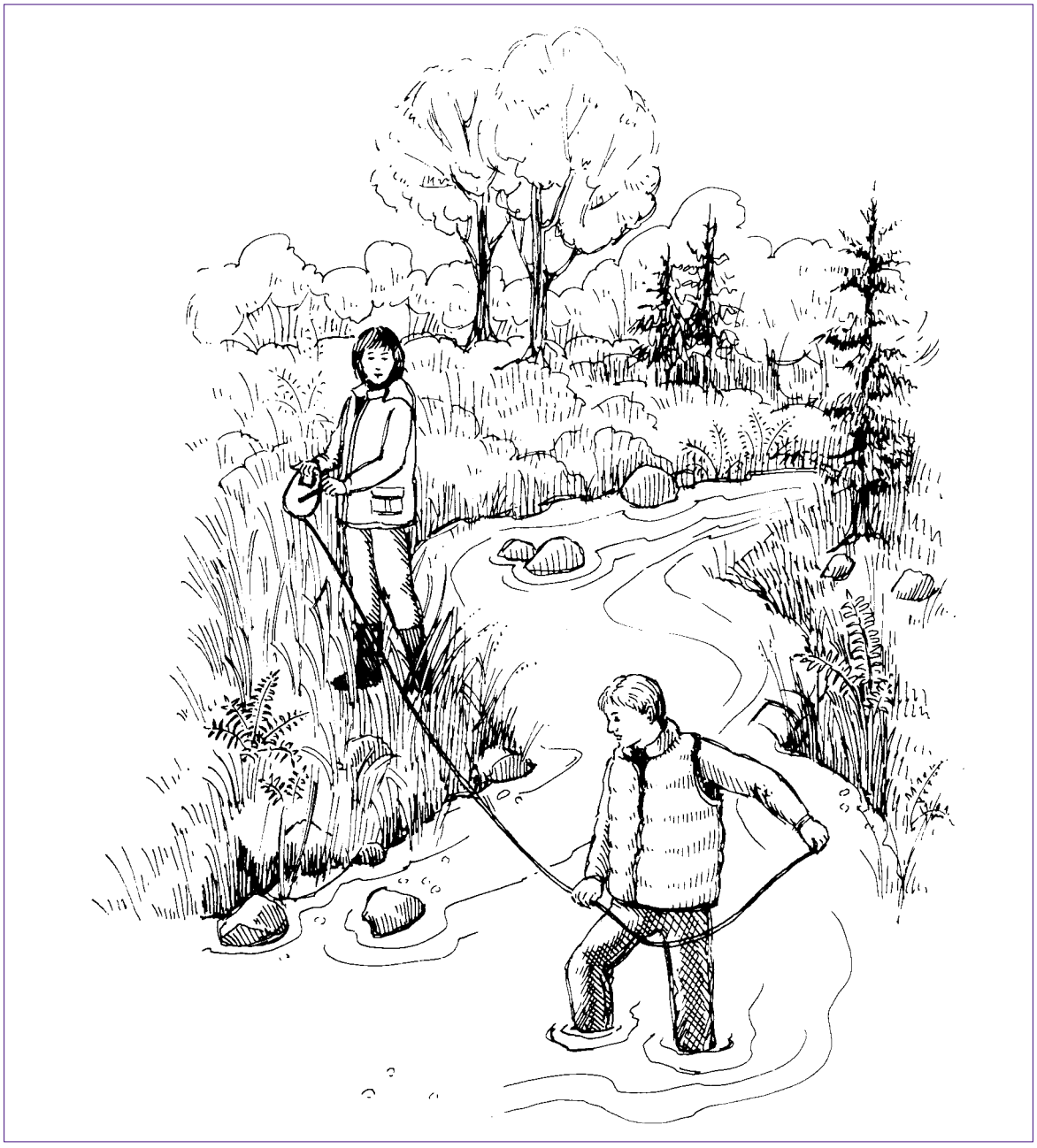
The **Stewardship** Series

The Streamkeepers Handbook

A Practical Guide To Stream And Wetland Care



Canada

Province of British Columbia

STREAMKEEPERS

Module 11
Juvenile Fish Trapping and Identification

Project Approval Required	Training	Time Commitment (per year)	Number of People	Time of Year
Yes	recommended	A half day or more	Two or more	Spring through fall

Fisheries and Oceans Pêches et Océans

Canada

MODULE 11

Juvenile Fish Trapping and Identification

Welcome to the Streamkeepers Program! The Department of Fisheries and Oceans Community Involvement Program provides these Streamkeepers training modules. These modules encourage "hands on" environmental activities in watersheds in British Columbia. Volunteer groups, schools, and individuals are using this material to monitor and restore local waterways. Your local Fisheries and Oceans Community Advisor can provide more information.

Acknowledgments

Brenda Donas and Barry Peters (Community Advisors with the Department of Fisheries and Oceans) and Dave Bates (Instructor, Capilano College) supplied the information for this module.

Project Activity and Purpose

You will learn how to collect and identify juvenile fish using a Gee minnow trap. Many surveys are designed to study salmonid populations, but other species are found in the traps as well. The most common reason for collecting juvenile fish is to find out which species are present, where they live, and how many there are.

There are several methods of collecting fish, and each is chosen for a specific purpose. This module describes how to use a Gee minnow trap. Other methods, such as beach seining, electrofishing, snorkeling, and various fences and traps, also are used to trap fish.

Introduction

Gee traps are manufactured commercially in the United States. They were designed to collect bait fish. You can modify the wire mesh cylinders easily or even make them at home. A Gee trap captures juvenile fish less than 200 mm long. It also selects for specific habitat preference, behaviour, and species, so it does not provide a reliable estimate of total fish numbers. Data from Gee traps are best used to show population trends over time and the presence or absence of individual species.

Many fish species inhabit British Columbia streams and lakes. McPhail and Carveth (1995) describe the species and their distribution in the major drainage systems of the province. The list of families shown in Table 1 is drawn from their work. Figure 1 shows the zoogeographic regions of the province referred to in Table 1. Details of salmonid distribution and ecology are well known, because these species are so important to the B. C. economy. In comparison, little is known about many non-salmonid species. Some require the same environmental conditions as salmonids, while others require different conditions or tolerate a wider range of conditions. You may find dace, sculpins, sticklebacks, suckers, minnows, and other fish in the traps.

Table 1
Distribution of Families of Freshwater Fish in the Eight Zoogeographical Regions of B.C.

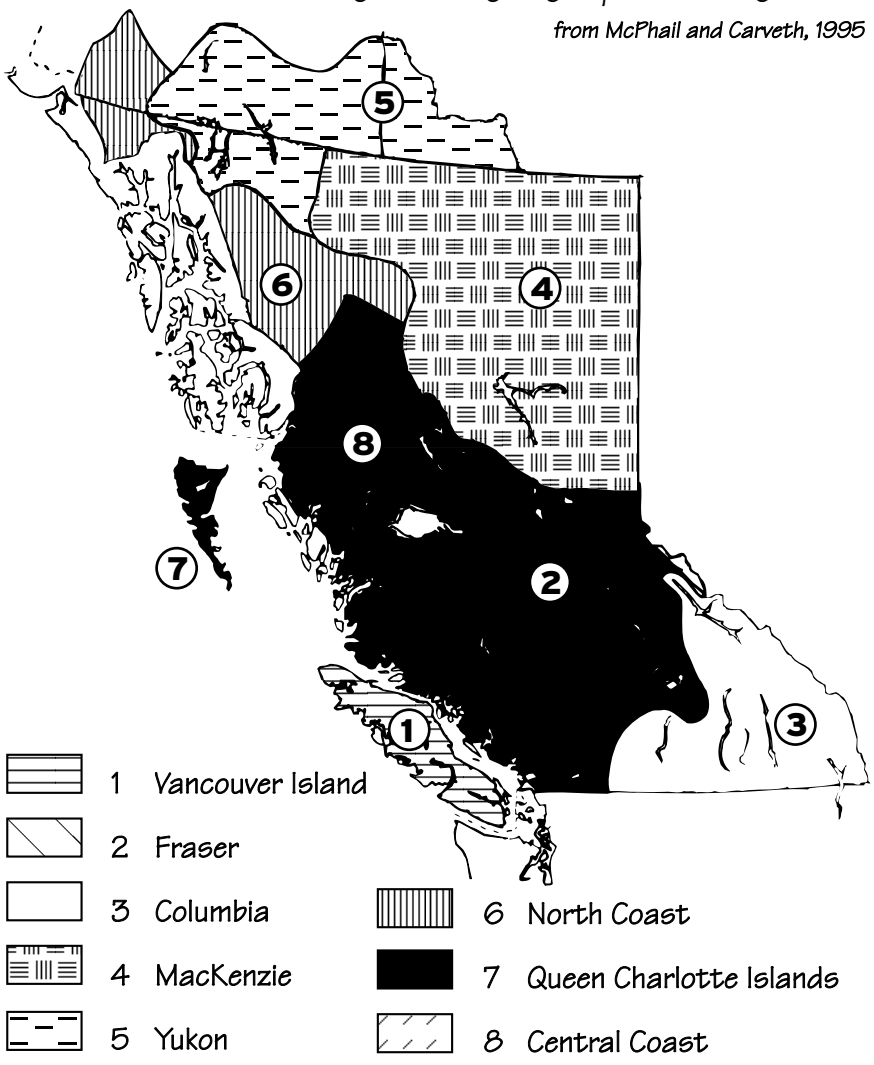
FAMILY	Van-couver Island	Fraser	Columbia	Mac-kenzie	Yukon	North Coast	Qn Char-lotte	Central Coast
Lamprey	X	X				X	X	X
Sturgeon	X	X	X			X		X
Herring	X	X				X	X	X
Minnow		X	X	X	X	X		X
Sucker		X	X	X	X	X		X
Catfish	X	X	X					
Smelt	X	X				X	X	X
Salmonid (salmon, trout, char)	X	X	X	X	X	X	X	X
Salmonid (whitefish)		X	X	X	X	X		X
Salmonid (graylings)			X	X	X	X		
Cod		X	X	X	X	X		X
Stickleback	X	X		X		X	X	X
Sculpin	X	X	X		X	X	X	X
Sunfish, Bass	X	X	X					
Flounder	X	X				X	X	
Perch			X					
Goldeneye				X				
Pike				X	X			
Trout-Perch				X				

Salmon, trout, char, whitefish, and grayling all belong to the salmonid family. They are considered good indicators of a healthy watershed because they require good water quality and habitat. Salmonids are among the first fish to relocate or disappear when an aquatic habitat starts to deteriorate. Documenting their presence helps identify and protect good quality streams and watersheds. Detecting their absence may identify the need for habitat improvement projects.

Salmonid life cycles can be described in general terms, but the details and timing of the stages vary with each species. Even within one species, behaviour can vary from stream to stream. Childerhose and Trim (1979) and Groot and Margolis (1991) describe salmonid biology in detail. Between July and February, pacific salmon return from the ocean to their natal streams to spawn. The eggs hatch into alevins and incubate in the gravel. They emerge as fry, rear for a period

Figure 1
British Columbia's Eight Zoogeographical Regions

from McPhail and Carveth, 1995



ranging from days to years, then migrate to the ocean. Trout spawn during winter or spring, eggs incubate through the spring, and fry emerge in early to midsummer. The life cycle timing of char is similar to salmon. Both trout and char have sea-run races that spend part of their life cycle in the ocean, like salmon.

Your trapping effort will be most successful when you understand the life cycle of the various species. For some species, early spring is best, and for others, any time between spring and fall is fine. The ideal period may be very short for a particular species. If you set the traps too early in the season, some species may still be in the gravel. If you set them too late, many fish will have migrated out of the stream. Chum and pink salmon migrate to the ocean almost immediately after emerging from the gravel and sockeye migrate to a lake. Usually, these species are not sampled using Gee traps, but can be assessed using an adult spawner survey (Module 12). Coho, chinook, steelhead, sea-run trout, and char can spend a year or more in the stream. During spring, both newly emerged fry and older juveniles of these species can be trapped. You will find older juveniles easier to identify than small fry.

Besides providing general information about fish distribution, trapping can answer many other questions. It can show the locations of good fish-rearing habitat, which helps convince planners and others about the importance of a particular water body. It also can provide information about individual species or populations, and whether there are barriers to their migration. Coho and other species are elusive during the spawning stage, so finding juvenile stages in traps confirms the presence of these species. Trapping also helps assess growth, distribution, and survival of hatchery fry-stocking projects.

Project Guidance and Approval

Fry trapping should be done with the guidance of a fisheries biologist. Contact your Community Advisor, or a biologist at DFO or MOELP to discuss the purpose of your proposed project. If your proposal is accepted, you will receive a Scientific Collection Permit. Notify local Fisheries and Conservation Officers before starting to trap. Take a copy of the Scientific Collection Permit with you into the field. Return all juvenile fish to the stream unharmed after you have finished sampling. A Streamkeepers certification course offers training in juvenile trapping.

Level of Effort

The traps usually are set overnight, but in special circumstances they can be set for a shorter period. The effort required varies from a few hours to a day, depending on the number of sites and their locations. It takes a few minutes to half an hour to process the fish in each trap, depending on trap contents and the extent of the information being collected. A large group of people with several traps and locations can survey a much larger part of a watershed.

Time of Year and Working Conditions

Although you can trap fish year round, spring through fall is the best period. Avoid trapping during freezing or extremely warm weather, when fish are easily stressed, injured, or killed. Also, avoid trapping when a stream is in flood. Few fish will enter the traps anyway and stream conditions during floods are not safe for people, either.

Safety

PERSONAL SAFETY

Concern for personal safety is essential when working outdoors. Always tell someone where you are going and when you will return. Work in pairs, never alone. Carry emergency phone numbers for police and ambulance.

Do not attempt to wade fast water or water deeper than your knees. Watch out for slippery stream beds, undercut banks, waterfalls, and fast flowing areas. Log jams can be unstable, so take care to walk around them.

Get permission to cross or use private property. Beware of domestic animals and wildlife.

HEALTH

Do not drink stream water. Although it may look pristine, it can harbour bacteria or parasites that will make you sick. Do not expose cuts and wounds to stream water. Know the symptoms and treatment for hypothermia.

EQUIPMENT

Carry a first aid kit. When working in isolated areas, carry a survival kit containing at least a lighter, fire starter, candle, and flares. Take a cellular phone if you have one.

CLOTHING

Dress for the weather and stream conditions. Wear highly visible clothing. Wear waders with felts when walking in the stream.

Materials and Equipment

waders or boots
3 buckets
thermometer
metric ruler
flagging tape
data sheets
key to identify fish
marking pen
glass jar or other viewing container
magnifying glass (optional)
Gee minnow traps
aquarium dipnets
bait for traps
Alka-Seltzer (anesthetic)
twine
waterproof paper
pencil
first aid kit

Procedure

Check the Stream Inventory Summary System (SISS) for details of salmonid species present in your stream, their life cycles, and their distribution. Your Community Advisor can help you find the information. In many cases, the SISS database contains no information about small streams.

If you plan to study the fish community over a long period, your trapping procedures should be identical from year to year. Make sure that time of year, number of traps, trap locations, bait, soak time, and stream conditions are consistent each year. Record this information on the Field Data Sheet.

THE TRAP

The Gee trap separates into two pieces to allow you to add bait and remove fish easily (Figure 2). You can adjust the trap to catch certain sizes of fish, by covering the trap with fiberglass fly screen to retain small fry, or by enlarging the opening to catch larger fish.

Fresh salmon roe is the best bait. Tie a piece of roe the size of a ping pong ball in a piece of nylon stocking. Suspend it from the top of the trap in front of an opening. If you throw it on the trap floor, fish will pick at it from the outside, but may not enter the trap. Substitute fish-flavoured dry cat food or a punctured tin of wet cat food if you have no roe.

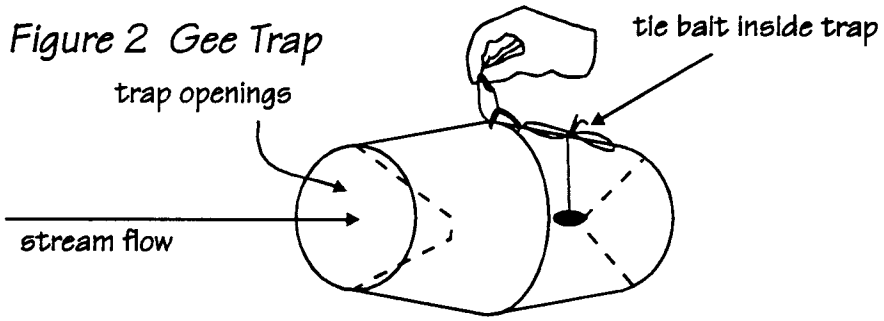


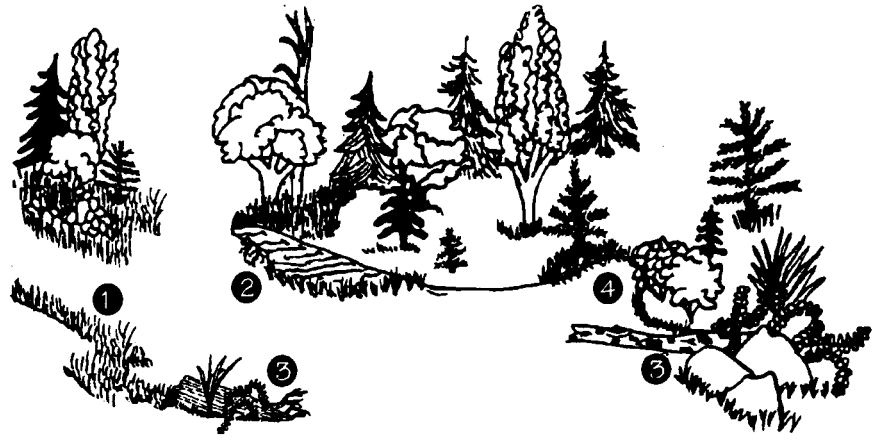
Figure 2 Gee Trap

Step 1. Choose a Site and Set the Trap

Fish trapping usually is part of a larger watershed survey. If the introductory and advanced stream habitat surveys (Modules 1 and 2) have been done, set the traps at reference sites established during these surveys.

Set at least two traps at every suitable location in a reference site. If there are only one or two suitable locations, use more than two traps at each location. Set the traps in slow-moving water near instream cover (Figure 3). Cover is anything that provides a hiding place for fish, such as undercut banks, large stumps, logs, protected pools, and back eddies. Sloughs and side-channels also are good places to set traps. The water should be deep, so the trap can be fully submerged.

Figure 3
Examples of Good Locations to Set a Gee Trap



❶ side channel ❷ cutbank ❸ large woody debris
❹ side pool with overhanging vegetation

Generally, you should not place traps in fast flowing water, because fish will become exhausted swimming against the current and fish that are pinned against the sides of traps can die. You can set a trap in fast-flowing water for a few hours if you are interested in that particular habitat and check the trap every two hours. Never leave a trap in fast water overnight.

Set traps lengthwise in the current. Attach a piece of twine to the eye of the clip holding the two halves of the trap together and tie the other end to a tree. Mark the tree with a piece of flagging tape labeled with the trap number. Write down the trap number and location, so you can find it again. Traps that are abandoned or lost in streams become fish killers.

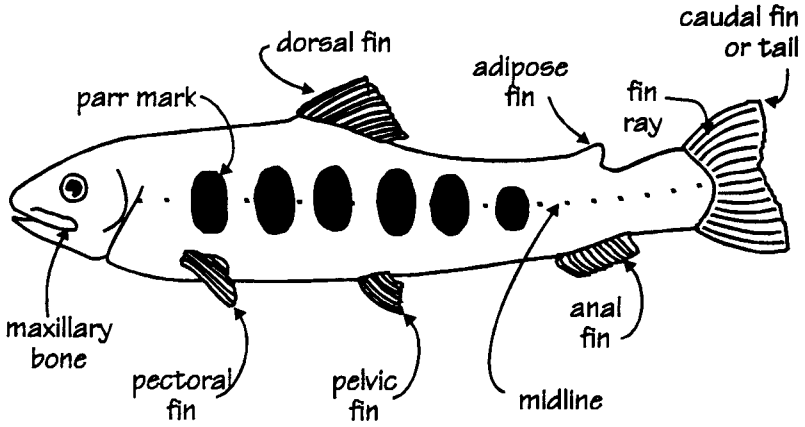
To catch the most fish, set your traps before dusk, and pick them up in the morning, leaving the traps in the stream for about twelve hours. This period is the "soak time." You can use a shorter soak time from late spring to early fall, when water is warmer and fish are more active. Even two hours can be long enough to check for the presence of fish. Never leave a trap in the water for more than twenty-four hours.

Step 2. Identify the Fish

Empty the trap by taking it apart and gently pouring the fish into a bucket of water. Keep the bucket cool and in the shade. Handle the fish very gently and keep them out of water as little as possible. Remove the salmonid species first and identify them using the key in Appendix 1. Catch one fish at a time with a dip net, place it in a glass jar or other clear viewing container, and identify it. Repeat this procedure for non-salmonid species, using the key in Appendix 2. This key identifies all the families of fish in the province. If you wish to identify them to the species level, use the keys in McPhail and Carveth (1995). Record the numbers on the Field Data Sheet. Use a separate data sheet for each sampling site.

Figure 4 shows the features used to identify juvenile salmonids. Juvenile salmonids can be difficult to identify to species, especially at the emergent fry and smolt stages, but with practice you will be able to identify them quickly.

Figure 4
Identification Features for Juvenile Salmonids



If you are interested in fish size, measure length from the nose tip to the tail fork and record the length in millimetres. Use Alka-Seltzer to anaesthetize the fish first. It produces dissolved carbon dioxide. Use one or two tablets for every four litres of water. Since the ideal concentration varies with temperature and water chemistry, experiment to find the right concentration. Dissolve one tablet in four litres of stream water and add one fish to test the strength of the anesthetic. The fish should become disoriented and start to roll over within one or two minutes. If it does not, gradually increase the concentration of Alka-Seltzer. After you find a good concentration, add a few more fish to the bucket. Work quickly and anaesthetize only a few fish at a time. Prolonged exposure to CO2 will suffocate them. When you have finished with a fish, let it recuperate in a bucket of fresh water. Return all fish to the location where you trapped them.

Step 3. Complete the Data Sheets

Fill in the details on the Stream Locations and Conditions Data Sheet. Record the exact survey location, weather, water temperature, turbidity, and percent bankfull. Measure turbidity in a deep pool area, using the tape measure. Turbidity is the maximum depth in centimetres that you see the "one" at the end of the tape. Estimate the percent bankfull: the amount of water compared with the bankfull channel size. The boundaries of the bankfull channel are defined by the edge of perennial vegetation growth. Record the fish species on the Field Data Sheet, along with other data such as length measurements. If a trap catches nothing be sure to record that result as well.

Collecting, Reporting and Evaluating Information

Always keep neat, organized records of your field activities. Send copies of the data to the Streamkeepers Database. The current address is in the Handbook. Also send copies to your Community Advisor and/or the fisheries biologist who has assisted you.

Fish distribution can be patchy. It is common to find lots of fish in one trap and few or none in others at the same site. If you set many traps but catch no fish, investigate the situation further. Fish may be absent from the samples for many reasons. Many species migrate to seasonal rearing or overwintering habitat, so they may inhabit an area for only part of the year. There may be water quality or habitat problems, a barrier to spawner migration, or no returning spawners due to over-fishing. A transient chemical spill in the past may have eliminated fish. Natural recolonization of such areas takes many years, or may never occur. You can find out if the stream is suitable for recolonization or has water quality or habitat problems by conducting the surveys described in Modules 1 through 4.

Public Relations

You can clean up streams, monitor their condition, and undertake enhancement projects, but you need the support of your community for these projects to succeed. Talk about your project with others whenever and wherever you can, including at schools and public meetings. Place signs at visible projects. Contact newspapers, radio stations and television stations. Module 10 contains specific information about increasing community awareness and working with the media.

References

Childerhose, R.J., and M. Trim. 1979. Pacific Salmon. Douglas and McIntyre, Vancouver, BC. 158 pp.

Conlin, K. and B. D. Tutty. 1979. Juvenile Salmonid Field Trapping Manual. Fish. & Marine Serv. Man. Rep. 1530; 136 pp.

Groot, C. and L. Margolis (editors). 1991. Pacific Salmon Life Histories. Univ. British Columbia Press, Vancouver, BC.

McPhail, J. D. and R. Carveth. 1995. Field Key to Freshwater Fishes of British Columbia. Prepared for Aquatic Inventory Task Force of the Resource Inventory Committee, Victoria, BC. 233 pp.

APPENDIX 1:

Key to Identifying Juvenile Salmonids

(from McPhail and Carveth 1995)

APPENDIX 2: Pictorial Key to the Families of Freshwater Fishes

(from McPhail and Carveth, 1995)

Appendix 1

from McPhail and Carveth 1995

Key to Juvenile Salmon, Trout and Char

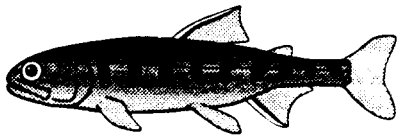
Family Salmonidae (subfamily salmoninae)

1 (10) Anal fin base longer than dorsal fin base; in profile, outer margin of anal fin slants backwards; no distinct dark spots on dorsal fin 2

2 (3) Sides silvery; no parr marks; back iridescent greenish-blue; small fish (usually less than 50 mm in fresh water)
.....PINK SALMON (Oncorhynchus gorbuscha)

3 (2) Parr marks on flanks 4

4 (7) Parr marks in the form of deep bars, the largest marks deeper than the vertical eye diameter 5



5 (6) Adipose fin uniformly pigmented; parr marks variable but the spaces between parr marks usually wider than the marks themselves; anal fin not sickle shaped, white leading edge contrasting sharply with adjoining dark pigment
COHO SALMON (Oncorhynchus kisutch

6 (5) Adipose fin with a clear unpigmented "window"; space between parr marks usually wider than the marks themselves, fin not sickle-shaped, white leading edge of anal fin not contrasting conspicuously with dark pigment CHINOOK SALMON
. . . . . (Oncorhynchus tshawytsch)

7 (4) Parr marks small, oval shaped, none much higher than the vertical diameter of the eye 8

8 (9) Size in fresh water to over 100 m;, parr marks roughly divided in half by mid line, combined width of parr marks much less than half the combined width of intervening light areas; no greenish iridescence on sides below mid line
. . . . . SOCKEYE SALMON/KOKANEE (Oncorhynchus nerka)

9 (8) Size in fresh water less than 500 mm; parr marks faint or absent below mid line; combined width of parr marks more than half the combined width of the intervening light areas
. . . . . CHUM SALMON (Oncorhynchus keta)

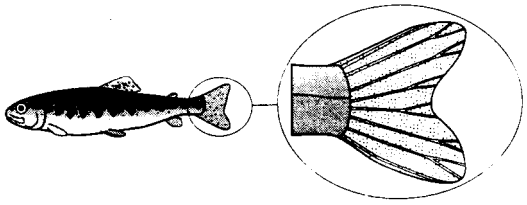
10 (1) Dorsal fin equal to, or longer than anal fin base, in profile, hind margin of anal fin vertical
. 11

11 (17) Numerous distinct dark spots on dorsal fin; in very small specimens only the first dorsal ray may be black 12

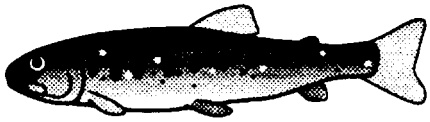
12 (15) Coloured spots (red to yellow) along mid line or between parr marks; combined width of parr marks along mid-line about equal to or greater than the combined width of intervening light areas 13

13 (14) Parr marks usually 8 or 9, the widest about width of eye; no dark spots other than parr marks below midline; adipose fin dusky
. . . . . BROOK TROUT (Salvelinus fontinalis)

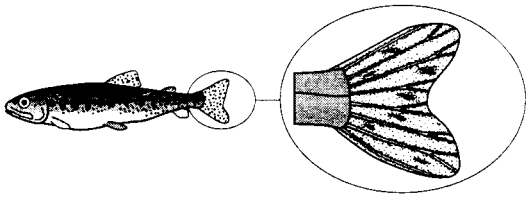
14 (13) No coloured (red to yellow) spots; width of dark areas along mid-line less than width of lighter areas
. 15



15 (16) Few or no spots on tail, on fish less than 50 mm the melanophores are evenly dispersed over the entire tail; hind margin of upper jaw does not reach hind margin of eye; no red or yellow marks under lower jaw
. . . . . RAINBOW TROUT (Oncorhynchus mykiss)

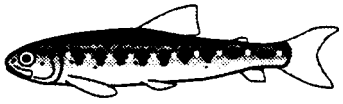


16 (17) About 11 (10-12) parr marks, none as wide as eye diameter; small black scattered spots in addition to parr marks
. . . . . BROWN TROUT (Salmo trutta)



17 (15) Usually black spots on tail, on fish less than 50 mm, melanophores are concentrated between the rays, often forming streaks (precursors of spots); hind margin of upper jaw usually reaches to or past hind margin of eye; often red or yellow marks under lower jaw . CUTTHROAT TROUT (Oncorhynchus clarki)

18 (11) Dorsal fin without numerous dark spots; in very small specimens the first dorsal ray may be dusky but not black. 18



19 (18) Black spots on back and sides; 8-10 regularly shaped parr marks; width of dark areas on mid-line about equal to a width of light areas; a single red dot between each parr mark
. . . . . ATLANTIC SALMON (Salmo salar)

20 (11) No black spots on back and sides, parr marks are irregular blotches; width of dark areas on mid-line greater than width of light areas; parr marks not separated any single red dots 21

21 (22) Parr marks along mid-line are vertical bars with width of dark areas equal to or less than width of light areas; dorsal fin starts about middle of body (excluding tail)
. . . . . LAKE TROUT (Salvelinus namaycush)

22 (21) Parr marks are irregular blotches; with of dark areas on mid line greater than width of light areas; dorsal fin starts in front of middle of body (excluding tail)
. . . . . DOLLY VARDEN & BULL TROUT
. . . (Salvelinus malma or Salvelinus confluentus

** The young of these species can not be reliably identified except biochemically.

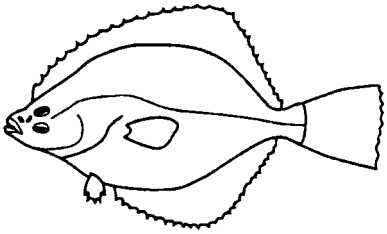
Appendix 2

from McPhail and Carveth 1995

Key to Families of Fish

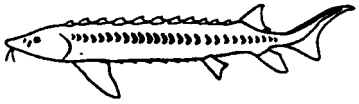
1 (2) Paired fins absent (no pectoral or pelvic fins); mouth in the form of a sucking disk; seven external gill openings . . . . . LAMPREYS (Petromyzontidae)

2 (1) Paired fins present; mouth with normal jaws; a single external gill slit. 3



3 (4) Body flat; eyes on same side of head . . . . . FLOUNDERS (Pleuronectidae)

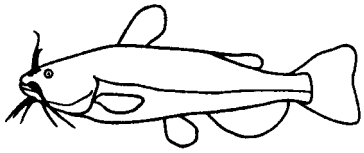
4 (3) Body normal; eyes normal, one on each side of head 5



5 (6) Tail heterocercal (upper lobe much longer than lower lobe); scales in the form of bony scutes arranged in widely separated rows on back and sides . . . . . .STURGEONS (Acipenseridae)

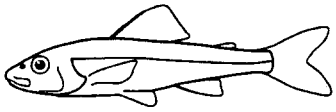
6 (7) Tail not heterocercal; scales either normal or absent. 7

7 (18) Adipose fin present 8



8 (9) Body without scales; 4 pairs of long barbels around mouth . . . . . CATFISH (Ictaluridae)

9 (8) Body with scales; no barbels around mouth 10



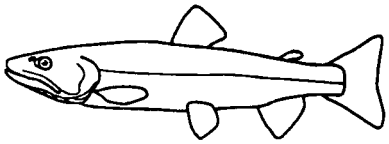
10 (11) Tips of pectoral fins extend well past origin of pelvic fins. . . . . TROUT-PERCHES (Percopsidae)

11 (10) Tips of pectoral fins do not reach origin of pelvic fins 12

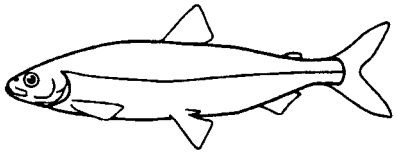
12 (17) Axillary process (small, fleshy spear-like tab at base of pelvic fin) present 13

13 (14) Dorsal fin base large, dorsal origin in front of posterior tips of pectoral fins . . . . . GRAYLINGS . . . . . .(Salmonidae; Subfamily Thymallinae)

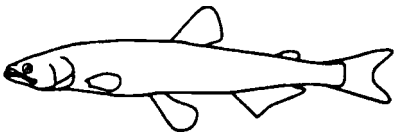
14 (13) Dorsal fin base small, dorsal origin is well behind posterior tips of pectoral fins. 15



15 (16) Scales small, difficult to count with naked eye; well developed teeth in jaws . . . . . .SALMON, TROUT, CHARS . . . . . (Salmonidae; Subfamily Salmoninae)

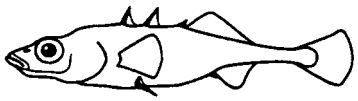


16 (15) Scales large, could be counted with naked eye; teeth in jaws absent or very weakly developed . . . . . .WHITEFISH . . . . . (Salmonidae; Subfamily Coregoninae)



17 (12) No axillary process at base of pelvic fins . . . . . SMELTS (Osmeridae)

18 (7) Adipose fin absent 19

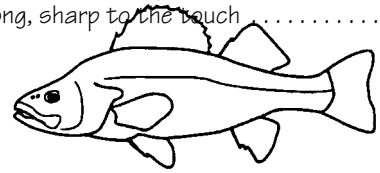


19 (20) Separate spines (usually 3 or more in front of soft dorsal fin) . . STICKLEBACKS (Gasterosteidae)

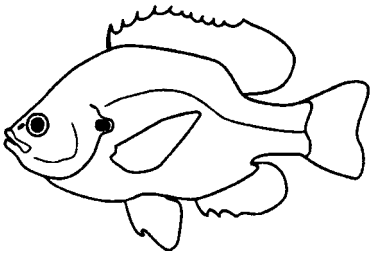
20 (19) Spines in dorsal fin not separate but interconnected by a continuous membrane. 21

21 (26) Two or more spines (may be soft spines clearly visible in dorsal fin) 22

22 (25) Body covered with ctenoid (rough to the touch) scales; 2 or more spines in anal fin; dorsal spines strong, sharp to the touch 23

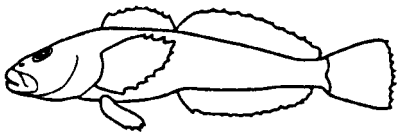


23 (24) Two dorsal fins (spinous and soft dorsals separated at their base) . . . . . PERCHES (Percidae)



24 (23) One dorsal fin (it may be indented); anal fin with 3 to 9 spine

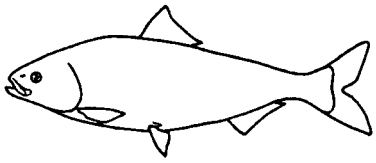
lae)



25 (22) Body without scales (small prickles may be present); no spines in anal fin; dorsal spines weak, soft to the touch . . . . . SCULPINS (Cottidae)

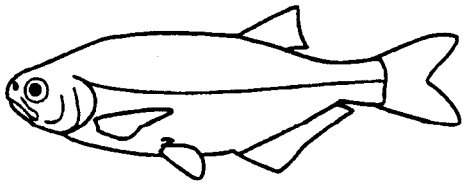
26 (21) No spines in dorsal fin (except for 1 in the carp)

27



27 (28) Scales on the belly in the form of a sharp saw-like keel . . . . . HERRINGS, SHAD (Clupeidae)

29



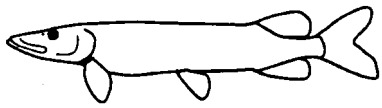
29 (30) Anal fin base more than twice as long as dorsal fin base . . . . . GOLDEYE (Hiodontidae)

30 (29) Anal fin base less than twice as long as dorsal fin base 31

31 (32) Teeth in jaws 34

32 (33) Dorsal and anal fin bases long (at least half the length of the body); single barbel at tip of chin

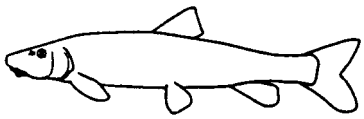
. . . . . .CODS (Gadidae)



33 (32) Dorsal and anal fin bases short (much less than half the body length): snout shaped like a duck's bill

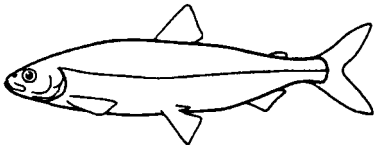
. . . . . PIKES (Esocidae)

34 . . . 35



35 (36) Mouth turned down; lips thick, covered in tiny papillae; distance from snout to anus over 2.5 times distance from anus to caudal fin base

idae)



36 (35) Mouth usually not turned down; lips thin, without tiny papillae; distance from snout to anus less than 2.5 times distance from anus to caudal fin base

. . . . . MINNOWS (Cyprinidae)

send the data to the Streamkeepers Database

STREAM LOCATION AND CONDITIONS

(use a new data sheet for each stream segment surveyed)
(see Module 1 for additional information)

Stream Name	**Date**
Watershed code	**NTS Map#**
Organization name	**Crew size**
Contact name	**Phone#**

Recent weather conditions	**Water turbidity (cm)**
Water temperature (^{o}C) ***(Leave thermometer in water 2 min.)***	**Air temperature (^{o}C)**
Stream condition (% bankfull)	**Photos taken: (yes or no)**

Upstream boundary (directions, distance to known landmark)
Downstream boundary (directions, distance to known landmark)
IF YOU ARE SAMPLING A SPECIFIC POINT ON THE STREAM, RECORD: **Specific location of sampling station (directions, distance to known landmark):**

send the data to the Streamkeepers Database

MODULE 11:
JUVENILE FISH TRAPPING FIELD DATA SHEET

Stream name	**Date**

COMMENTS

Trap # / bait used	**Location**	**Time set**	**Time re-trieved**	**species**	**Length (mm)**