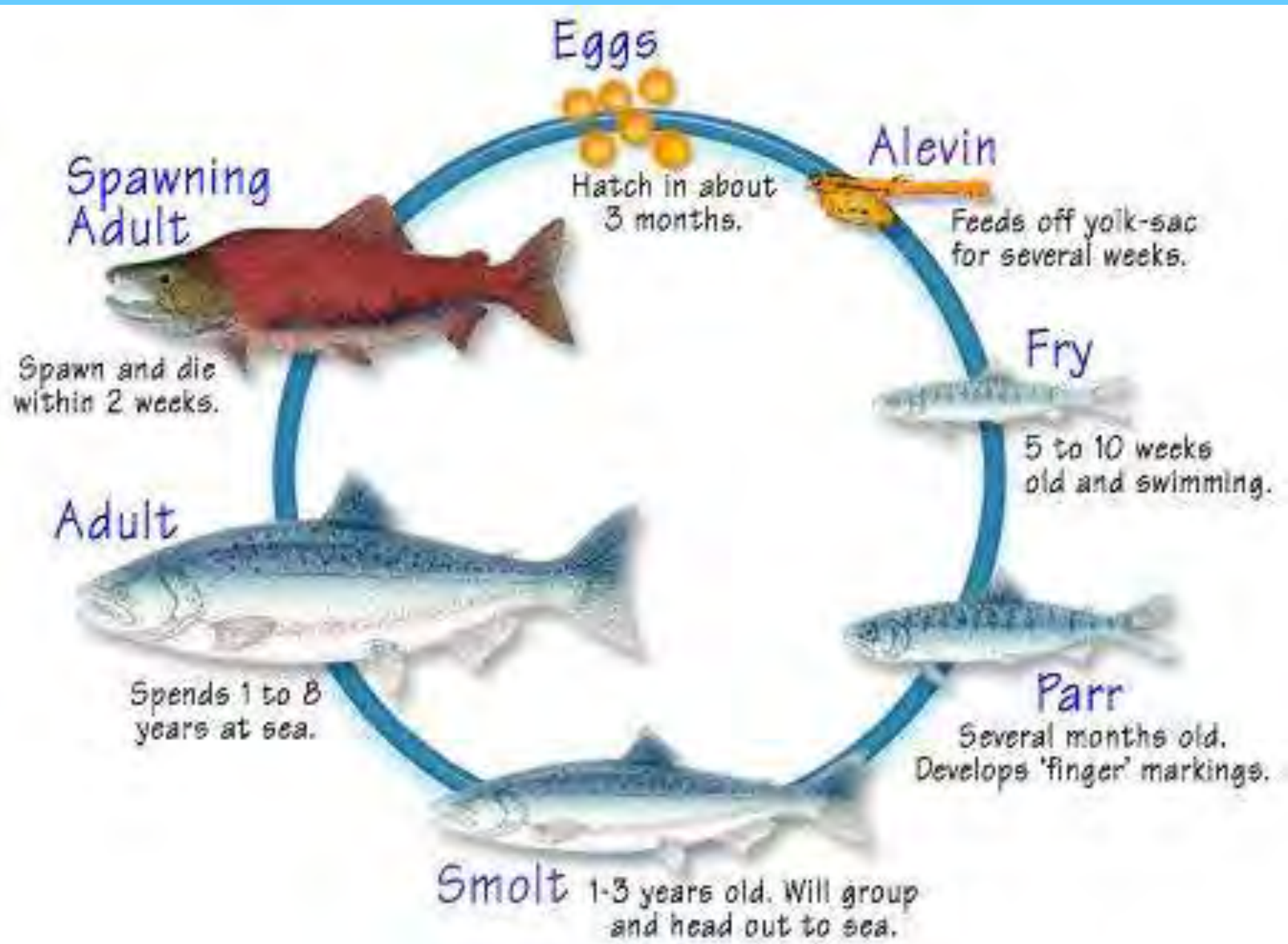


Pacific Salmon Life Cycle



General Salmon Life Cycle

Eggs are laid in redds



General Salmon Life Cycle - Continued

When hatched, alevins stay in gravel until yolk is absorbed



General Salmon Life Cycle - Continued

Once yolk is absorbed, fry/fingerlings will stay in freshwater from days up to 2 years, depending on species



General Salmon Life Cycle - Continued

When ready to leave freshwater for saltwater, they will smolt, undergoing physiological changes in preparation for saltwater



General Salmon Life Cycle - Continued

- Some species will remain in the estuary for several months, some will go straight to sea.
- They will spend anywhere from 1 up to 6 years at sea.
- Adults will “home” to their natal stream (95% of the time).

General Salmon Life Cycle - Continued

When entering freshwater, adults will go through morphological and physiological changes.



General Salmon Life Cycle - Continued

- Adults will quit eating and focus their energy into:
 - Developing their gonads
 - Swimming to their spawning grounds
 - Reproductive behavior (courtship, redd building, nest defense)
- These collectively will consume most of their fat storage.

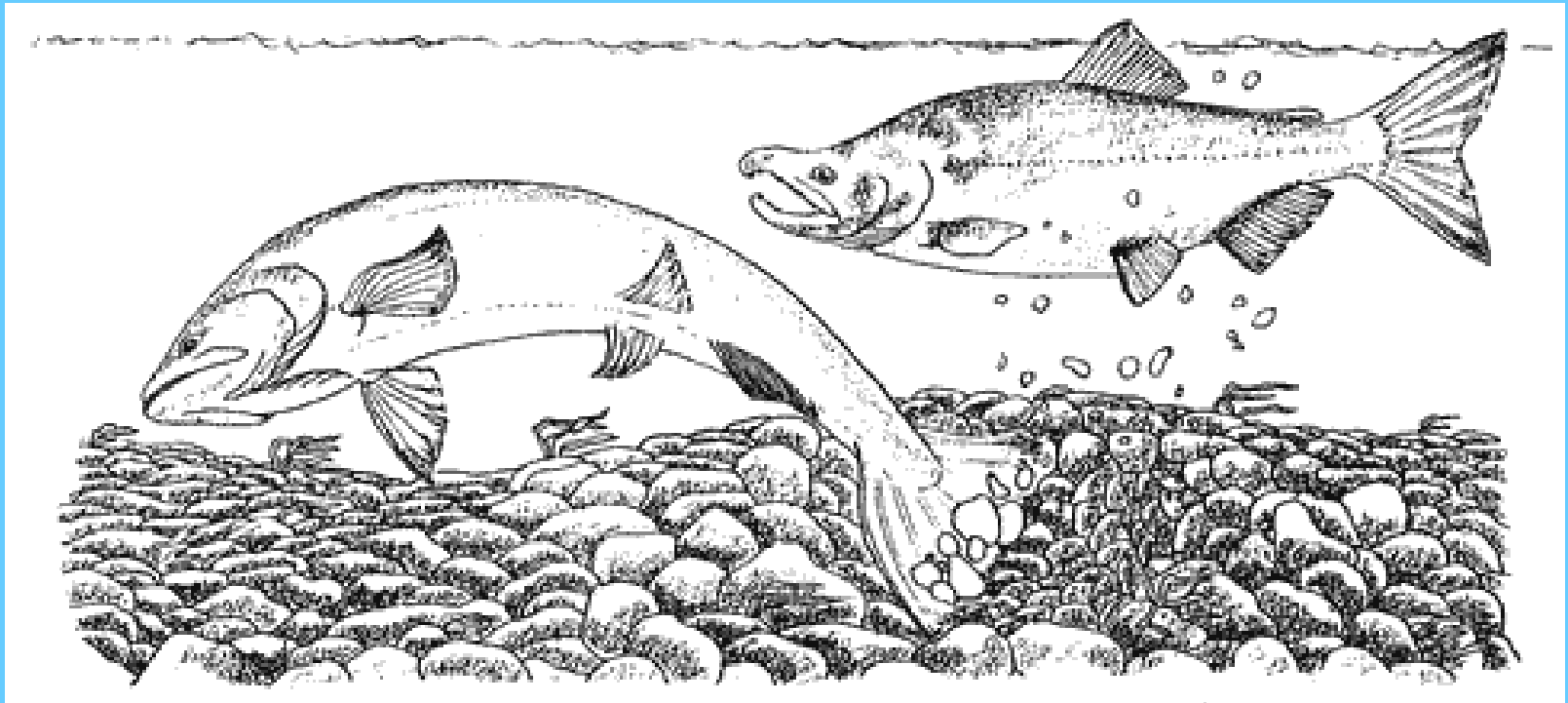
General Salmon Life Cycle - Continued

Once mates are found, females start digging redds.



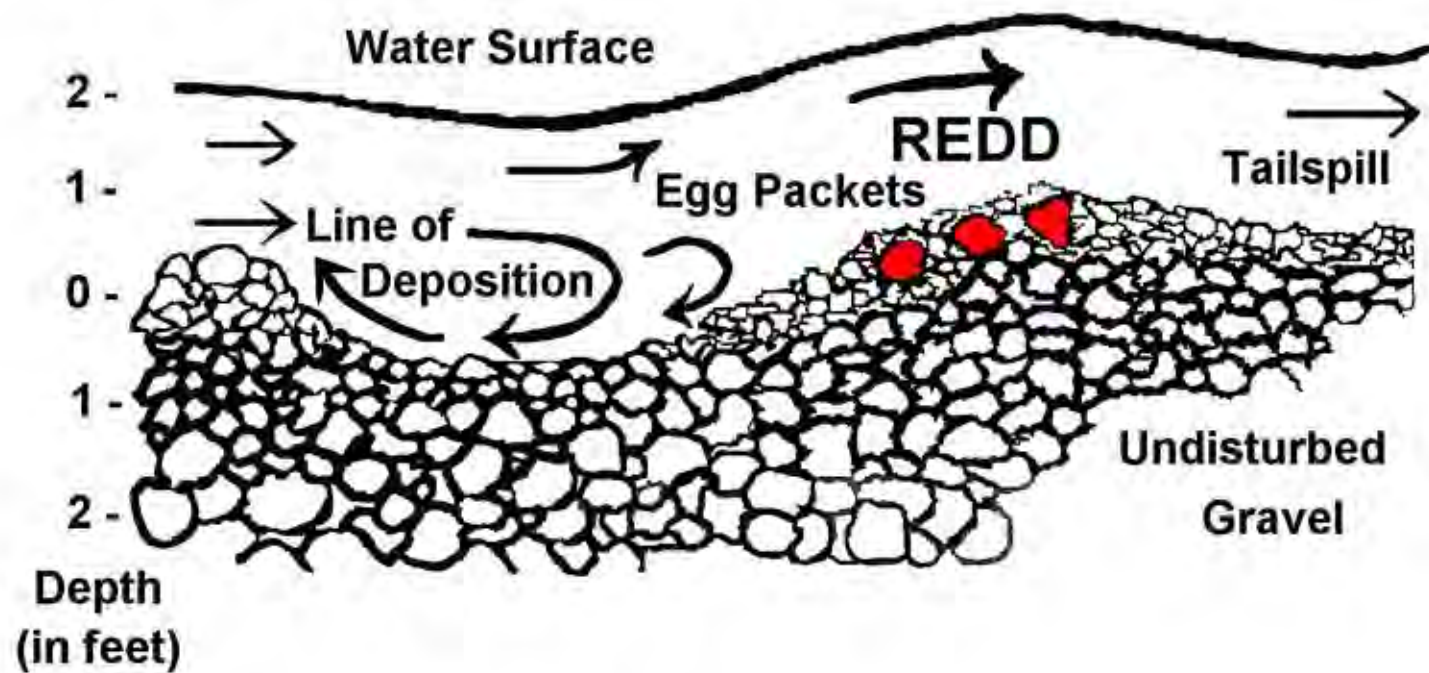
General Salmon Life Cycle - Continued

Female digging redd



General Salmon Life Cycle - Continued

Detail of a redd



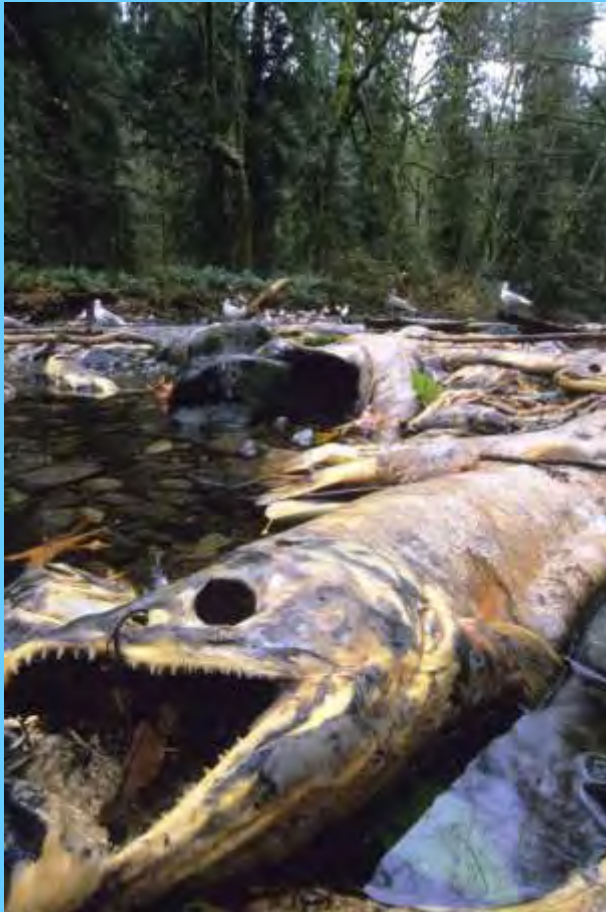
General Salmon Life Cycle - Continued

The female will release eggs, then the male will fertilize with its milt.



General Salmon Life Cycle - Continued

Once pacific salmon spawn they die, leaving their dead body as nutrients



General Salmon Life Cycle - Continued

Too many at one time could
have a negative effect.

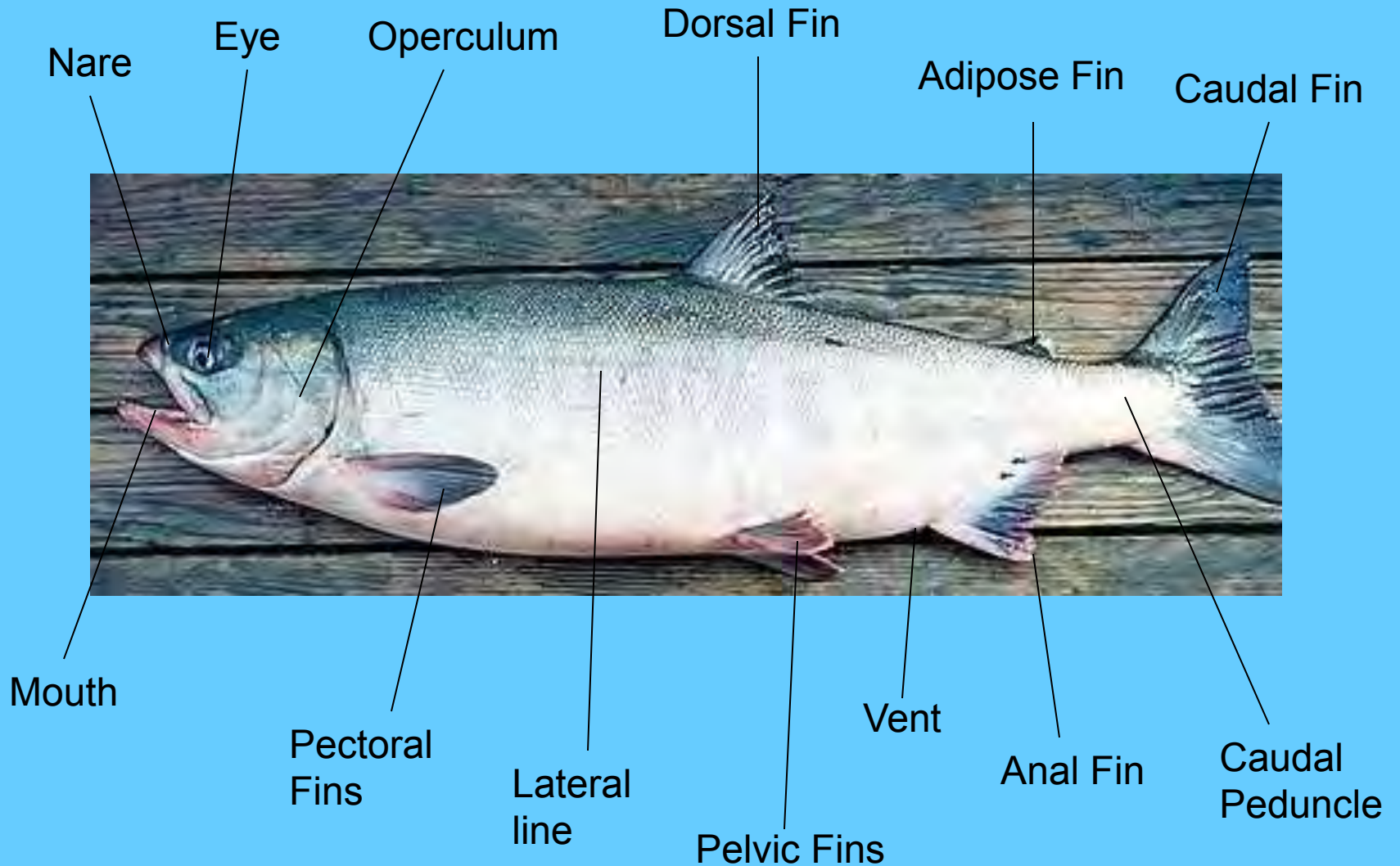


General Salmon Life Cycle - Continued

The process starts all over again



External Anatomy



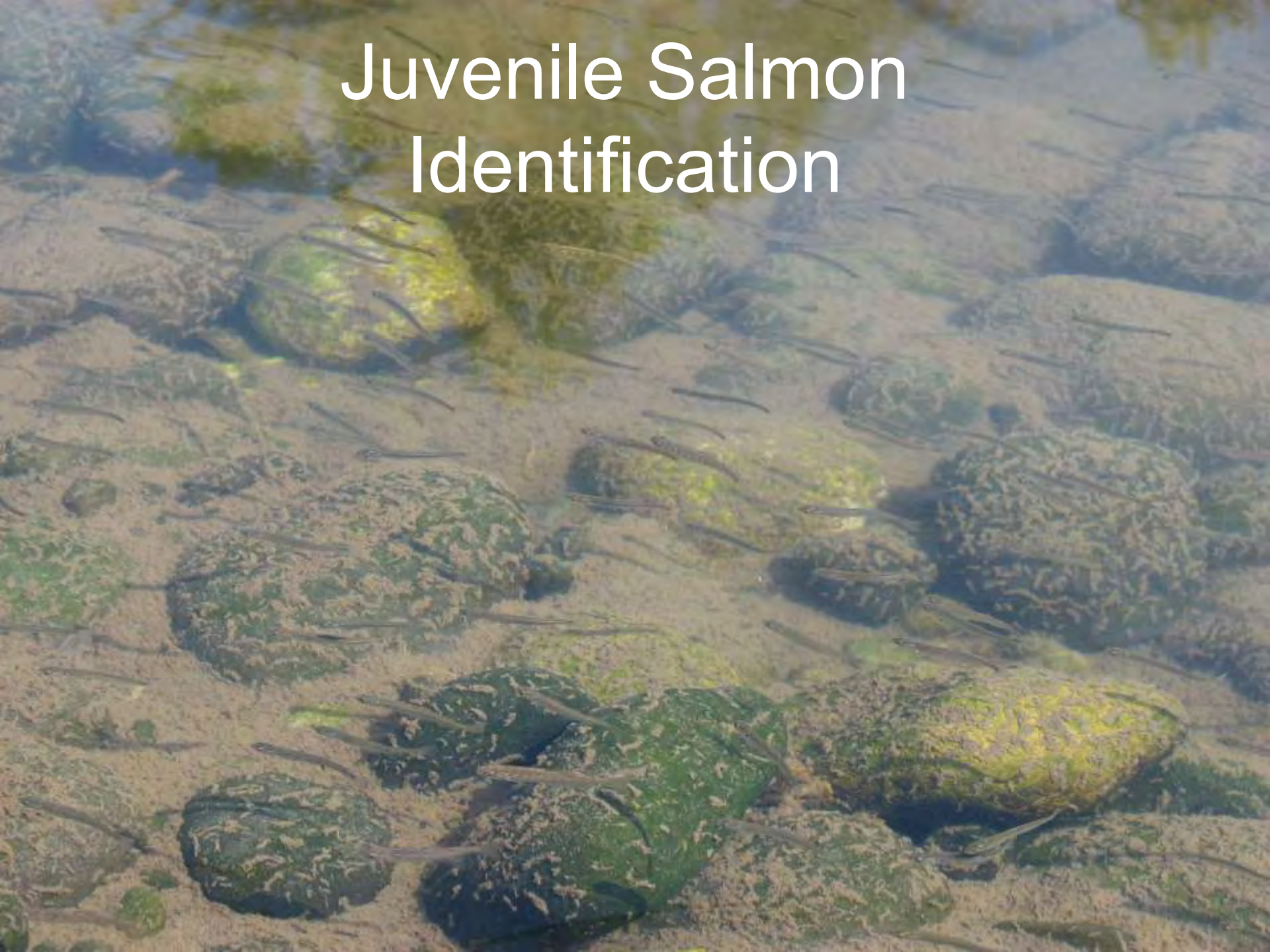
External Anatomy



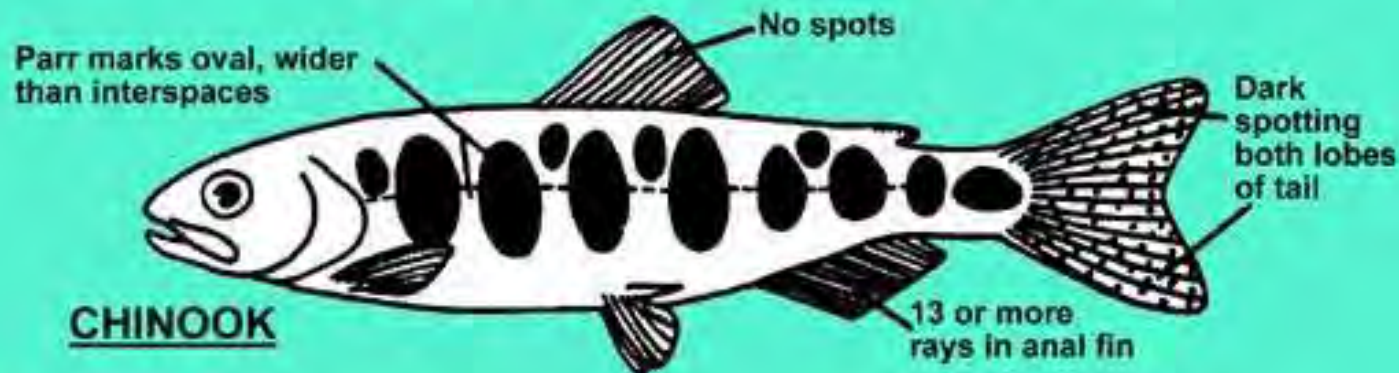
Salmon Identification

- Juvenile identification
- Ocean phase adult identification
- Freshwater phase adult identification

Juvenile Salmon Identification



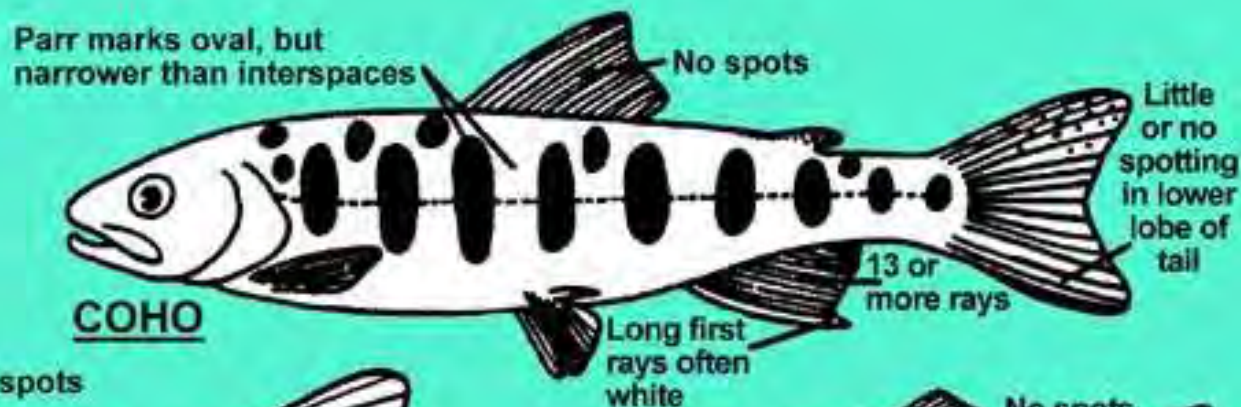
GENUS ONCORHYNCHUS - PACIFIC SALMON IDENTIFICATION FEATURES OF JUVENILES



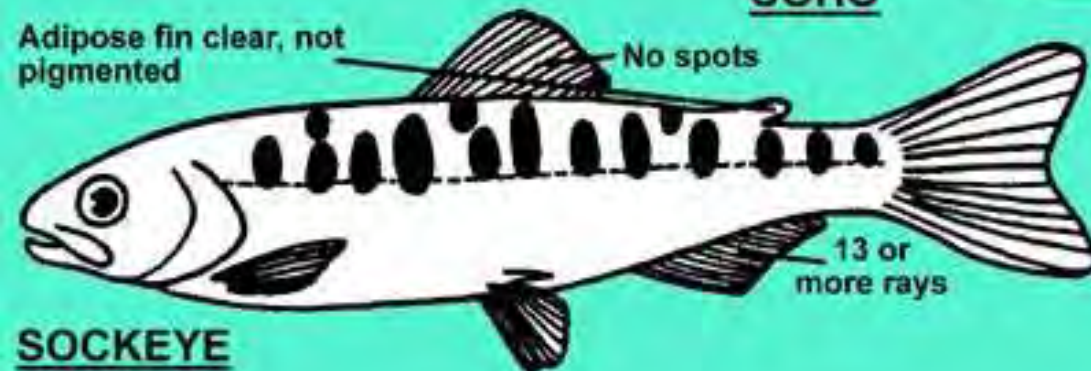
Faint parr marks, extend little, if any, below lateral line. Leaves fresh water as fry.



Parr marks oval, but narrower than interspaces



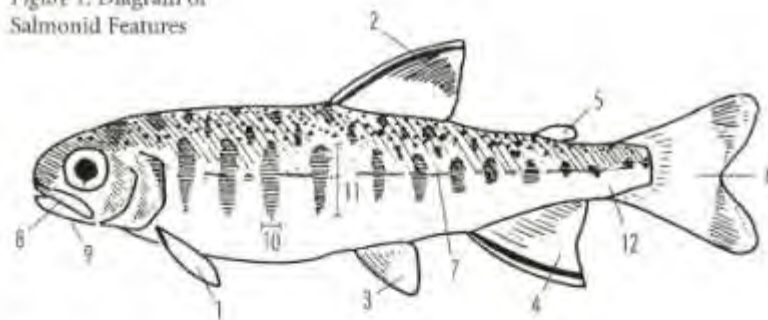
Adipose fin clear, not pigmented



No parr marks



Figure 1: Diagram of Salmonid Features



Key:

- | | |
|-----------------|----------------------|
| 1. Pectoral fin | 7. Lateral line |
| 2. Dorsal fin | 8. Maxillary |
| 3. Pelvic fin | 9. Branchiostegals |
| 4. Anal fin | 10. Parr mark width |
| 5. Adipose fin | 11. Parr mark height |
| 6. Caudal fin | 12. Caudal peduncle |

Salmonid identification characteristics vary over geographic areas. The illustrations used in this guide generalize and emphasize those characteristics. The photos of live fish from Vancouver Island waters show examples of what you may see in the field. Features and colours vary greatly among fish. Stress may affect the intensity of colours. These things make it necessary to look carefully at live fish to see features that are clear on drawings. Some of the key features that are usually easy to see on live fish are listed with the photos.

WHAT IF I USE THE GUIDE AND STILL CAN'T IDENTIFY THE FISH?

Some juvenile fish are difficult to identify. Even experienced biologists occasionally have trouble with the field identification of some small salmonids. For example, determining the difference between rainbow and cutthroat trout that are smaller than about 80 mm is very difficult. Fortunately, continued sampling of species that rear in fresh water for several years will usually yield larger specimens that are easier to identify. If you can't identify a specimen, then report the fish as "unknown" or identify the fish as far as you can confidently take it (e.g. trout, char, etc.).

SAMPLING RULES & REGULATIONS

Capturing juvenile salmonids for identification purposes requires sampling permits from the Department of Fisheries and Oceans and the B.C. Ministry of Environment, Lands and Parks. Some characteristics involving detailed counts or other procedures require that fish be preserved. Check the conditions of your permit to determine if you can retain fish and only do so if it is absolutely necessary to confirm your identification. **Examining fish for features highlighted in red in the Identification Charts or on the Detailed Species Information pages can seriously harm or kill the specimen. Check your permit before attempting to use these diagnostic features.**

Figure 2

IDENTIFICATION CHART

Salmon and trout/char

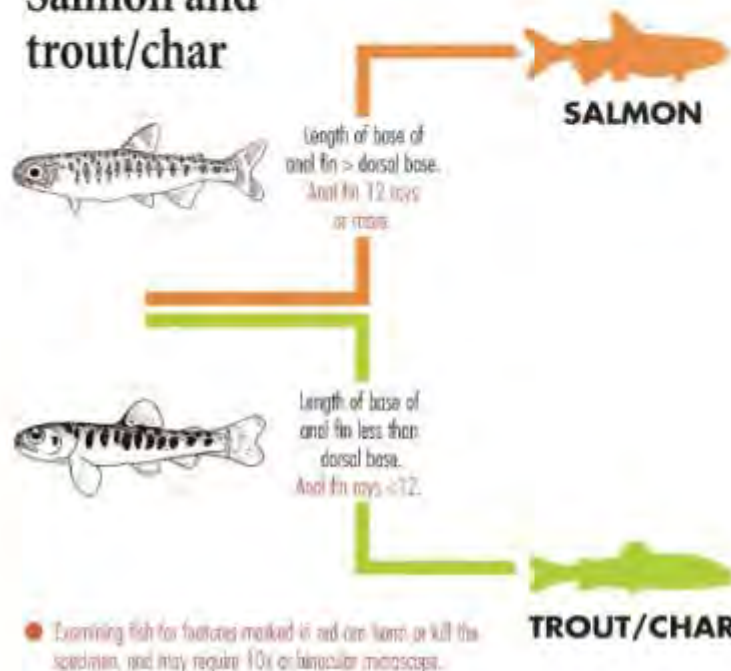
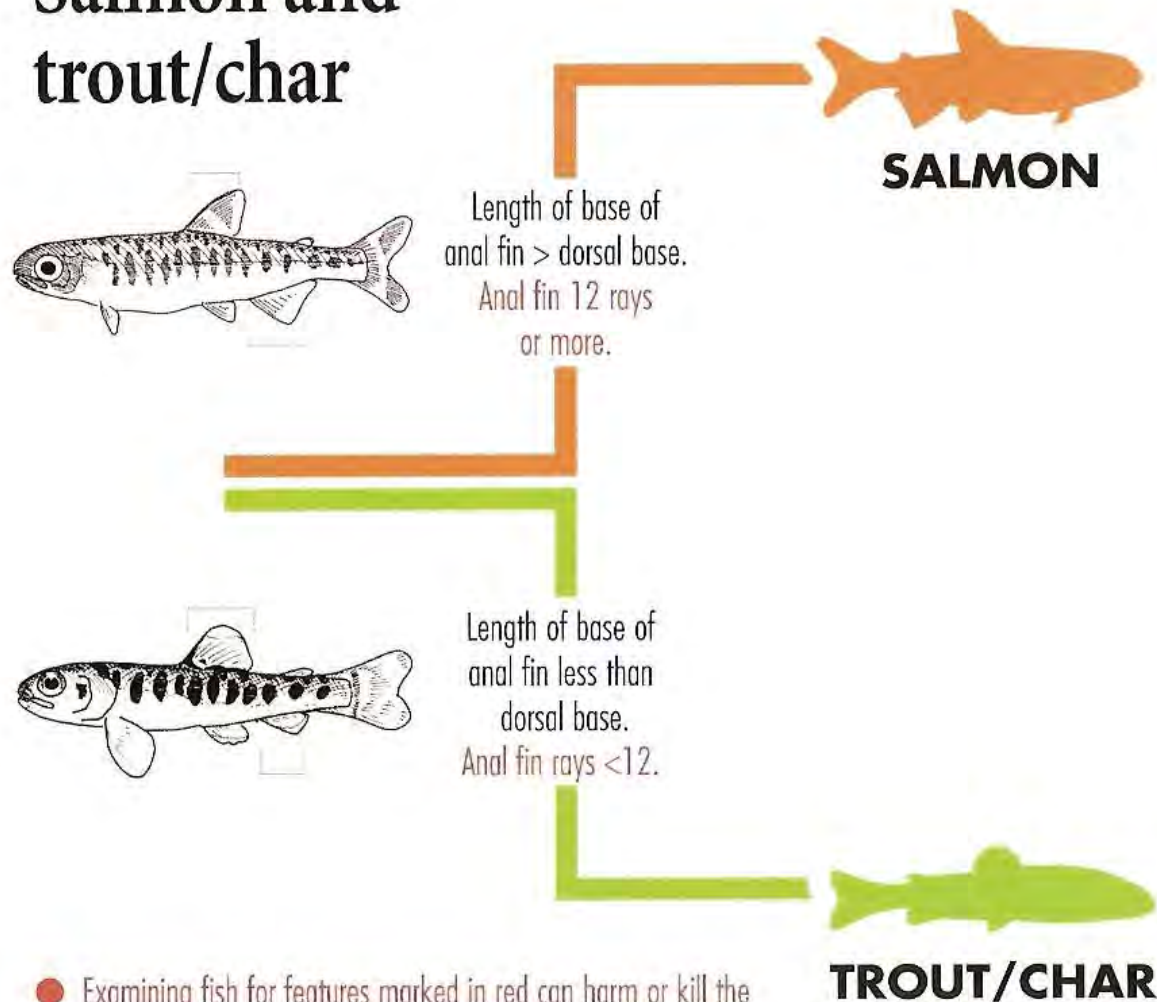


Figure 2

IDENTIFICATION CHART

Salmon and trout/char

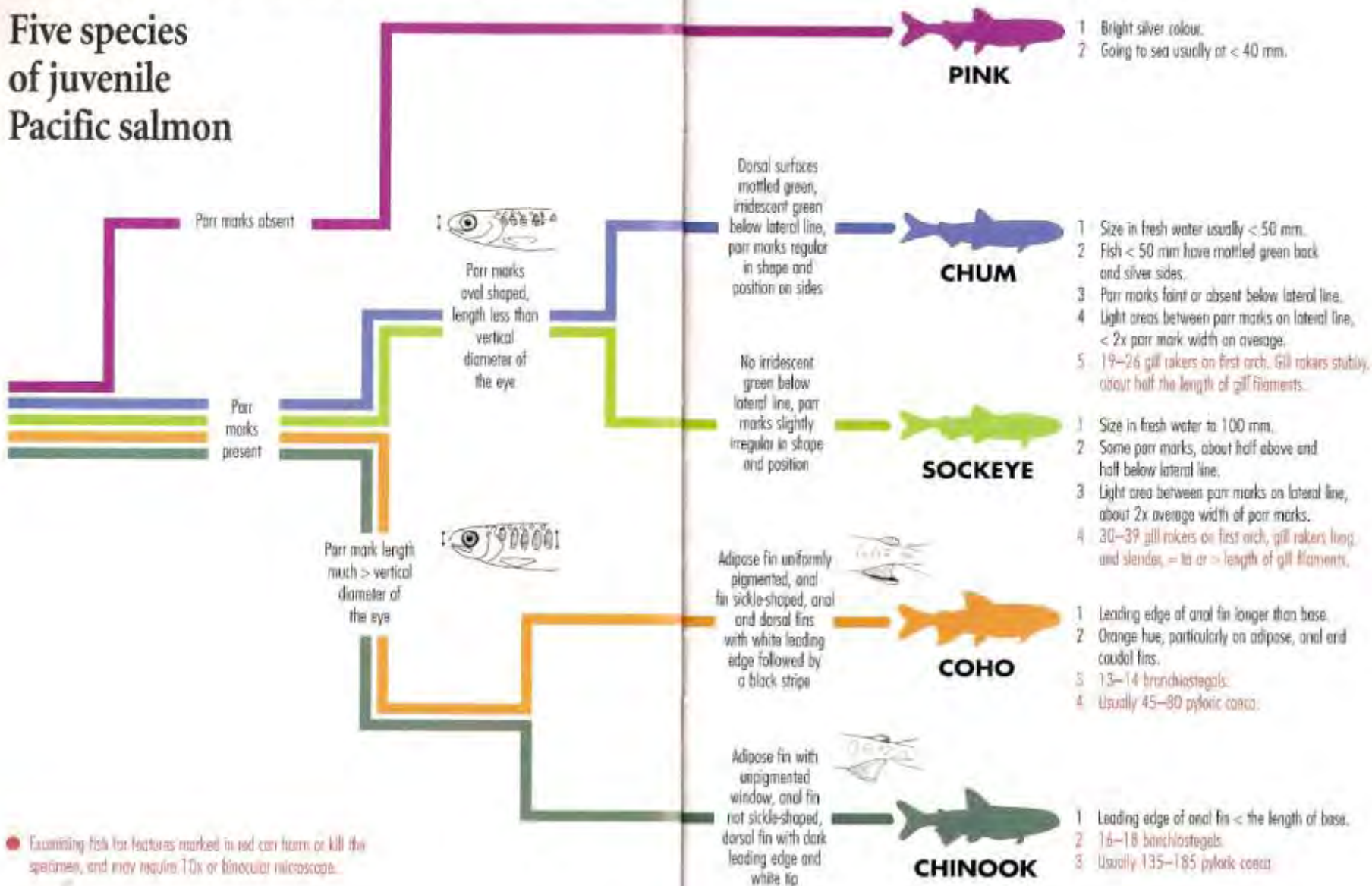


● Examining fish for features marked in red can harm or kill the specimen, and may require 10x or binocular microscope.

Figure 3

IDENTIFICATION CHART

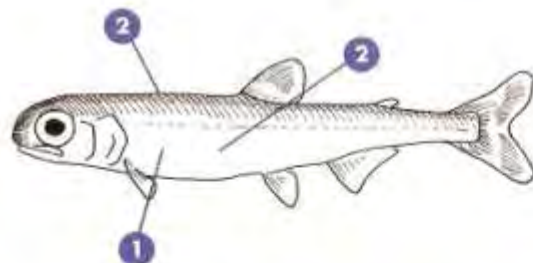
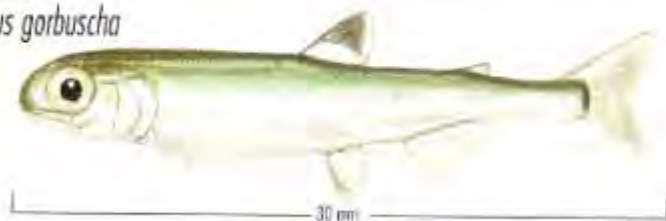
Five species of juvenile Pacific salmon



PINK SALMON

Oncorhynchus gorbuscha

FRY



COLOUR & ANATOMY

- 1 Parr marks are absent.
- 2 Dorsal surface is green, ventral is silver.

DISTRIBUTION

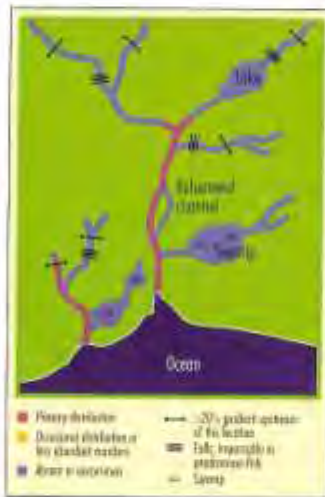
- Pink salmon are found in lower reaches of small coastal streams.
- Some runs ascend large rivers for several hundred kilometres.

FRESHWATER RESIDENCE TIME

- Fry hatch, emerge and go directly to sea.

OTHER

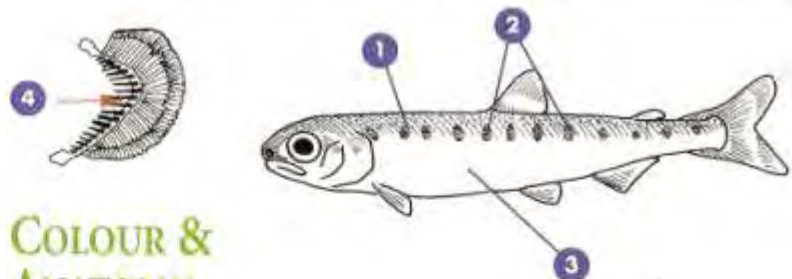
- Fry are 3–3.5 cm long—maximum size in freshwater 4.5–5 cm.
- Pink salmon may spawn in the intertidal zone.
- All adult pink salmon are 2 years old. Rivers frequently have adult runs only every other year. A few watersheds have natural runs every year, but the even-numbered year or odd-numbered year run will typically be stronger.



CHUM SALMON

Oncorhynchus keta

FRY



COLOUR & ANATOMY

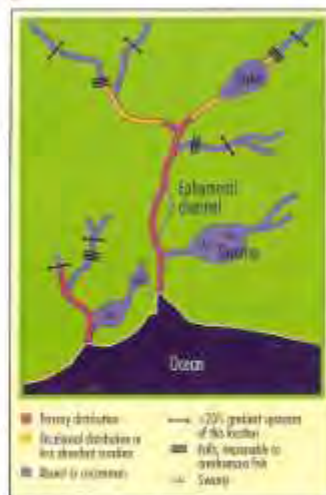
- 1 Parr marks smaller than vertical diameter of eye, and faint or absent below lateral line.
- 2 Parr mark height is more regular than on sockeye.
- 3 Area below lateral line has pale greenish iridescence.
- 4 Gill rakers are short and stubby, about half the length of the gill filament, 19 to 26 on first gill arch.

DISTRIBUTION

- Chum usually occur in lower reaches of most coastal streams.
- Chum migrate up to 160 km up Fraser River and lower reaches of large tributaries. Fish migrate over 2000 km in Yukon and Mackenzie Rivers.

BEHAVIOUR

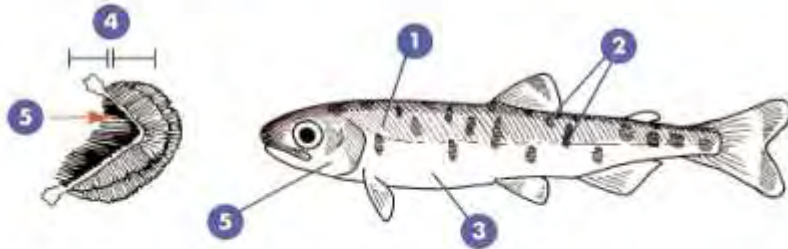
- Chum migrate downstream to sea soon after emergence. They are usually gone from fresh water by June 1.
- Chum may spawn in intertidal zone of small streams.



SOCKEYE SALMON

Oncorhynchus nerka

FRY

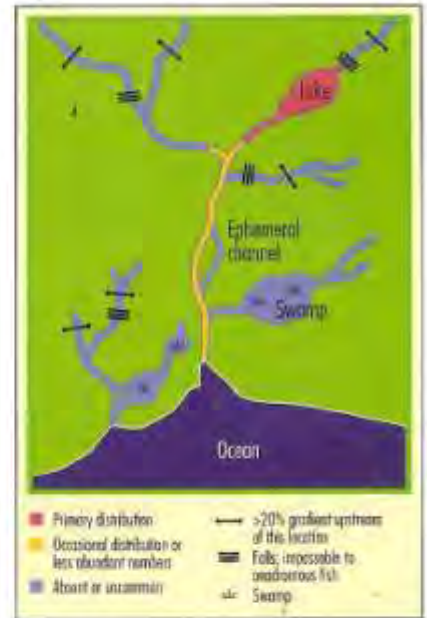


COLOUR & ANATOMY

- 1 Parr mark length less than than vertical diameter of the eye.
- 2 Parr marks are irregular—height is irregular.
- 3 Area below lateral line is silver or white—no greenish sheen.
- 4 Gill raker length is almost = to length of gill filaments.
- 5 30–39 gill rakers on first arch.

DISTRIBUTION

- Most sockeye occur in systems where young can enter a lake to rear.
- Some small populations spawn and rear in lower reaches of large rivers.
- Fry migrate to lakes from spawning areas that may be either upstream or downstream from the lake.
- Resident forms, "Kokanee," spend their entire life in fresh water.
- Sockeye rarely rear in coastal streams without a lake that is accessible to adult salmon.



BEHAVIOUR

- In large lake-river systems, fry may migrate in great numbers along shore of the river while moving to lake.
- Sockeye may spawn on beaches in some coastal lakes.

FRESHWATER RESIDENCE TIME

- Juveniles rear in lakes for 1–2 years.

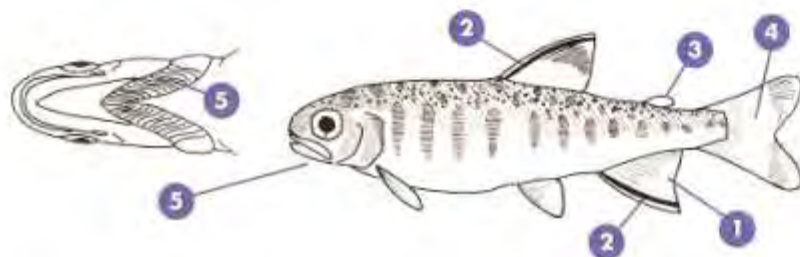
SOCKEYE VS CHUM

- Sockeye fins are larger than those of chum.
- Height of parr marks is irregular in sockeye.
- Sockeye has no greenish iridescence below lateral line.
- Chum have regular-height parr marks, usually faint or absent below lateral line, and greenish iridescence below lateral line.
- Sockeye are generally found only in watersheds with accessible lakes.
- Sockeye have long gill rakers.

COHO SALMON

Oncorhynchus kisutch

FRY

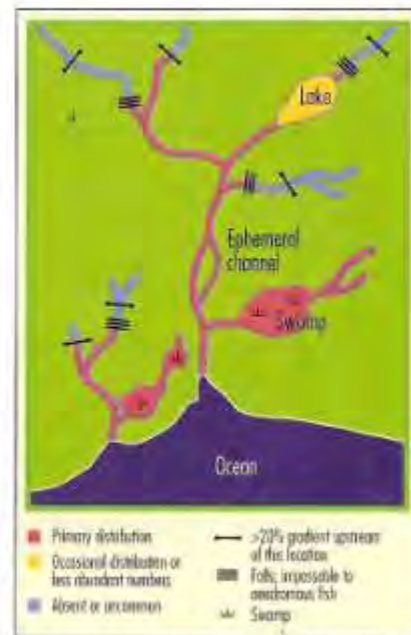


COLOUR & ANATOMY

- 1 Anal fin is sickle-shaped, leading edge longer than base.
- 2 Leading edges of anal and dorsal fins have white followed by black.
- 3 Adipose fin has dark edge, centre is opaque.
- 4 Caudal, anal and adipose fins are pale orange.
- 5 Species has 13-14 branchiostegals.
- 6 Species usually has 45-80 pyloric caeca.

DISTRIBUTION

- Coho use all accessible reaches of streams.
- Seasonally wetted areas and off-channel sloughs, swamps and their tributaries are used for winter rearing.
- In main stems of large rivers, coho use margins, debris piles and undercut banks.
- Coho may be found in fresh/saltwater pools in small estuaries.
- In small streams they prefer pools and glides.



BEHAVIOUR

- Coho feed actively on anything falling into water. They are common along stream margins. Coho are the most common and easily seen salmon fry during the active growing season.
- Below about 6°C, the fry will seek cover under banks or in debris piles.
- Coho will nip and chase each other.

FRESHWATER RESIDENCE TIME

- Coho remain in fresh water 1-2 years.

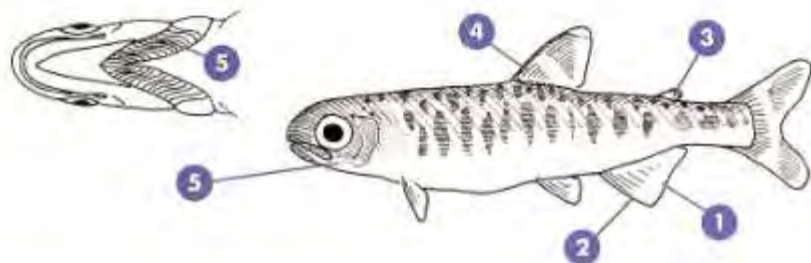
OTHER

- Coho are very widely distributed in streams of all sizes, including very small first- and second-order streams.
- Some stocks in small first- and second-order streams may not be in DFO files.
- You may encounter "Lake Forms" of coho with a less sickle-shaped anal fin.
- As coho become ready to smolt, they will become brighter and the anal fin is less sickle-shaped.

CHINOOK SALMON

Oncorhynchus tshawytscha

FRY



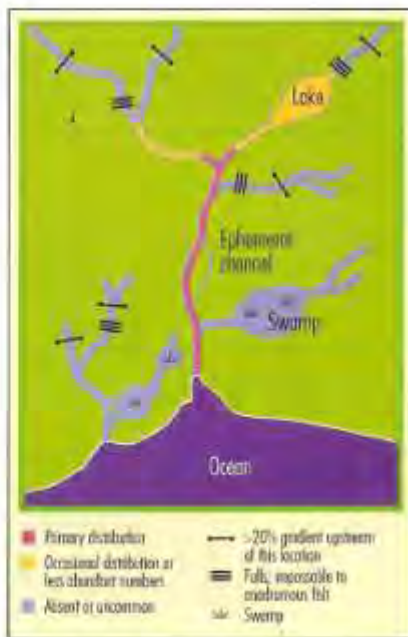
COLOUR & ANATOMY

- 1 Anal fin is not sickle-shaped: leading edge of anal fin shorter than length of base.
- 2 Anal fin leading edge is white.
- 3 Adipose fin has clear centre or "window."
- 4 Dorsal fin has dark leading edge and white tip.
- 5 Species has 16–18 branchiostegals.
- 6 Species usually has 135–185 pyloric caeca.



DISTRIBUTION

- Chinook are usually found in moderate to large streams.
- Main channel is used for rearing.
- In large streams, 8–10 cm fish live in faster, deeper water than coho.
- Chinook may rear in estuaries of larger rivers—e.g. Nanaimo, Cowichan, Fraser.
- Adults may hold in lakes before spawning.



FRESHWATER RESIDENCE TIME

- Chinook may form races with some rearing >1 year, some 90 days or less depending upon type. Southern populations frequently stay 90 days and northern populations are more likely to stay up to a year, but can be variable in all areas.

OTHER

- Most populations of chinook are known and listed in DFO escapement catalogs.
- Dorsal fin tip darkens as fish become ready to go to sea.

CHINOOK VS COHO

- Chinook have "clear window" in adipose.
- Chinook do not have sickle-shaped anal fins or white and black stripes on leading edges of anal and dorsal fins.
- Coho have sickle-shaped anal fins, with the leading edges longer than length of base of anal fins. Leading edges of anal and dorsal fins have white and black stripes.
- Chinook frequent main stems of moderate to large rivers. Coho are found in all accessible stream reaches, including seasonally wetted areas.

LIVE SPECIMENS: SALMON FRY

Important diagnostic features visible on photographs are identified. Refer to Identification Charts and species pages to confirm identifications made from photos. Note: length of base of anal fin is larger than length of base of dorsal fin on all juvenile salmon.



Length: 30 mm.

Pink Salmon Fry

Parr marks are absent.
Colour is very silver.



Length: 55 mm.

Chum Salmon Fry

Parr marks are even in length—
more above than below lateral line.
Blue/green sheen shows below
lateral line.



Length: 50 mm.

Sockeye Salmon Fry

Parr marks are uneven length, and
some are equal above and below
lateral line.
No green sheen shows below lateral
line.



Length: 50 mm.

Coho Salmon Fry

Dorsal and anal fin margins are
sickle-shaped and have white and
black stripes.
Parr marks larger than eye diameter.
Fins are red or orange.



Length: 50 mm.

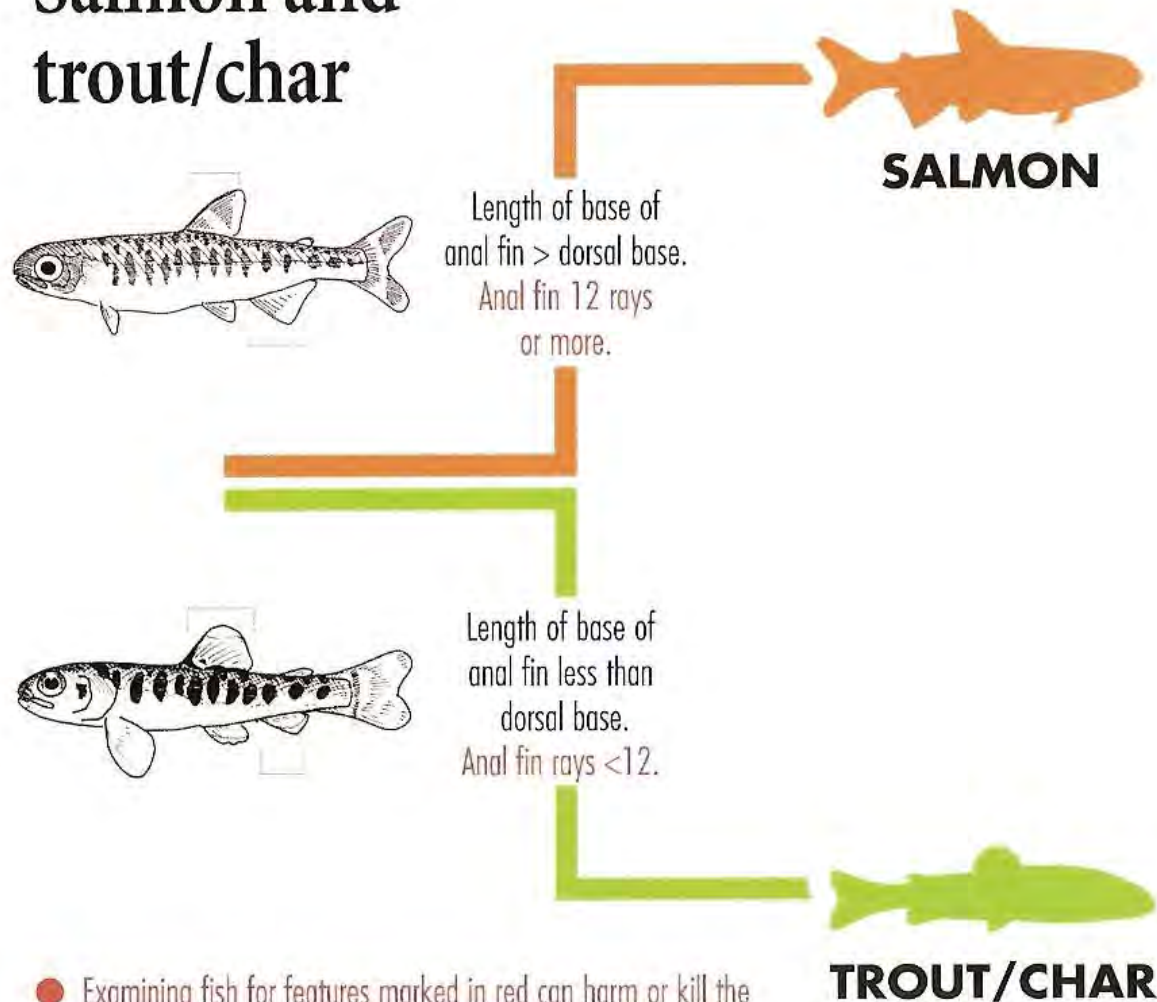
Chinook Salmon Fry

Dorsal has white tip.
Adipose has clear window.
Parr marks larger than eye diameter.

Figure 2

IDENTIFICATION CHART

Salmon and trout/char

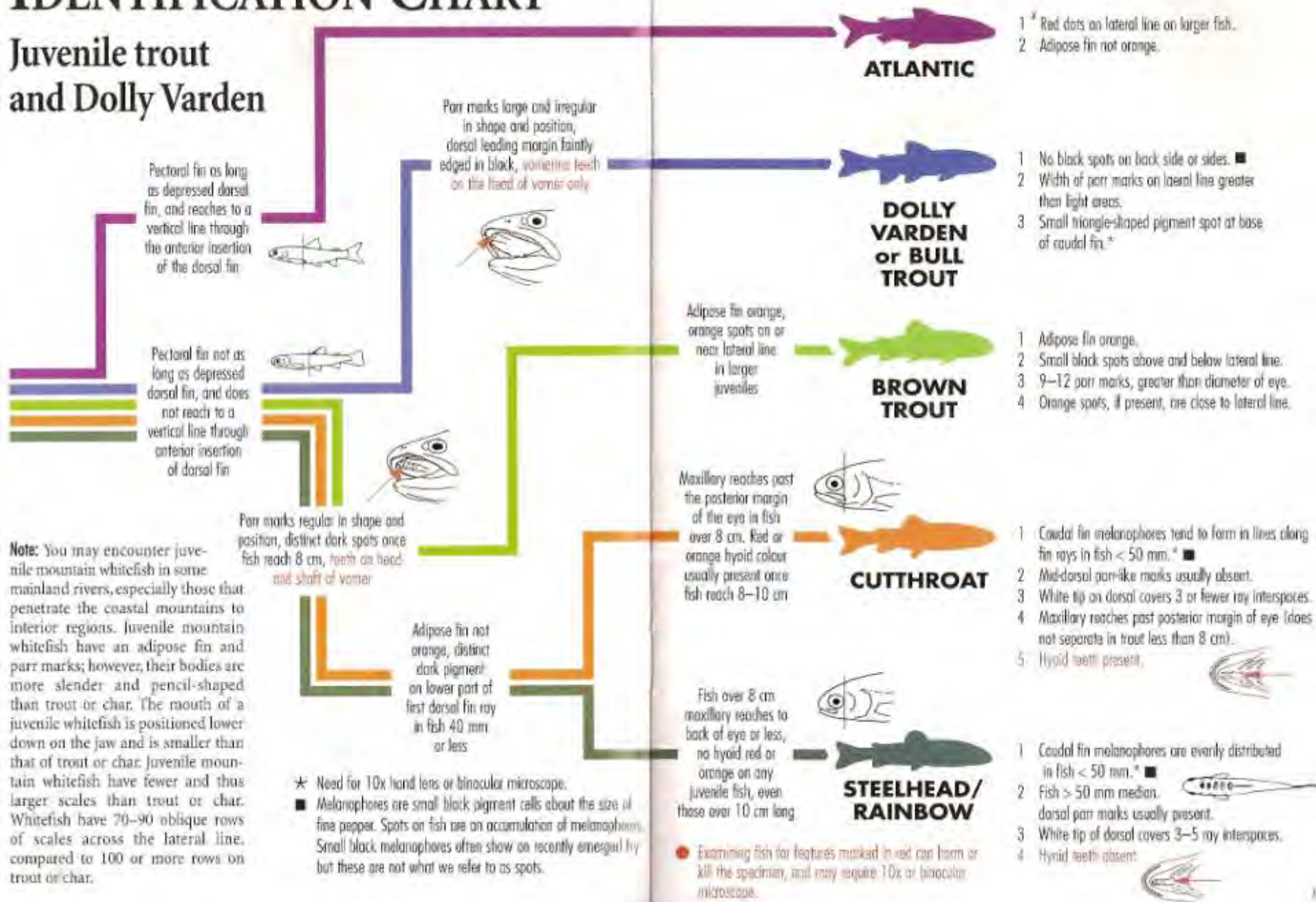


● Examining fish for features marked in red can harm or kill the specimen, and may require 10x or binocular microscope.

Figure 4

IDENTIFICATION CHART

Juvenile trout and Dolly Varden



STEELHEAD/ RAINBOW TROUT

Oncorhynchus mykiss

FRY



PARR

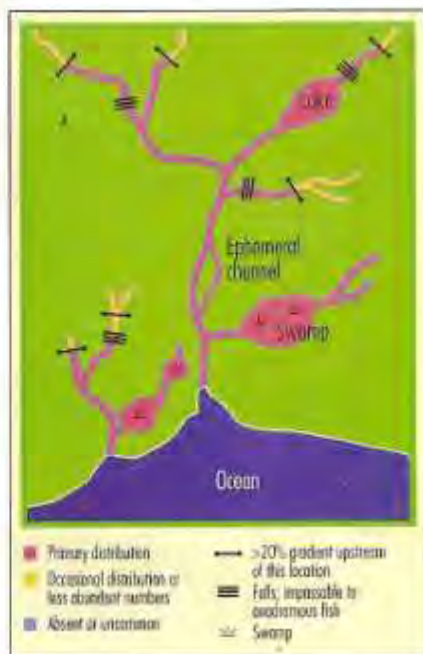


COLOUR & ANATOMY

- 1 Melanophores are evenly speckled on caudal fin of fry.
(Note: magnifying glass usually required to observe this trait.)
- 2 Median-dorsal area has parr-like marks, about 5.
- 3 White tip on dorsal covers 3 to 5 interspaces between dorsal fin rays.
- 4 First ray is black on fry.
- 5 Adipose usually has continuous rim of pigment or one break.
- 6 Maxillary does not extend past back margin of eye of parr.
- 7 Jaw has no red or yellow slash.
- 8 There are 60 hyoid teeth.

DISTRIBUTION

- Steelhead/rainbow are found in main channel, permanent tributaries and in lakes.
- Steelhead/rainbow can use small permanent streams and stable side channels.
- Small resident forms may be found isolated above barriers and in lakes.
- Rainbow do not normally coexist with cutthroat in headwaters. Steelhead/rainbow and cutthroat are found together in anadromous waters and occasionally coexist in large rivers and lakes.
- Finding both rainbow and cutthroat in streams usually signifies anadromous use.
- Resident and anadromous forms can be distinguished by opening fish and checking for maturity. Mature males/females in the 115-120mm range signify resident fish. If fish are immature at this size, assume they are juvenile steelhead.
- Large lakes can have late spawning populations where fry do not emerge until late summer.



BEHAVIOUR

- Steelhead/rainbow hide in streambed or debris piles at temperatures < about 6°C. They may move out at night.
- Steelhead/rainbow may occasionally spawn with cutthroat and form hybrids.
- Steelhead/rainbow usually spawn from late winter through spring.

FRESHWATER RESIDENCE TIME

- Anadromous fish rear for up to 3 years before going to sea.
- Resident fish spend their entire life in fresh water.

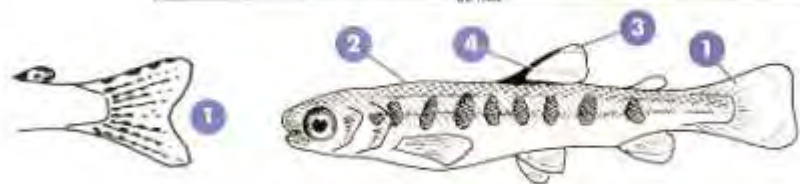
STEELHEAD/RAINBOW VS CUTTHROAT

- Steelhead/rainbow are less likely to be found in ephemeral off-channel habitat or tributaries above sloughs or swamps.
- Steelhead/rainbow maxillary does not extend past back of eye, hyoid teeth and red slash are absent.
- Cutthroat maxillary extends past the eye, hyoid teeth are present, red slash is present on bottom of the jaw.

CUTTHROAT TROUT

Oncorhynchus clarki

FRY



PARR

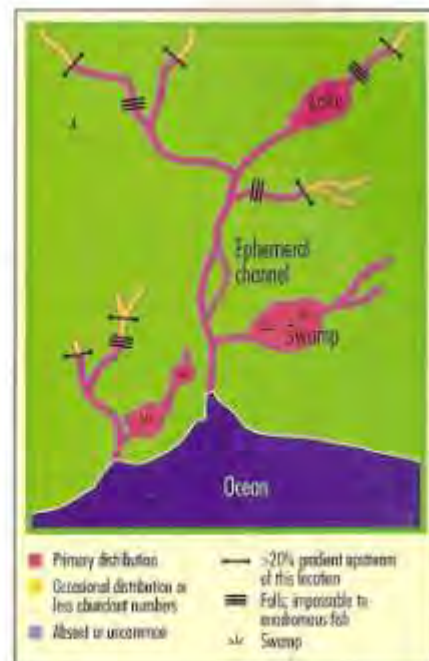


COLOUR & ANATOMY

- Melanophores are in spots or streaks along rays in caudal fin of fry <50 mm. (Note: magnifying glass may be required to observe this trait.)
- Median-dorsal parr-like marks are usually absent.
- White tip on dorsal covers 1 to 3 interspaces between dorsal fin rays.
- First ray is black on fry.
- Adipose may have 1-2 breaks in pigment on rim and often spotted on parr.
- Maxillary extends past rear margin of the eye on fish >80 mm.
- Underside of jaw (on parr) has red or yellow slash.
- Hyoid teeth are present at the base of the tongue behind first gill arch—see inside lower jaw.

DISTRIBUTION

- Populations live in large and small permanent lakes and streams.
- Resident fish may be found in lakes and streams.
- Cutthroat are usually further up in the system than steelhead/rainbow.
- Cutthroat may co-exist with Dolly Varden in small stream tributaries.
- Cutthroat may occur above barriers in streams.
- Cutthroat use off-channel habitats such as intermittent tributaries and sloughs.
- Cutthroat may also occur in small tributaries upstream from sloughs—steelhead do not.



BEHAVIOUR

- Both anadromous and resident forms occur.
- Cutthroat hide under logs and debris piles, or under streambank at temperatures <6°C.
- Cutthroat may occasionally spawn with rainbow and produce hybrids.
- Cutthroat spawn from late winter through spring.

FRESHWATER RESIDENCE TIME

- Anadromous fish are resident up to 3 years.
- Resident fish spend their entire life in fresh water.

OTHER

- Small cutthroat are very difficult to distinguish from steelhead/rainbow, and features may be similar on fish <10-12 cm long.
- Continued sampling will usually yield fish >10 cm that are more easily identified than younger fish.

Adult identification

Ocean phase

- *Oncorhynchus tshawytscha*
- *Oncorhynchus kisutch*
- *Oncorhynchus gorbuscha*
- *Oncorhynchus keta*
- *Oncorhynchus nerka*

Oncorhynchus tshawytscha

Chinook

- Mouth is dark with a black gum line
- Large, sharp teeth
- Spots on both lobes of tail
- Large spots on back



Jaw – The chinook has a dark mouth and black gums at the base of its teeth. Immature chinook are known as a “blackmouth”



Tail – Both the upper and lower lobes of the tail are covered with spots and silver is prominent.

Oncorhynchus kisutch

Coho

- Mouth is light with a white gum line
- Medium size, sharp teeth
- Spots only on upper lobe of tail
- Spots on back
- Wide caudal peduncle



Jaw - The mouth is white and the gum line is almost white, but the tongue may be black. The teeth are sharp and strong.



Tail – The coho tail has just a few scattered spots, usually on the upper lobe, with silver streaks. It has a wide caudal peduncle.

Oncorhynchus gorbuscha

Pink

- Mouth is white with a black gum line.
- In marine areas, almost no teeth
- Large oval spots on both lobes of tail
- Large black spots on back
- Pointed lower jaw
- No silver on tail
- Very small scales



Jaw – The mouth of a pink is white, but the gums and tongue are black, as they are in a chinook. It does not have “teeth” on its tongue.

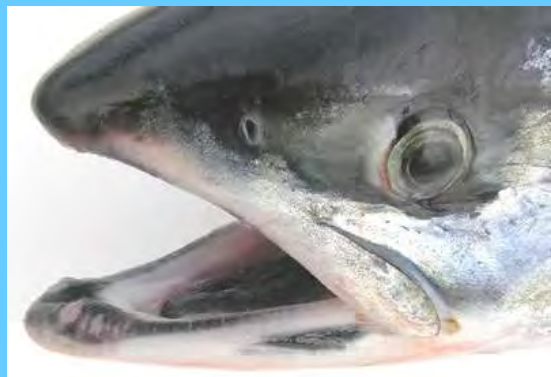


Tail – The pink salmon tail is covered with large oval spots. It does not have silver on the tail. The scales are very small compared to other salmon of the same size

Oncorhynchus keta

Chum

- Mouth is white with a white gum line
- Well developed teeth
- No spots on tail or back
- Calico markings (vertical bars) – faint on bright fish
- Narrow caudal peduncle
- White tip on anal fin



Jaw – The mouth is white and the gum line is white, but the tongue may be black. The lips are fleshy with well developed teeth in both jaws, but there are no teeth on the base of the tongue.



Tail – The tail has no spots, but does have silver streaks covering about half of the fin. The caudal peduncle is narrow.

Oncorhynchus nerka

Sockeye

- Mouth is white with a white gum line
- Almost toothless
- No spots on tail or back
- Large, bright gold, glassy eye



Jaw – The mouth is white and the gum line is white. The lips are fleshy. The teeth are small and well developed in both jaws. There are no teeth on the base of the tongue.

Tail – There are no spots on the tail.

Adult identification

Freshwater phase

- *Oncorhynchus tshawytscha*
- *Oncorhynchus kisutch*
- *Oncorhynchus gorbuscha*
- *Oncorhynchus keta*
- *Oncorhynchus nerka*

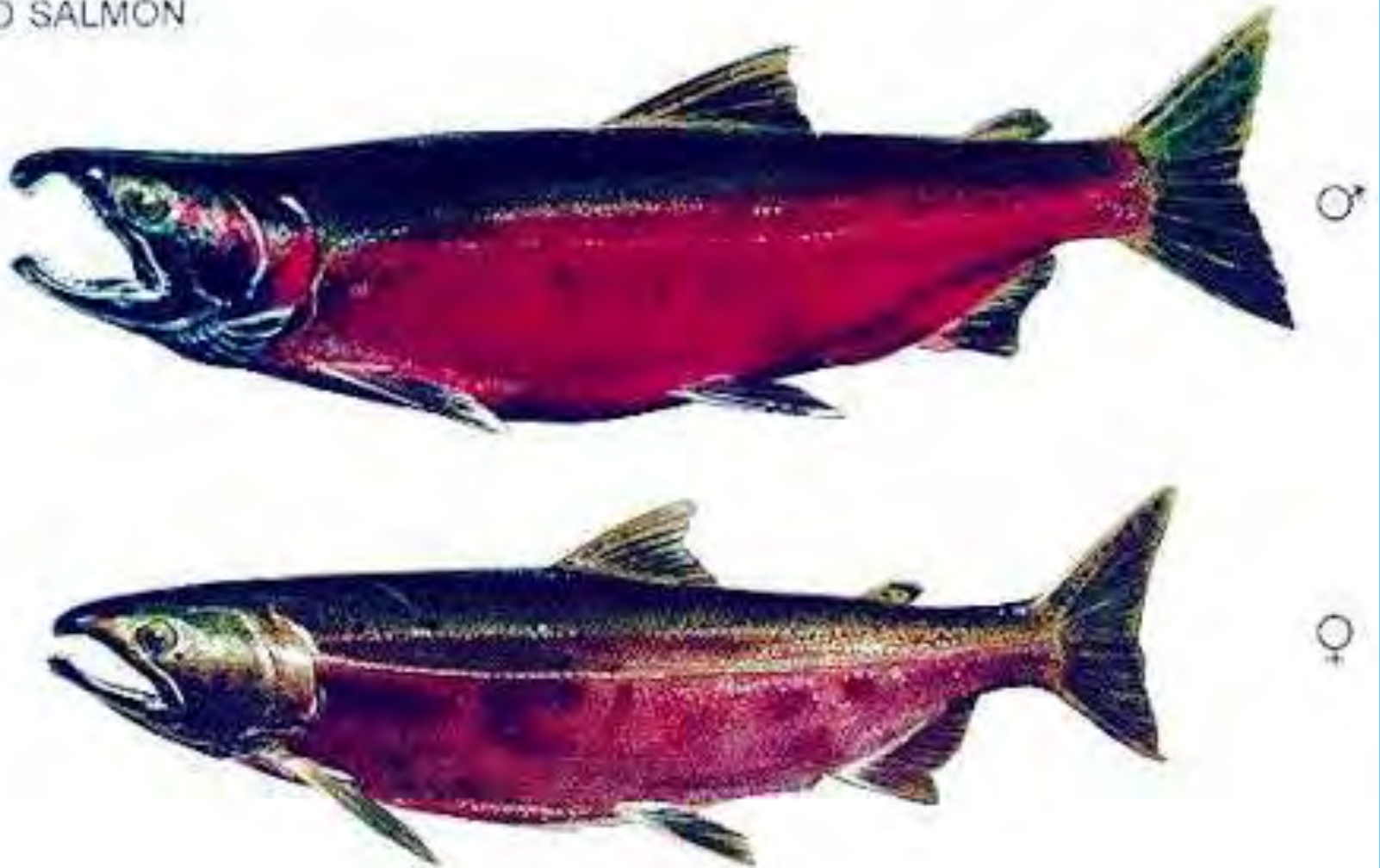
Oncorhynchus tshawytscha

CHINOOK SALMON



Oncorhynchus kisutch

COHO SALMON



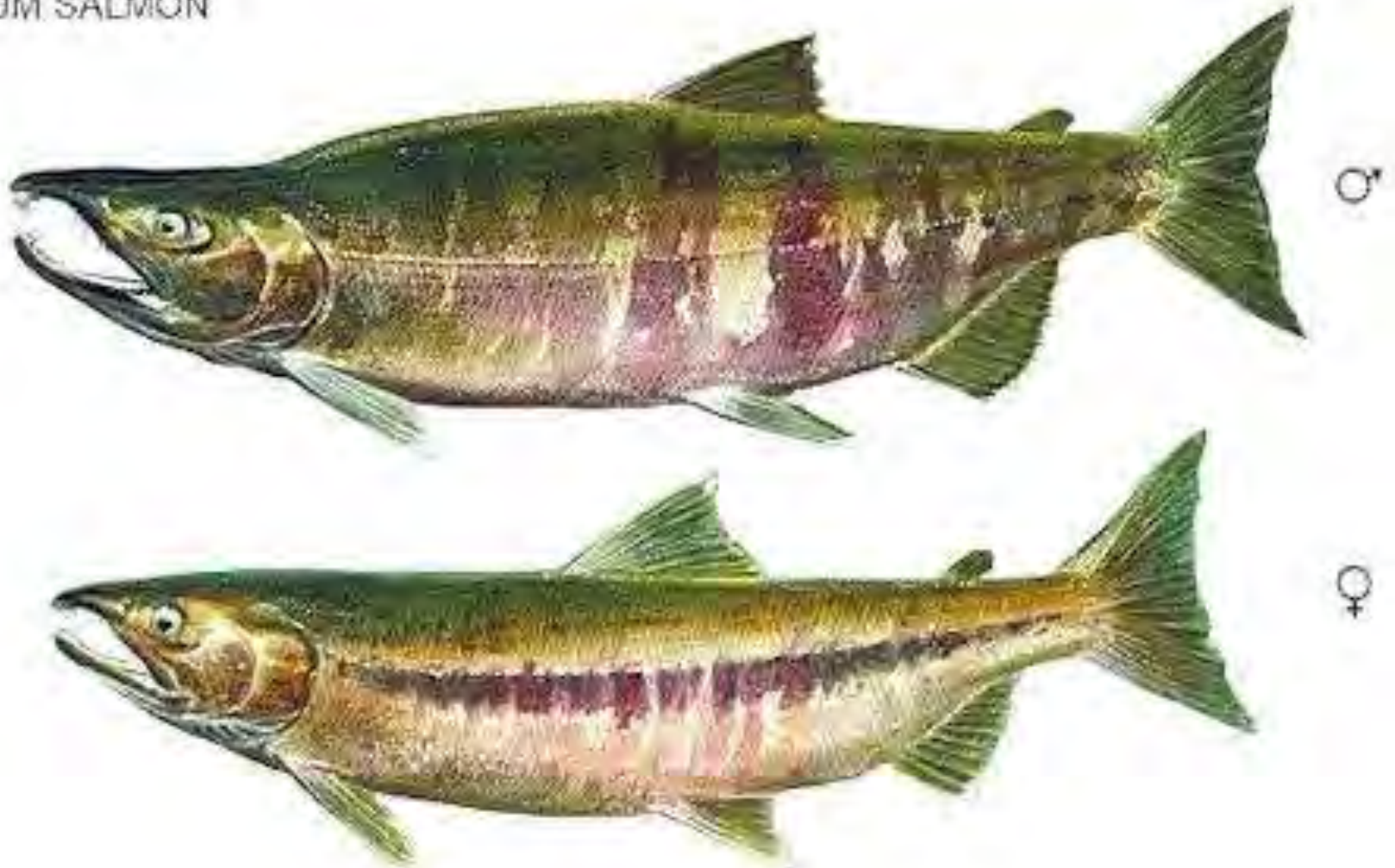
Oncorhynchus gorbuscha

PINK SALMON



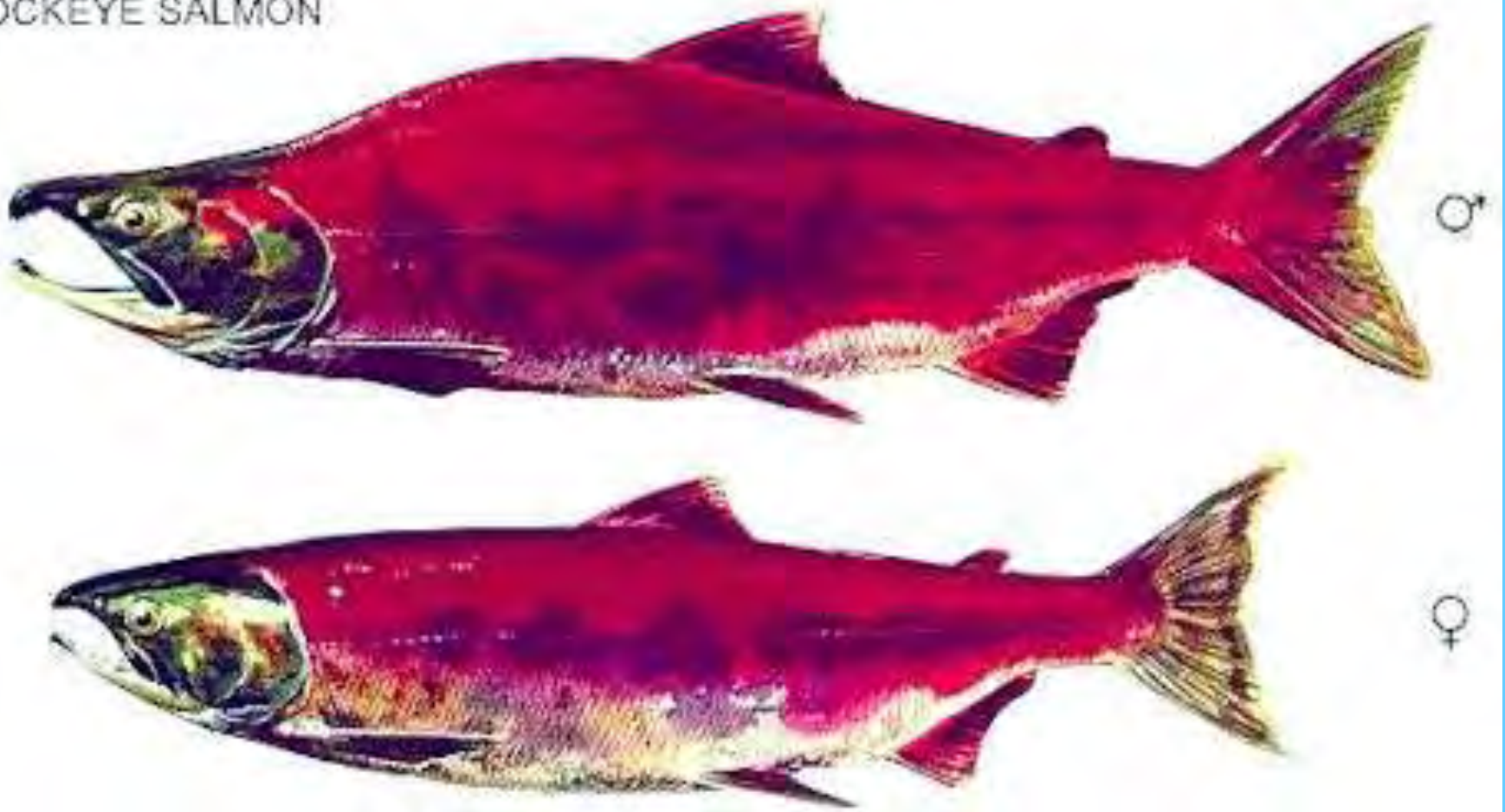
Oncorhynchus keta

CHUM SALMON



Oncorhynchus nerka

SOCKEYE SALMON



Chinook



Size

24-60"

Chum



30-42"

Coho



17-38"

Sockeye



20-28"

Pink



24-60"

Kokanee



10-18"

Cutthroat



up to 30"

Chinook



Spots

Large, splotchy, on top and bottom of tail fin

Chum



No defined spots

Coho



Small and distinct, only on top half of tail

Sockeye



No defined spots

Pink



Large, oval

Kokanee



May have small spots

Cutthroat



Numerous small spots, top & bottom

Chinook



Color

Wide color range
from red to green to
brown

Chum



Red/purple flame
like markings

Coho



Red on belly and gill
covers, green back

Sockeye



Red body, green
head and tail

Pink



Green back, white
belly

Kokanee



Varies red to brown

Cutthroat



silvery





























Any Questions?





