

NINESPINE STICKLEBACK

Pungitius pungitius Linnaeus, 1758
(Gasterosteidae)

Global rank G5 (20Sep1996)
State rank S4S5 (07Jul2004)

State rank reasons

Apparently widespread and abundant in mainland coastal areas. However, noted declines in unique and reproductively isolated populations in Southcentral Alaska warrant concern; needs study. Potential threats include introduction of predatory fishes (i.e. northern pike) to isolated lakes and degradation of water quality.

Taxonomy

Haglund et al. (1992) examined allozyme variation in ninespine sticklebacks and concluded that the North American population is a species (*P. occidentalis*) distinct from European *P. pungitius*. Haglund et al. (1992) regarded Palearctic *P. platygaster*, *P. tymensis*, and *P. sinensis* as distinct species and noted that many regard *P. sinensis* as conspecific with *P. pungitius*. See Haglund et al. (1992) for further discussion of the taxonomy of Asian *pungitius*. McPhail (1963) described two "forms" (coastal and inland) that were, however, considered unworthy of taxonomic recognition due to the slight level of divergence and the occurrence of intergradation in areas of contact (coastal form has more numerous dorsal spines and lateral plates and fewer gill rakers). These evidently survived glaciation in different refugia (Beringian and Mississippian, respectively). Commonly placed in genus *Pygosteus* by European workers (Lee et al. 1980).

See McLennan (1993) for a phylogenetic analysis of the Gasterosteidae based on behavioral characters.

Keivany and Nelson (2000) classified North American forms in *P. pungitius* and recognized five subspecies, with *P. p. accidentalis* the form occurring in Alaska from Cook Inlet to the Arctic, and *P. p. pungitius* the form expected along the Aleutian Islands (Mecklenburg et al. 2002).

General description

Sticklebacks typically have a slender, elongate body with bony scutes instead of scales on the sides. Ninespine are characterized by having isolated dorsal fin spines, usually 9, angled alternately to left and right. Color varies from olive



to light brown dorsally, darker mottling or blotches laterally, yellowish to silvery white ventrally. Breeding colors are variable as well; males turn black on belly and chin. Female colors always less intense than male (Mecklenburg et al. 2002).

Length (cm) 9

Reproduction

Spawns in spring and summer (May through July in Alaska). Male fans eggs and guards young. Sexually mature at age 1-2. Few live more than 3 years. Females may spawn twice each season (Becker 1983). Promiscuous spawning observed in both sexes (Griswold and Smith 1972). Females in most populations probably produce multiple clutches of eggs during a spawning season (Heins et al. 2003).

Ecology

Marine, brackish and freshwaters; anadromous and resident freshwater forms. Coastal populations may occur in brackish water, species is seldom found in full seawater; is generally considered a freshwater form (Morrow 1980, Haglund et al. 1992). They are a major prey source for piscivorous birds. Their interesting behavior, including nest building and guarding of eggs and fry by males, wide range of salinity tolerance, phenotypic response to environmental factors and genetic diversity make them a much studied species (Mecklenburg et al. 2002).

Migration

Migrates between spawning and nonspawning habitats in some areas (Scott and Crossman 1973).

Food

Eats mainly small crustaceans and aquatic insects; sometimes also fish eggs and fry (Becker 1983).

Phenology

Diurnal but migrations are mostly nocturnal (Harvey et al. 1997).

Global habitat

Cool quiet waters of ponds, lakes, estuaries, and streams; usually in shallow vegetated areas,

sometimes in open water over sand. In lakes, may occupy deep water in winter, shallows in summer. Marine populations occur near shore. Spawns in fresh water; estuarine populations move into creeks and streams to spawn. Eggs laid in nest made by male among rocks or plants.

State habitat

Low-lying lakes and streams. Many unique populations exist in lakes without inlets or outlets. Habitats are likely in near pristine condition except in developed areas (i.e. Southcentral Alaska).

Global range

Arctic and Atlantic drainages across Canada and Alaska and south to New Jersey; Pacific coast of Alaska; Great Lakes basin; Eurasia (Page and Burr 1991). North American and Palearctic populations were regarded as specifically distinct by Haglund et al. (1992).

State range

Found from the Kenai Peninsula side of Cook Inlet, into the Mat-Su valley, west and north along the coast to the Bering and Beaufort Seas, and are reported on St. Lawrence Island, Kodiak Island and the Aleutian Chain (Scott and Crossman 1973, Wootton 1976, Morrow 1980). Do not penetrate far inland in Alaska and are absent from Southeast Alaska (Mecklenburg et al. 2002).

Global abundance

Abundant throughout most of its range.

State abundance

Abundant in lowland lakes and streams, as well as marine and brackish water (Morrow 1980, Fruge et al. 1989, West and Fruge 1989, Wiswar 1991, 1992, 1994, Underwood et al. 1992, Moulton 1996). Some unique populations may be threatened, particularly in Southcentral Alaska.

Global trend

Stable.

State trend

Little information, but thought to be abundant and stable. Some unique populations may be declining in Southcentral Alaska. Requires further study.

State protection

Habitat protected where species occurs in Katmai and Gates of the Arctic National Parks and in the

Alaska Peninsula/Becharof, Izembek, Kenai, Koyukuk, Togiak, Yukon-Delta, Arctic, and Nowitna National Wildlife Refuges.

Global threats

This species faces eradication programs to improve sport fishing for competitor salmonid fishes. See State threat comments below.

State threats

Predation by northern pike is leading to population declines and potential extinction of unique forms. Stocking or introduction of other predatory and competitive fishes (e.g. salmonids, rainbow trout) in isolated lakes could further reduce populations. Although most habitats are in relatively pristine condition, human impacts on water quality in developed areas are of concern.

State research needs

Research is needed on geographic variation in molecular and morphological characteristics of Alaskan populations to delimit subspecies (Mecklenburg et al. 2002). Effects of introduced predators on stickleback populations need study as well as research that identifies additional threats or limiting factors. Identify potential sources of water quality degradation.

State inventory needs

There is a general lack of information on abundance, population trends and distribution. Inventory of unique and isolated populations in Southcentral Alaska is needed. Population trends should be monitored.

State conservation and management needs

Introduction of non-indigenous fish species into lakes and streams (especially in Cook Inlet) should be prevented and controlled. In lakes with existing pike populations, eradication strategies should be implemented. Anthropogenic activities affecting water quality should be monitored and preventative measures taken to avoid sedimentation or drainage associated with construction and logging projects, or introduction of fertilizers.

LITERATURE CITED

- Becker, G.C. 1983. Fishes of Wisconsin. Univ. Wisconsin Press, Madison. 1052 pp.
- Fruge, D.J., D.W. Wiswar, L.J. Dugan and D.E. Palmer. 1989. Fish population characteristics of Arctic National Wildlife

- Refuge coastal waters summer 1988. U.S. Fish and Wildlife Service Region 7, Dept. of the Interior. Anchorage, Alaska.
- Griswold, B.L. and L.L. Smith Jr. 1972. Early survival and growth of the ninespine stickleback. American Fisheries Society. Transactions, 101:350-352.
- Haglund, T.R., D.G. Buth, and R. Lawson. 1992. Allozyme variation and phylogenetic relationships of Asian, North American, and European populations of the ninespine stickleback, *Pungitius pungitius*. Pages 438-452 in R.L. Mayden, editor. Systematics, historical ecology, and North American freshwater fishes. Stanford Univ. Press, Stanford, California. xxvi + 969 pp.
- Harvey, C.J, G.T. Ruggerone and D.E. Rogers. 1997. Migrations of three-spined stickleback, nine-spined stickleback and pond smelt in the Chignik catchment, Alaska. Journal of Fish Biology 50:1133-1137.
- Heins, D.C., J.M. Johnson and J.A. Backer. 2003. Reproductive ecology of the nine-spined stickleback from south-central Alaska. Journal of Fish Biology 63:1131-1143
- Keivany, Y. and J.S. Nelson. 2000. Taxonomic review of the genus *Pungitius*, ninespine sticklebacks, (Teleostei, Gasterosteidae). Cybium 24:107-122.
- Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. (eds.). 1980. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History and U.S. Dept. Interior, Fish and Wildlife Service, Raleigh, NC. 854 pp.
- McLennan, D.A. 1993. Phylogenetic relationships in the Gasterosteidae: an updated tree based on behavioral characters with a discussion of homoplasy. Copeia 1993:318-326.
- McPhail, J.D. 1963. Geographic variation in North American ninespine sticklebacks. J. Fish. Res. Bd. Can. 20:27-44.
- Mecklenburg, C.W., T.A. Mecklenburg and L.K. Thorsteinson. 2002. Fishes of Alaska. American Fisheries Society. Bethesda, MD.
- Morrow, J.E. 1980. The freshwater fishes of Alaska. Alaska Northwest Publishing Co., Anchorage, AK. 248 pp.
- Moulton, L.L. 1996. 1995 Colville Delta fish habitat study. Bainbridge, WA: MJM Research for ARCO Alaska, Inc.
- Page, L.M., and B.M. Burr. 1991. A field guide to freshwater fishes: North America north of Mexico. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.
- Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea and W.B. Scott. 1991. Common and scientific names of fishes from the United States and Canada. Am. Fish. Soc. Spec. Publ. 20, 183 pp.
- Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Board Canada Bull. 184. Ottawa, Ontario, Canada. 966 pp.
- Underwood, T.J, J.A. Gordon and B.M. Osborne. 1992. Fish population characteristics of Arctic National Wildlife Refuge coastal waters, summer 1990. Alaska Fisheries Technical Report Number 92-3. Anchorage, Alaska: Region 7, U.S. Fish and Wildlife Service, Dept. of the Interior.
- West, R.L. and D.J. Fruge. 1989. A review of coastal plain fish surveys and the results of 1986 fish surveys of selected coastal lakes and streams, Arctic National Wildlife Refuge, Alaska. Alaska Fisheries Technical Report Number 4. Anchorage, Alaska: Region 7, U.S. Fish and Wildlife Service, Dept. of the Interior.
- Wiswar, D.W. 1991. Summer distribution of fishes in the Okpilak and Akutoktak rivers, Arctic National Wildlife Refuge, Alaska, 1989. Alaska Fisheries Technical Report Number 11. Anchorage, Alaska: Region 7, U.S. Fish and Wildlife Service, Dept. of the Interior.

Wiswar, D.W. 1992. Summer distribution of fishes in the Okpilak, Akutoktak, Katakturuk, and Jago rivers, Artic National Wildlife Refuge, Alaska, 1990. Alaska Fisheries Technical Report Number 17. Anchorage, Alaska: Region 7, U.S. Fish and Wildlife Service, Dept. of the Interior.

Wiswar, D.W. 1994. Summer distribution of Arctic Fishes in the 1002 area of the Arctic National Wildlife Refuge, Alaska, 1991, with special emphasis on selected lakes, tundra streams, and the Sadlerochit river drainage. Fisheries Technical Report Number 27. Anchorage, Alaska: Region 7, U.S. Fish and Wildlife Service, Dept. of the Interior.

Wootton, R.J. 1976. The biology of sticklebacks. Academic Press. London. 387 pp.

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Global Element Ecology and Life History

Author: G. Hammerson, January 1994
