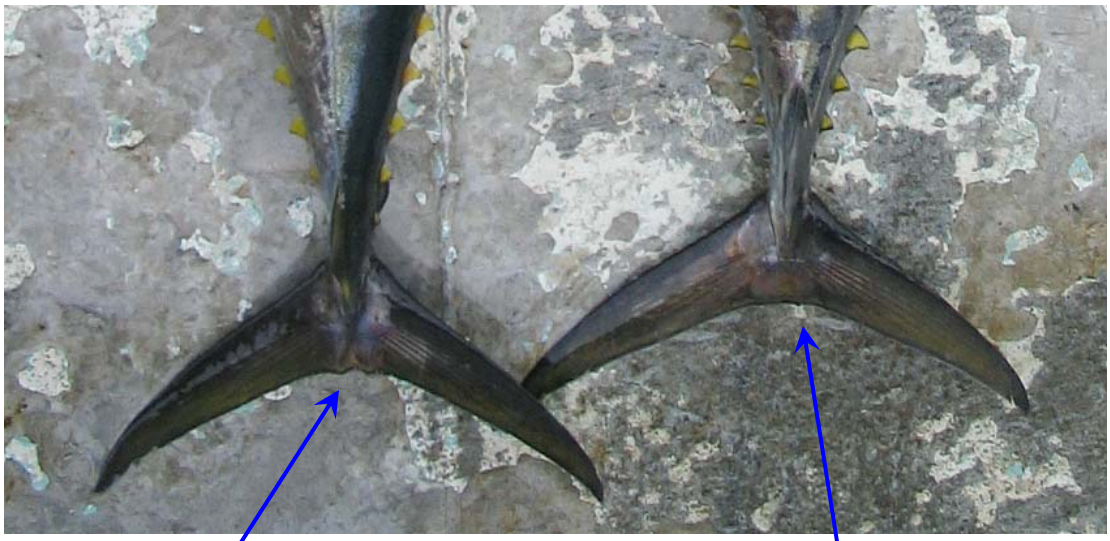
External Characteristics

Pectoral fin length and characteristics

- **Yellowfin and Bigeye (70 cm)**
  - Pectoral fin of yellowfin is broken but other fins and body markings can be used to identify the yellowfin
  - Second dorsal and anal fins beginning to elongate, yellow color
  - Bigeye pectoral fin goes past the second dorsal fin

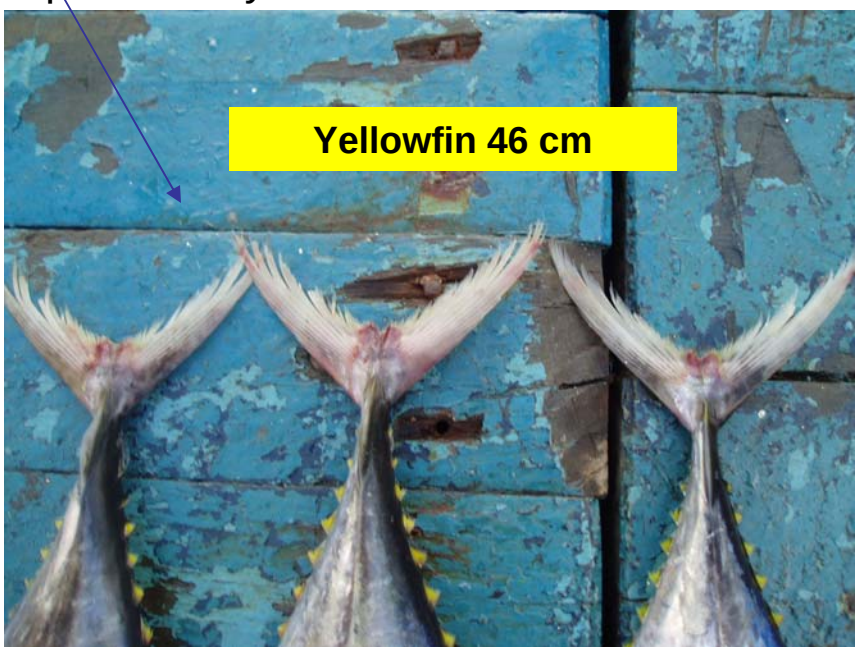
External Characteristics

Caudal fin



- **Yellowfin**
  - Central portion of trailing edge forms a distinct notch
  - Central area of caudal fin with two raised mounds
  - Caudal fins shown below have lost all colour and have become split and frayed

- **Bigeye**
  - Central portion of trailing edge forms a flat or slightly crescent shaped area
  - Central area of caudal fin flat

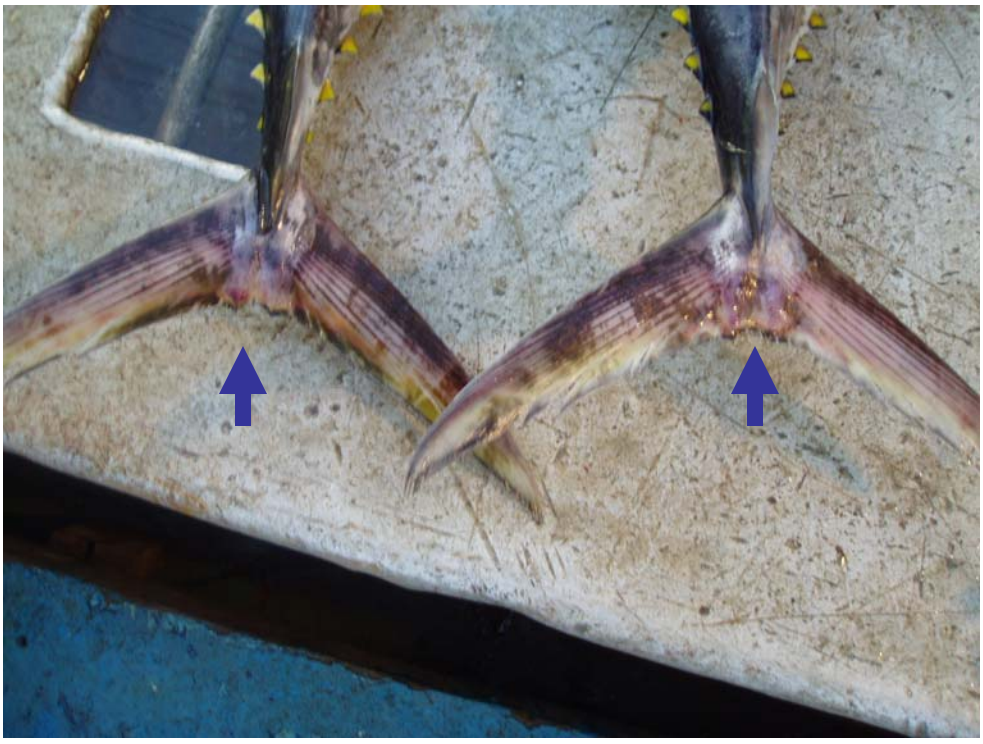


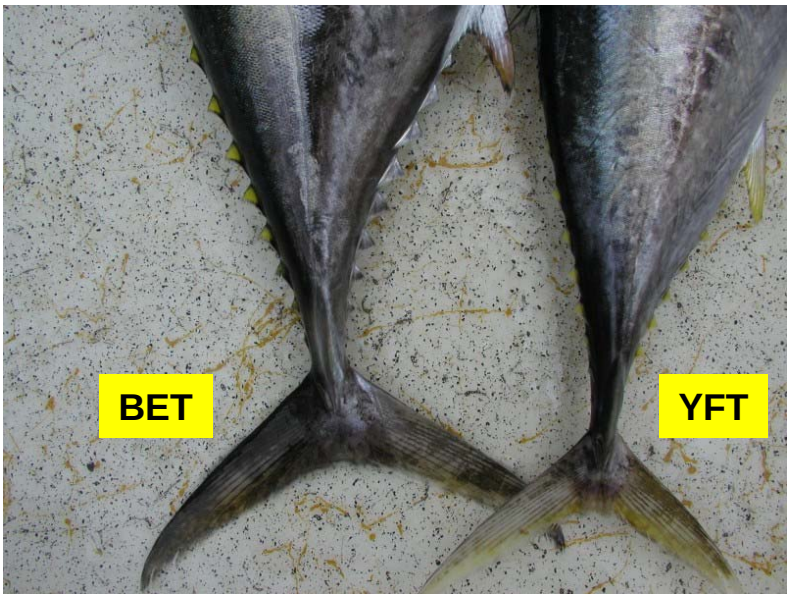
External Characteristics

Caudal fin – center of trailing edge

Yellowfin (70 cm) — **Forms “V shaped notch**

Bigeye (70 cm) — **Forms flat or slightly rounded cup**



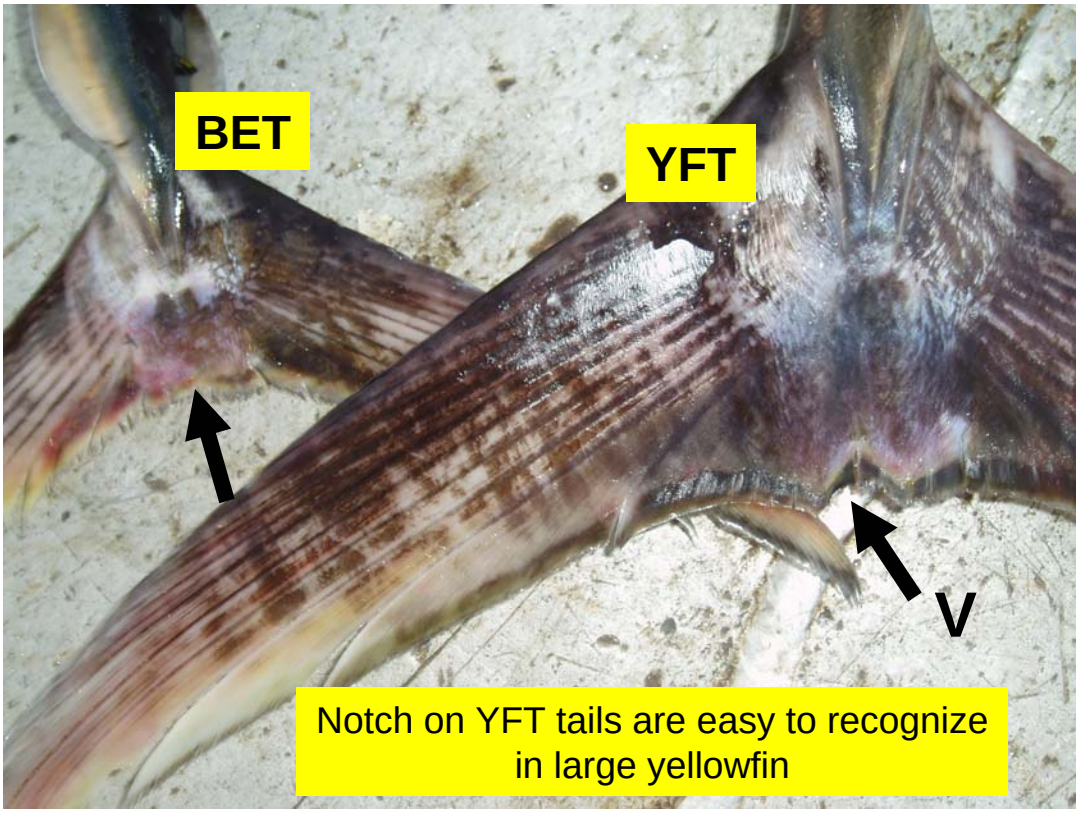


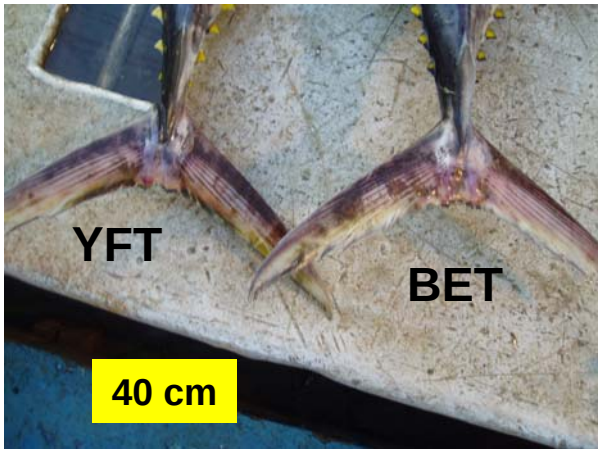
External Characteristics

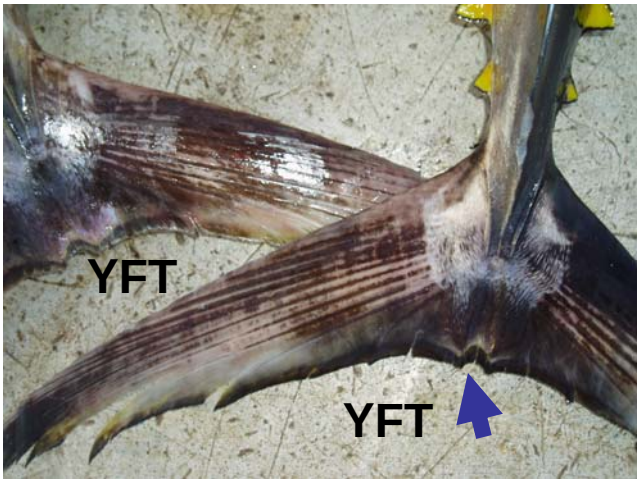
Caudal fin – center of trailing edge

Bigeye — **Forms flat or slightly rounded cup**

Yellowfin — **Forms “V or M” shaped notch**







External Characteristics

Finlet coloration - *ideal*

- **Yellowfin**
  - bright yellow with no black edging

- **Bigeye**
  - yellowish color edged with black

External Characteristics

Finlet coloration

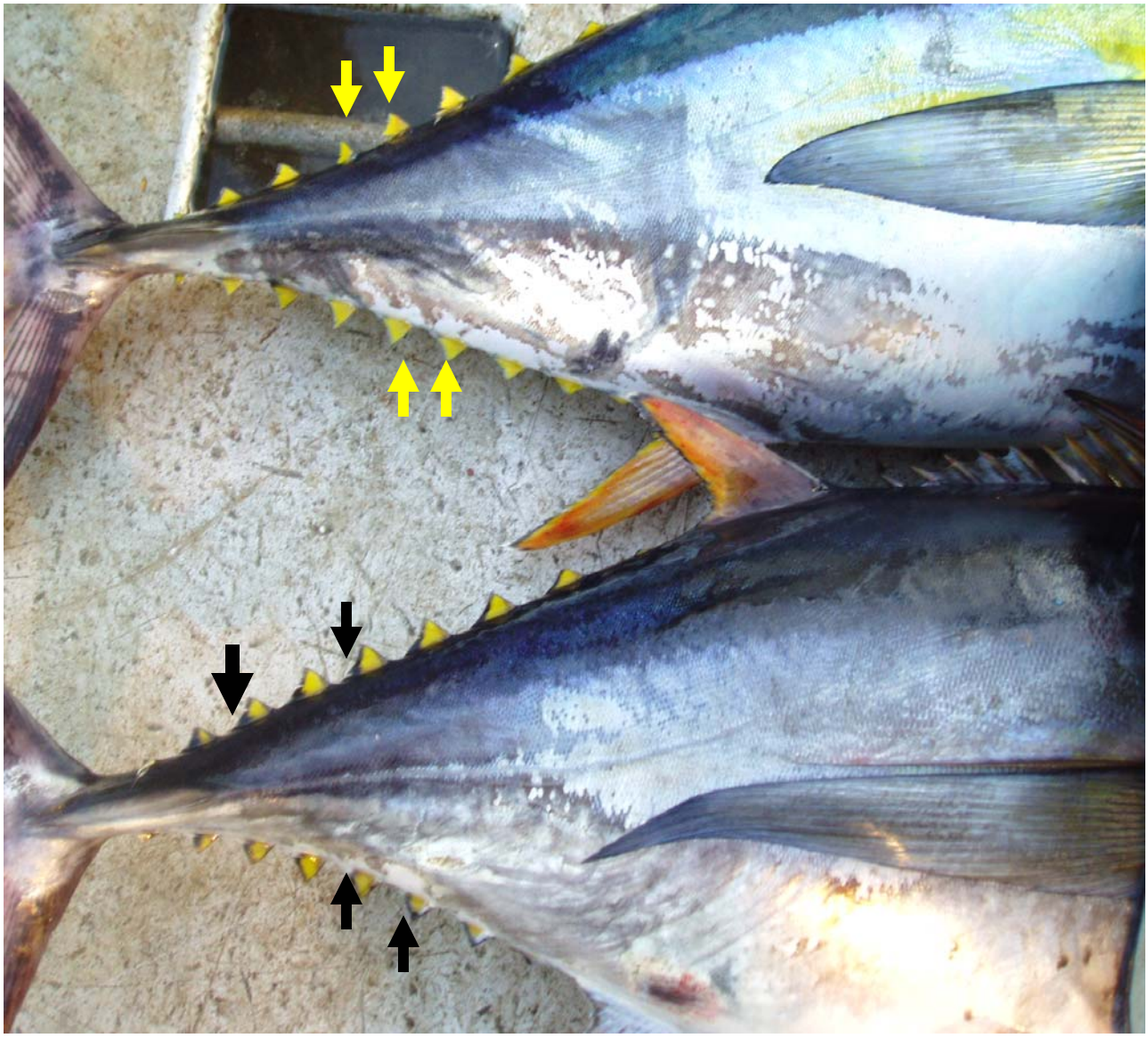
- **Yellowfin**
  - bright yellow with no black edging

- **Bigeye**
  - yellowish colour edged with fine black line

External Characteristics

Finlet coloration

- **Yellowfin**
  - bright yellow with no black edging



- **Bigeye**
  - yellowish color edged with fine black line

External Characteristics

Comparisons by size and features - *ideal*

- **Yellowfin (~ 33 cm)**
  - Short, blunt pectoral fin
  - Closely spaced markings of lines and rows of dots in chevron pattern extending to insertion of pectoral fin
  - Shorter, smaller head, small, round eye
  - Yellowish tail

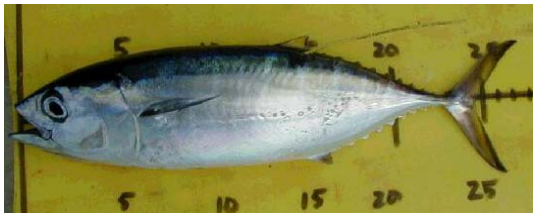
- **Bigeye (~ 34 cm)**
  - Longer, pointed pectoral fin
  - Irregular, white lines across body with dusky markings
  - Large head, deep body, large eye
  - Dusky colored tail

External Characteristics

Examples of small yellowfin and bigeye

Yellowfin 17 cm

Bigeye 32.5 cm



Yellowfin 25 cm

Bigeye 34 cm

Yellowfin 32 cm

Bigeye 36 cm

Yellowfin 37 cm

Yellowfin 41 cm

Bigeye 44 cm

Examples of extremely small yellowfin tuna

These yellowfin tuna are of a size that you are unlikely to see in capture fisheries but are commonly found inside the stomachs of other tuna and predatory fish. They were collected on an anchored FAD in Hawaiian waters on 15 August 1997 and measured 12.6, 14.3, 14.5 and 15.9 cm FL. Despite their tiny size, the pattern of lines separated by a row of spots is apparent even in fish of this size.

External Characteristics

Comparisons by size and features

- **Yellowfin (~ 45 cm)**
  - Long, narrow body, small head, small eye
  - Closely spaced, chevron pattern of alternating lines and rows of spots, faded but visible

- **Bigeye (~ 45 cm)**
  - Large, deep head, large eye, deeply rounded body
  - Long pectoral fin with thin, pointed tip
  - Vertical, widely spaced irregular white lines still visible

External Characteristics

Comparisons by size and features

- **Bigeye (~ 51cm)**
  - Large, deep head, large eye, deeply rounded body
  - Long pectoral fin past the second dorsal attachment with thin, pointed tip
  - Body markings no longer visible

- **Yellowfin (~ 56 cm)**
  - Long, narrow body, small head, small eye
  - Closely spaced, chevron pattern of alternating lines and rows of spots **almost gone**

External Characteristics

Comparisons by size and features

➢ Bigeye (~ 65 cm)

- Large, deep head, large eye, deeply rounded body
- Long pectoral fin with thin, pointed tip
- Vertical, widely spaced irregular white lines **disappeared**
- Damage to the skin around the lower pectoral fin attachment

➢ Yellowfin (~ 68 cm)

- Long, narrow body, small head, small eye
- Closely spaced, chevron pattern of alternating lines and rows of spots can barely be recognized
- Skin below the dorsal finlets and around the pectoral fin base has been scraped and discolored

External Characteristics

Comparisons by size and features

- **Yellowfin (~ 70 cm)**
  - Long, narrow body, small head, small eye
  - Closely spaced, chevron pattern of alternating lines and rows of spots **disappeared**
  - Yellow and blue bands above the pectoral fin are still visible

- **Bigeye (~ 70 cm)**
  - Large, deep head, large eye, body deeply rounded body
  - Long pectoral fin with thin, pointed tip
  - Body markings have **disappeared**
  - A healed cookie cutter shark bite visible above anal fin, typical of bigeye tuna but also seen in some yellowfin

External Characteristics

Comparisons by size and features

- **Bigeye (~ 77cm)**
  - Large, deep head, large eye, deeply rounded body
  - Long pectoral fin with thin, pointed tip
  - Body markings have **disappeared**

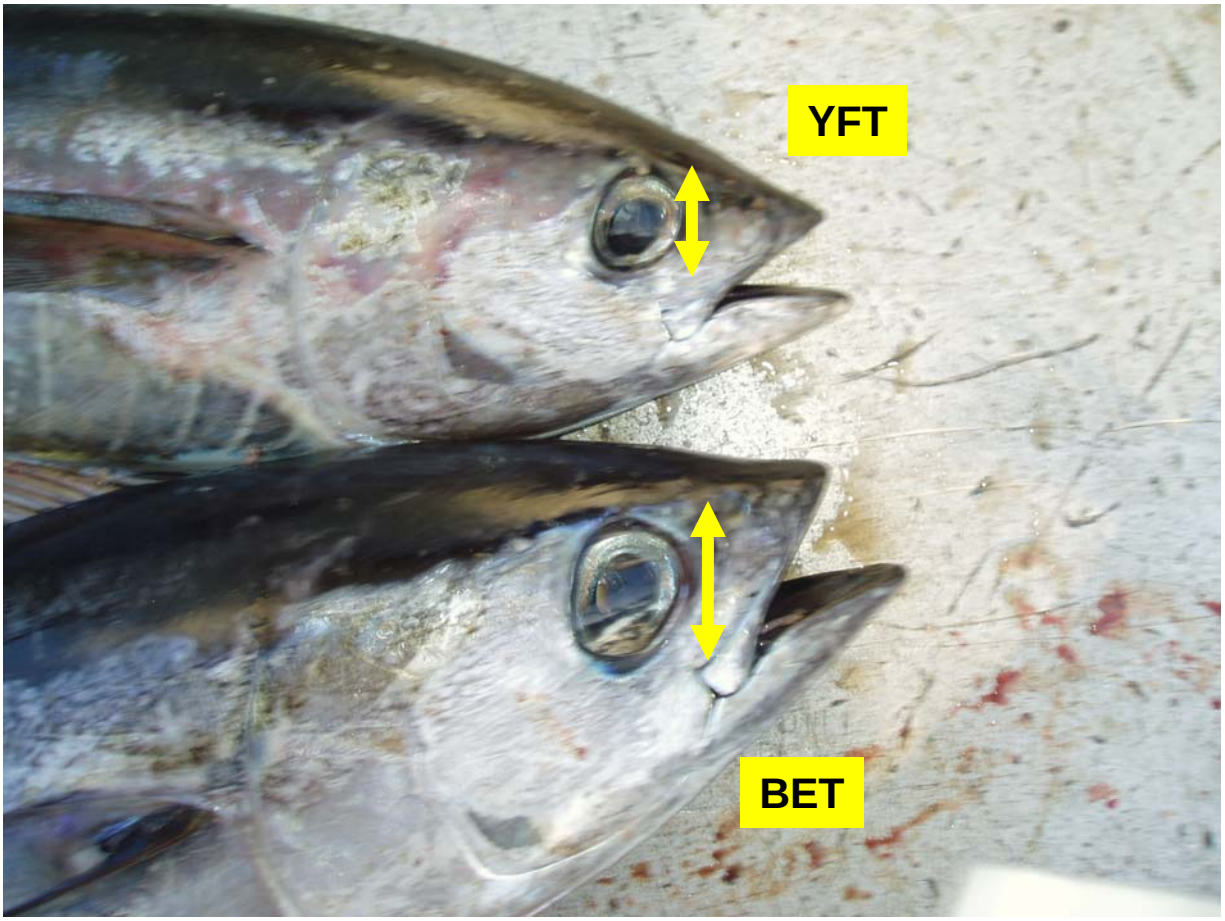
- **Yellowfin (~ 77 cm)**
  - Long, narrow body, small head, small eye
  - Closely spaced, chevron pattern of alternating lines and rows of spots mainly below the lateral, faded above the lateral
  - Second dorsal and anal fins beginning to elongate

External Characteristics

Comparisons by size and features – *eye diameter*

- **Yellowfin and Bigeye (~ 45 cm)**

  - Bigeye eye is larer than yellowfin, extending down towards corner of mouth



External Characteristics

Comparisons by size and features – *body shape*

- **Yellowfin (~ 90 cm)**
  - Long, narrow body, small head, small eye
  - Closely spaced, chevron pattern of alternating lines and rows of spots **disappeared**

- **Bigeye (~ 90cm)**
  - Large, deep head, large eye, deeply rounded body
  - Long pectoral fin with thin, pointed tip
  - Vertical, widely spaced irregular white lines **disappeared**

External Characteristics

Comparisons by size and features - *combined*

- **Bigeye (99 cm)**
  - Deep, rounded body outline, large, deep head, large eye
  - Long pectoral fin, thin, pointed, wavy tip
  - Trailing edge of caudal fin flat

- **Yellowfin (104 cm)**
  - Long, narrow body, straight behind 2nd dorsal, small head and eye
  - Evenly spaced lines and rows of uniform dots
  - Noticeable “V” notch in caudal fin with two raised areas
  - 2nd dorsal and anal fins beginning to elongate

- **Note:**
  - the bigeye has lost all body markings and yellow coloration

External Characteristics

Mixed fish on deck

The sampler/observer must be alert to changes in size and species compositions during the brailing process, when moving tuna from the net to fish wells and during unloading, and record these changes as they occur. In order to do so, the ability to quickly determine tuna species under a variety of conditions is necessary.

Using the criteria outlined in this handbook, positive identifications should be possible using only external characteristics. If in doubt, cut the fish and check the liver.

External Characteristics

Mixed fish from ringnet vessel – *self test*

photo: A.D. Lewis

External Characteristics

Mixed fish on purse seine deck – *self test*

External Characteristics

Mixed fish from troller – *self test*

External Characteristics

Mixed fish from purse seiner – *self test (brine frozen)*

External Characteristics

Dinner fish – s*elf test*

photo: A.D. Lewis

External Characteristics

Mixed fish – *self test (all different species)*

Note:

The tuna samples illustrated in this guide are in good to excellent condition making identifications easy and straight forward. With practice, port samplers and observers should be able to make positive identifications from fish in a wide range of condition using external characteristics alone.

Remember:

Identifications should be based on a combination of features appropriate to the particular sample being examined – and not just a single feature. If doubt remains, the fish should be set aside and examined for internal characteristics.

END