Drizzle Lake, Graham

Drizzle Lake

Ref. No.: 150

APPLICATION FOR ECOLOGICAL RESERVE

1. Legal description of the area (or general description).

2. Geographical location (relate to nearest settlement, mountain, river, etc.)

   Drizzle Lake lying 5½ miles SSE of Masset, Q.C.I., B.C.

3. Indicate the biogeoclimatic zone of which the reserve is representative.

   Coastal Western Hemlock Zone

4. Approximate total acreage.

   303⅘ acres.

5. Purpose of the reserve.

   (a) Primary:
   To protect and preserve undescribed endemic species of Brackish Stickleback Gasterosteus which is apparently the only freshwater fish species restricted entirely to British Columbia. The 303⅘ acres requested would protect the present quality of all waters draining into the lake.

   (b) Others if any

   (c) Buffer areas.

6. Map attached.

7. Descriptive account attached.

Signature A. E. Peden (S.N)
I.B.P. Surveyor

1972

I.B.P. #106

SECTION CT: CONSERVATION OF TERRESTRIAL BIOLOGICAL COMMUNITIES

CHECK SHEET (Mark VII) FOR SURVEY OF IBP AREAS*

To be completed with reference to the GUIDE TO THE CHECK SHEET

Serial Number | | | | | | | |

For Data Centre Use only

1. 1. Name of surveyor ..... Alex E. Peden

2. Address of surveyor .. B. C. Provincial Museum
   Victoria, B.C.
   Canada

3. Check Sheet completed (a) on site .... (b) from records .. XX

4. Date Check Sheet completed .... 1972 ?

2. 1. Name of IBP Area .... Drizzle Lake

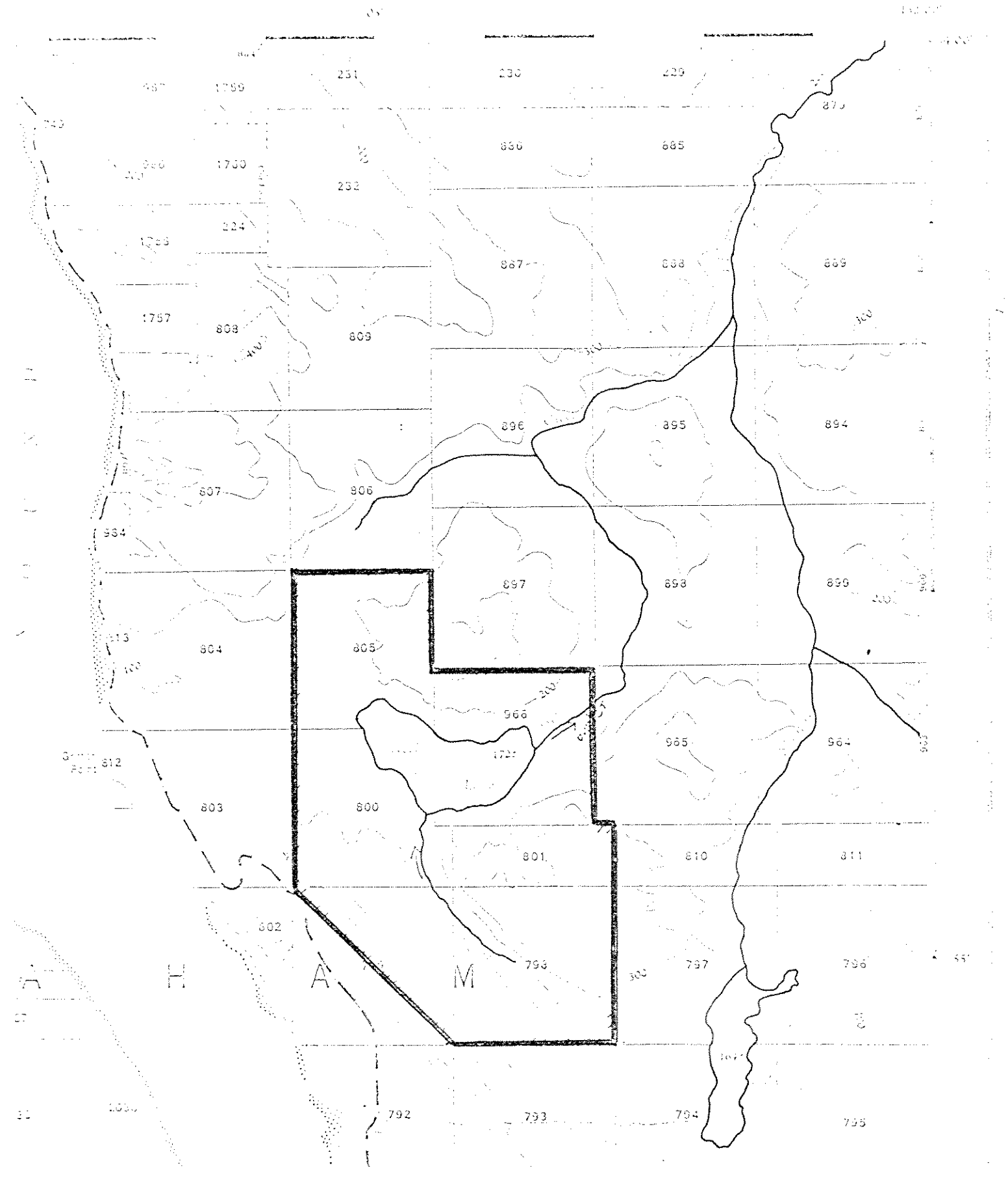
2. Name of IBP Subdivision (or serial letter) ....

3. Map of IBP Area* showing boundaries attached? Yes .XX... No ....

4. Sketch map of IBP Area*. Please mark direction of north, the scale and grid numbers where applicable.

See attached map segment from
Masset Sound Sheet
B.C. Dept. Lands and Forests
103 F/16 E
Second edition, 196?

* For "IBP Area", read IBP Area and/or IBP Subdivision.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Centre Use only

3. **Location of IBP Area***

1. Latitude ....53.....° ...56!..... N Longitude 132.....° ....04!..... W
2. Country ..Canada.....
   State or Province ..British Columbia..... County .....
   (State or Province ..... County .....)

4. **Administration**

National 1. Official category .....

2. Address of administration .....
.....
.....
.....
.....

International Class

3.

Included in U.N. List	Rejected from U.N. List	Area with formal conservation status	No formal cons. status
(A)	(B)	(C)	(D)

5. **Characteristics of IBP Area***

1. Surface area (state units of measurement) ...3034..acres.....
2. Altitude (state units of measurement) Maximum .....300...feet.....
   Minimum .....172± feet.....

6. **Climate**

Nearest climatological station :

1. Name .....Masset.....
2. Climatological station on IBP Area*? Yes ..... No ..X....
3. If (2) not, distance from edge of IBP Area* (state units) .....5 or 6 miles.....
4. Direction from IBP Area* .....Northwest.....
5. Additional data sheet attached? Yes ..... No .....X.

Centre Use only

9. Landscape

1. General Landscape (give brief description) ...Shallow brown-stained lake.....
...and creek, some coniferous forest and raised bog community.....
.....
.....

2. Relief Type

	Flat	Undulating (0)-200 m.	Hilly 200-1000 m.	Mountainous > 1000 m.	%
Sharply dissected					
Gently dissected	50	50			100
Incised					
Skeletonised					
%	50	50			100%

3. Special landscape features (list) .....
.....
.....

10. Coastline of IBP Area*

1. Protected bays and/or inlets — Many [ ] Few [ ] None [ ]

2. Substratum. % of coast

Rock	Boulder Beach	Shingle Beach	Sand Beach	Shell Beach	Mud	Coral	Ice

3. Physiography. % of coast

Cliffed	Sloping	Flat

4. Special Coastal Features (list) .....
.....
.....

5. Tide. Maximum range (state units of measurement) .....

6. Total length of coastline :

Less than 1 km. [ ] 1-10 km. [ ] Above 10 km. [ ]

14. **Outstanding Floral and Faunal Features**

1. None .....

2. Fauna

	Species diversity	Abundance of individuals	Superabundance of individuals	Rare species	Threatened/Relict species	Spp. of biogeographical interest	Exceptional Associations	Breeding or Nesting Populations	Migrating Populations	Wintering Populations		
Mammalia												
Aves	X											
Reptilia												
Amphibia												
Pisces		XX										
Insecta	X											

3. Names of main threatened, endemic, relict and rare species

Gasterosteus sp. undescribed. Species parapatric with Gasterosteus aculeatus and endemic to Q.C.I.

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11. **Freshwater within IBP Area***

1.

	Permanent	Intermittent
General		
Standing	XX	
Running	XX	

2. Standing Water

	Permanent	Intermittent	Unproductive	Productive
Swamps	X			
Ponds	X			
Lakes	X			

3. Running Water

	Permanent	Intermittent
Springs, cold	X	
Springs, hot		
Streams		
Rivers		

4. Special freshwater features .....

.....

12. **Salt and Brackish Water within IBP Area***

nil

Salt Lakes		Lagoon		.....	
Estuaries		Salt pools		.....	

13. Adjacent Water Bodies (not within IBP Area*)

1. Fresh [X] Lake [X] River [X] Stream [X]

2. Salt and Brackish

Estuary	Salt lake	Salt pool	Lagoon	Ocean		
				X		

Centre Use only

4. Flora

	Species diversity	Abundance of particular species	Rare species	Threatened/relict species	Spp. of biogeographical interest	Exceptional associations	Outstanding specimens				
Angiospermae :											
trees	X										
shrubs	X										
herbs	X										
grass	X										
Gymnospermae		X									
Pteridophyta		X									
Bryophyta	X										
Lichens and Algae	X										

5. Names of main threatened, endemic, relict and rare species

.....

.....

.....

15. Exceptional Interest of IBP Area*

A unique species of Gasterosteus endemic to O.C.I.

.....

.....

.....

.....

16. Significant Human Impact

1. General : None in entire IBP Area* .....

None in part of IBP Area* .....XX.....

Impact on entire IBP Area* .....

2. Particular

	Past impact	Present impact	Trend			
			Increasing	Decreasing	No change	No information
Cultivation						
Drainage						
Other soil disturbance						
Grazing						
Selective flora disturbance						
Logging						
Plantation						
Hunting		XX	XX			
Removal of predators						
Pesticides						
Introductions — plants						
Introductions — animals						
Fire						
Permanent habitation	XX	XX		XX		
Recreation and tourism						
Research						

3. Additional details on each type of impact attached?

Yes ...XX.... No .....

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17. **Conservation Status**

	Protection			Utilisation			Conservation Management			Permitted Research		
	none	partial	total	none	controlled	uncontrolled	none	to alter status	to maintain status	experimental	observational	prohibited
Flora	XX			XX								
Fauna	XX			XX								
Non-living	XX			XX								

18. **References**

1. List major biological/geographical references for the IBP Area.

   Sheet attached? Yes ..... No .....

2. List main maps available for the IBP Area.

   List attached? Yes ..... No .....

3. Aerial photographs for the IBP Area available?

   For whole area ..... For part of area ..... None .....

19. **Other Relevant Information**

See attached report.

A.E.Peden

Signed ....

(Surveyor)

PROPOSAL OF DRIZZLE LAKE AS AN ECOLOGICAL RESERVE

Drizzle Lake could provide an additional or alternative reserve to the one proposed for Mayer Lake. Previous trips to the lake by G.E.E. Moodie and D.W. Hagen indicated the presence of large black Queen Charlotte Sticklebacks; however, these unusually large and swift specimens were difficult to capture. Peden and Moodie visited the lake in June of 1972 and captured very large numbers with a larger 50' seine. Unfortunately, either the weather was poor or our cameras malfunctioned, thus preventing adequate photographic record of the locality.

Advantages for a reserve at Drizzle Lake

1. The lake and drainage system is relatively small.
2. The lake is relatively inaccessible to the public. It takes about one hour while using a hand compass to walk through thick forest and bogs from the nearest road to the lake.
3. Except for a few crumbling log cabins, there are few signs of human activity at the lake.
4. The timber in the area appears to be rather scrubby and of little commercial use.
5. Black sticklebacks (See Fig. 21) appear to be very numerous. Many salmonid fishes are also present in the lake.
6. This is the only locality other than Mayer Lake where Black Queen Charlotte and typical freshwater sticklebacks have been found living in the same body of water.

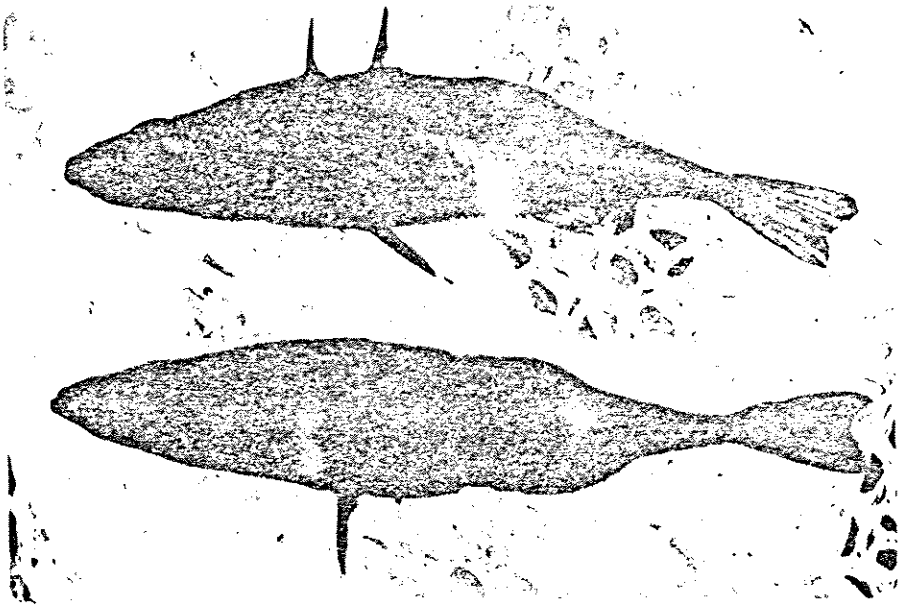

Fig. 21

Fig. 21. Black sticklebacks freshly caught in Drizzle Lake. This extre-ely dark colour with bluish light reflection is typical of the Gasterosteus caught here. (The lower fish depressed its spines on its back before a photo could be taken.)

Disadvantages of a reserve at Drizzle Lake

1. No major studies have yet been made on the stickleback population here. Except for the smaller size of the lake all that can be said is that the situation in respect to sticklebacks appears to be quite similar to that found in Mayer Lake.

2. The small creek system at the south end was sampled only with difficulty and very few typical freshwater Gasterosteus were captured by using either seines or a limited amount of fish toxicant. Traps or other such gear will be needed to sample this creek population adequately.

Description of Drizzle Lake region

Drizzle Lake is a small and apparently shallow lake about a mile long and one half mile wide. It lies at an elevation of 172 feet and its brown-stained waters flow to the northwest to join the Skonun River and eventually to the the north coast. The shoreline possesses extensive pebble beach and bottom habitats where black sticklebacks probably nest. In some areas the raised bog and coniferous vegetation produces a relatively vertical bank that overhangs the shallow pebble bottom. The creek draining into the south end where typical freshwater Gasterosteus was found is deep with overhanging raised bog and coniferous vegetation. It had very little flow at the time of our visit and possessed a bottom of mud and organic ooze.

Although the relatively flat terrestrial habitat needs to be surveyed by botanists or other qualified non-ichthyologists, it was our impression that the raised bog habitat predominated

more than it did at Mayer Lake. Otherwise, the vegetation appeared fairly similar according to our non-botanical viewpoint.

Fauna observed at Drizzle Lake

Sticklebacks, Gasterosteus (two species)
Dolly Varden, Salvelinus malma
Cutthroat trout, Salmo clarki
Coho salmon, Oncorhynchus kisutch
Sitka deer, Odocoileus herionus sitkensis

Present and potential use

We saw no signs that the lake is being used in any way by modern civilization. On the highway running between Masset and Port Clements there is an extensive gravel pit near the proposed boundary of the ecological reserve. On the day of our visit to the lake we witnessed the first strip of asphalt paving being laid between each town. The long abandoned log cabins near the lake indicated trapping and hunting were probably pursued here in the early days. Drizzle Lake could have potential as a park under conditions similar to those described for Mayer Lake. However, the absence of human contamination here increases its value greatly as an ecological reserve.

Three Proposed Ecological Reserves For Sticklebacks (Gasterosteus) On The Queen Charlotte Islands

by Alex E. Peden

The three-spined stickleback (Gasterosteus aculeatus) is an abundant circumpolar species inhabiting marine and fresh waters from arctic coasts to as far south as Baja California and Hokkaido, Japan, in the Pacific Ocean as well as Chesapeake Bay and the Mediterranean area in the Atlantic. Great interest by both American and European behaviorists, morphologists, physiologists, and taxonomists has centered on the differentiation between freshwater and marine populations along the coasts of each continent. Whether the populations represent two separate species or merely just a single variable one is the subject of much controversy.

Recent investigations have shown many freshwater populations on the Queen Charlotte Islands are more variable than has been found elswhere in British Columbia. One of these, the Queen Charlotte Black Stickleback inhabiting Mayer Lake, is apparently the only freshwater species of fish whose geographic range lies entirely within our province. Other lakes of the region also possess black coloured sticklebacks with each population showing different levels of morphological divergence from typical freshwater Gasterosteus aculeatus, but in most of these lakes, only one type of stickleback is known. When situations are found where two different populations coexist in the same area (i.e., sympatry) and few or no hybrids exist, biologists have an impor-

tant criterion for recognizing the presence of two species. Because such a situation exists between black and typical freshwater Gasterosteus in the Mayer Lake region (see G.E.E. Moodie, 1972, in Canadian Journal of Zoology 50: 721-732) while the differentiation of the black form appears to be greater here than in other lakes, this locality is the most ideal one to set aside as an ecological reserve for Gasterosteus.

Because the area needed for a reserve at Mayer Lake might be considered a little large and there is some human impact on its environment, I am also proposing a reserve for the smaller and more isolated Drizzle Lake region. This is the only other lake where we know that both Black and typical Gasterosteus may be found; however, the typical freshwater form is not abundant.

As yet, a scientific name is not available for the endemic Black Stickleback on the Queen Charlotte Islands. Some researchers feel that the naming of such forms of Gasterosteus should await clarification of the confused nomenclature of the genus. Moodie notes that recognition of the species should await demonstration of the existence of selection against the few hybrids found at Mayer Lake.

Although several lakes could be set aside to provide examples of the divergence found in the typical Gasterosteus aculeatus on the Queen Charlotte Islands, Boulton Lake possesses by far the most unique population and for this reason I wish to seek protection for this locality also.

Before discussing each situation at Mayer, Drizzle, and Boulton Lakes, the following description of typical freshwater

and marine G. aculeatus is provided as background information. (I have quoted liberally from Moodie, Hagen, Reimchen and others in this report. Additional information was obtained during hurried trips by Peden and Moodie in June, 1972.)

MORPHOLOGY

Figures 3-8 provided in the proposal for Mayer Lake illustrate more typical Gasterosteus aculeatus. The genus can normally be identified from other fishes by the presence of two large spines isolated in front of the dorsal fin on the back and two stout spines representing pelvic fins on the abdomen. Although some characters may be altered by environmental conditions during growth, most of the characters discussed here are considered to be largely of genetic origin. Studies on Gasterosteus from southern British Columbia indicate marine and freshwater G. aculeatus differ as follows (Queen Charlotte populations apparently have similar differences):

	freshwater form (leiurus)	marine form (trachurus)
No. of lateral plates	3-7	30-35
Lateral keel on caudal peduncle	absent	present
No. of gill rakers on first arch	12-19	18-25
Size of breeding adults	smaller (3.4 cm. average size)	larger (5.7 cm. average size)
Relative body depth	deeper (about 3.7 times in length)	slimmer (4.3 times in length)
Colour of non-breeding adults	mottled olive with indistinct bars	silvery

LIFE HISTORY

As would be expected, marine Gasterosteus spend much of their life in the sea whereas the freshwater form spends its entire life in freshwater. Those inhabiting marine waters migrate to streams and rivers for reproduction in late spring and summer. The breeding area of marine sticklebacks is in the lower reaches of streams on a sandier and more vegetated substrate whereas freshwater sticklebacks tend to occur farther upstream and breed on muddier bottoms with less water current. At the onset of the breeding season, males of each type develope bright red throats, construct a nest, breed with one or several females, and guard the territory around the nest until the eggs hatch and fry become free-swimming. Marine sticklebacks are reported to live about one year while the freshwater ones apparently live two years (some G. aculeatus near Mayer Lake are reported to have survived through at least three summers).

BEHAVIOUR

Ethologists have used Gasterosteus aculeatus as a convenient laboratory animal and found an intricate series of behaviours between male and female before reproduction. In association with this activity, both marine and freshwater males possess bright red pigment on the breast and chin region and defend territories around the nest site. Classic experiments showing the reaction of sticklebacks to painted models demonstrate that red colour elicits strong agonistic behaviour between breeding males.

Absence of red on Queen Charlotte Black Sticklebacks is most notable and indicates possible behaviour differences between black and normal sticklebacks.

HYBRIDIZATION AND GENETICS

Hybrids between freshwater and marine sticklebacks are quite common as they are between many other species of freshwater fishes. Such hybrids are intermediate in their morphology and can reproduce readily among themselves or even backcross with either parental type. Most significantly, hybrids tend to be restricted to narrow zones between the upstream freshwater and downstream marine stickleback habitats. Studies in British Columbia indicate that selection occurs against hybrids which stray into the wrong habitat and therefore ecological factors are the principal ones preventing the genetic intermingling of each type of stickleback.

Laboratory experiments indicate the principle characters distinquishing freshwater and marine sticklebacks are polygenetic. Although similar detailed studies have not been done on Black Queen Charlotte Sticklebacks, the characters used to differentiate them from typical freshwater sticklebacks are similar and thus for the moment assumed to be controlled genetically with little environmentally induced variation.

QUEEN CHARLOTTE ISLAND ENDEMISM

The Queen Charlotte Island region is the main area in British Columbia possessing many endemic organisms and has

been discussed extensively by Foster, and Calder and Taylor. Discussion centers on whether or not the endemic forms have differentiated before, during or since Pleistocene glaciation. Moodie indicates that Gasterosteus is a very variable and adaptable organism and the differences found in black sticklebacks are of a magnitude that could have evolved in the characteristic brown waters of the Queen Charlotte lowlands since the Pleistocene. As a part of the endemic fauna of the Queen Charlotte Islands, black sticklebacks are certainly worth maintaining for study in the ecological reserve system.

GENERAL REFERENCES

On three-spined sticklebacks:

Greenbank, J. and P.R. Nelson. 1959. Life history of the three-spine stickleback Gasterosteus aculeatus Linnaeus in Karluk Lake and Bare Lake, Kodiak Island, Alaska. U.S. Fish Wildl. Serv. Fish. Bull. No. 153.

*Hagen, D.W. 1967. Isolating mechanisms in threespine sticklebacks Gasterosteus. J. Fish. Res. Bd. Canada 24: 1637-1692.

Hagen, D.W. and L.G. Gilbertson. 1972. Geographic variation and environmental selection in Gasterosteus aculeatus in the Pacific Northwest, America. Evolution 26: 32-51.

*Hagen, D.W. and J.D. McPhail. 1970. The species problem within Gasterosteus aculeatus on the Pacific Coast of North America. J. Fish. Res. Bd. Canada 27: 147-155.

Heuts, M. 1947. Experimental studies on adaptive evolution in Gasterosteus aculeatus L. Evolution 1: 89-102.

Heuts, M. 1947. The phenotypic variability of Gasterosteus aculeatus L. populations in Belgium. Klarse Der Wetenschappen, Jaargang IX, No. 25.

Hoogland, R., D. Morris, and N. Tinbergen. 1956. The spines of sticklebacks (Gasterosteus and Pygosteus) as a means of defense against predators (Perca and Esox). Behaviour 10: 205-236.

Iersel, J. Van. 1953. An analysis of the parental behaviour of the three spine stickleback (Gasterosteus aculeatus L.). Behaviour Suppl. 3.

Lindsey, C.C. 1962. Experimental study of meristic variation in a population of threespine sticklebacks, Gasterosteus aculeatus. Canadian J. Zool. 40: 271-312.

McPhail, J.D. 1969. Predation and evolution in a stickleback (Gasterosteus). J. Fish. Res. Bd. Canada 26: 3183-3208.

*Miller, R.R. and C.L. Hubbs. 1969. Systematics of Gasterosteus aculeatus, with particular reference to inter-

gradation and introgression along the Pacific Coast of North A-erica: a co--entary on a recent contribution. Copeia 1969: 52-69.

*Moodie, G.E.E. 1970. Predation as a mechanism in the evolution of sticklebacks in the Queen Charlotte Islands, Canada (Pisces: Gasterosteidae). Ph.D. Thesis, Dept. of Zoology, University of Alberta.

*Moodie, G.E.E. 1972. Morphology, life history, and ecology of an unusual stickleback (Gasterosteus aculeatus) in the Queen Charlotte Islands, Canada. Canadian J. Zool. 50: 721-732.

*Moodie, G.E.E. 1972. Predation, natural selection and adaptation in an unusual threespined stickleback. Heredity 28: 155-167.

Mullen, P.J. Van, and J.C. Van Der Vlugt. 1964. On the age, growth and migration of the adadro-ous stickleback Gasterosteus aculeatus L. investigated in -ixed populations. Arch. Neerl. Zool. 16: 111-139.

Munzing, J. 1963. The evolut on of variation and distributional patterns in European populations of the three-spined stickleback, Gasterosteus aculeatus. Evolution 17: 320-332.

*Reimchen, T.E. (Unpublished). Selective agents and variation in the Queen Charlotte sticklebacks (Gasterosteus).

(Class study done at University of Alberta. To date this is the only documentation of the spineless stickleback population at Boulton Lake and intended for very limited distribution. A more detailed study is in progress.)

On other fauna:

Foster, B.J. 1965. The evolution of the mammals of the Queen Charlotte Islands, British Columbia. Occasional Paper of the British Columbia Provincial Museum 14: 1-130.

On the flora:

Calder, J.A. and Roy C. Taylor. 1968. Flora of the Queen Charlotte Islands: Part I. Systematics of the vascular plants. Monograph of Canada Department of Agriculture, Research Branch 4: 1-659. (Note: Gold Creek mire habitat on the proposed Mayer Lake reserve is photographed on page 74.)