Species richness, composition, and abundance of fish larvae and juveniles inhabiting natural and developed shorelines of a glacial Iowa lake

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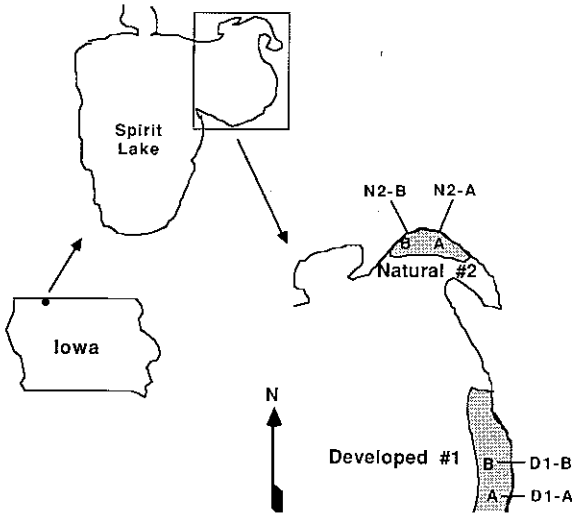


ment, information on the use of nearshore aquatic vegetation by fish larvae and juveniles is needed to provide insight into both the short- and long-term effects of extensive vegetation removal on lake fish communities.

The objective of this study was to compare species richness, composition, and relative abundance of young-of-the-year fish assemblages at two naturally vegetated sites with those of two previously similar sites (Sigler 1948) now altered by shoreline development (i.e., construction of homes, boat docks, and beaches).

Study area

Methods

Plexiglass trap design was modified from Breder (1960). Traps measured 0.31 × 0.31 × 0.61 m and

A descriptive survey of the macrophyte beds that

conduit straps were bolted to the back of each trap, one above the other. At each set location, a 3.81 cm

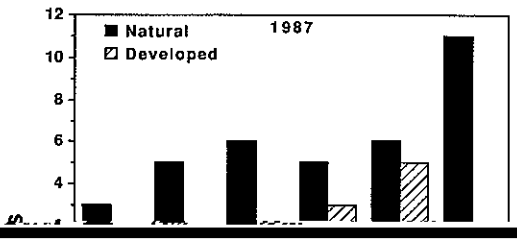
preserved. Auer's (1982) key for fish larvae was used to identify all specimens.

In addition to the fish sampling described, clear water conditions during the spring of 1988 enabled us to make visual observations of spawning activity for several fish species.

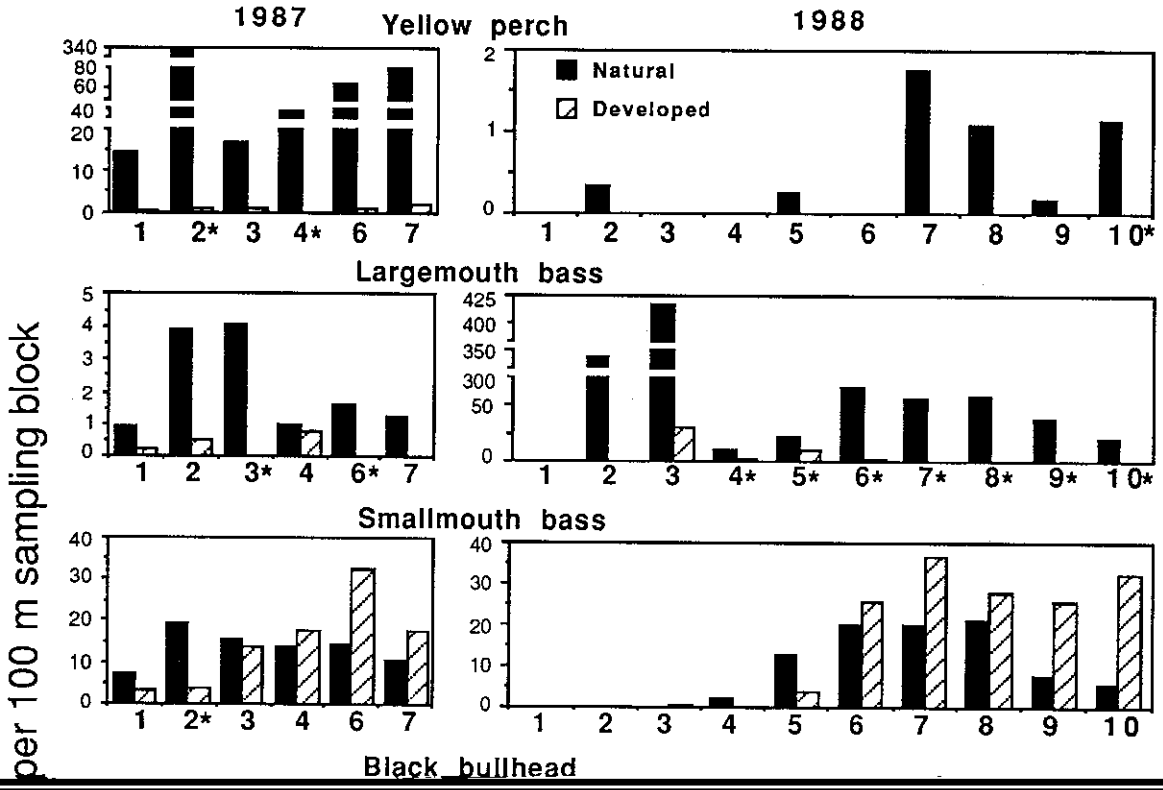
Data analysis

Catch-per-unit-effort (CPUE) was used to describe the relative abundance of fishes at each site

System (SAS) General Linear Models (GLM) procedure (SAS Institute Inc. 1985). The mean square error for sites nested within shore-type (natural or developed) was used to test for the effect of shore-type (1,2 df) on fish abundance (CPUE). Weekly comparisons were made by sorting the CPUE data by week and then running the analysis described above on each week's data. Student's t-tests and the Friedman nonparametric two-way analysis of variance by ranks (Daniel 1978, p. 224) were used to compare differences in overall macrophyte



Ceratophyllum demersum – were found only in natural sites. One species, horned pondweed *Zannichellia palustris,* was found only in site N2. In general, *Potamogeton* spp. dominated the submerged macrophyte communities in all sites, but muskgrass *Chara contraria,* wild celery *Vallisneria*


1987
Yellow perch
1988
Natural
Developed
Largemouth bass
Smallmouth bass
Black bullhead
per 100 m sampling block

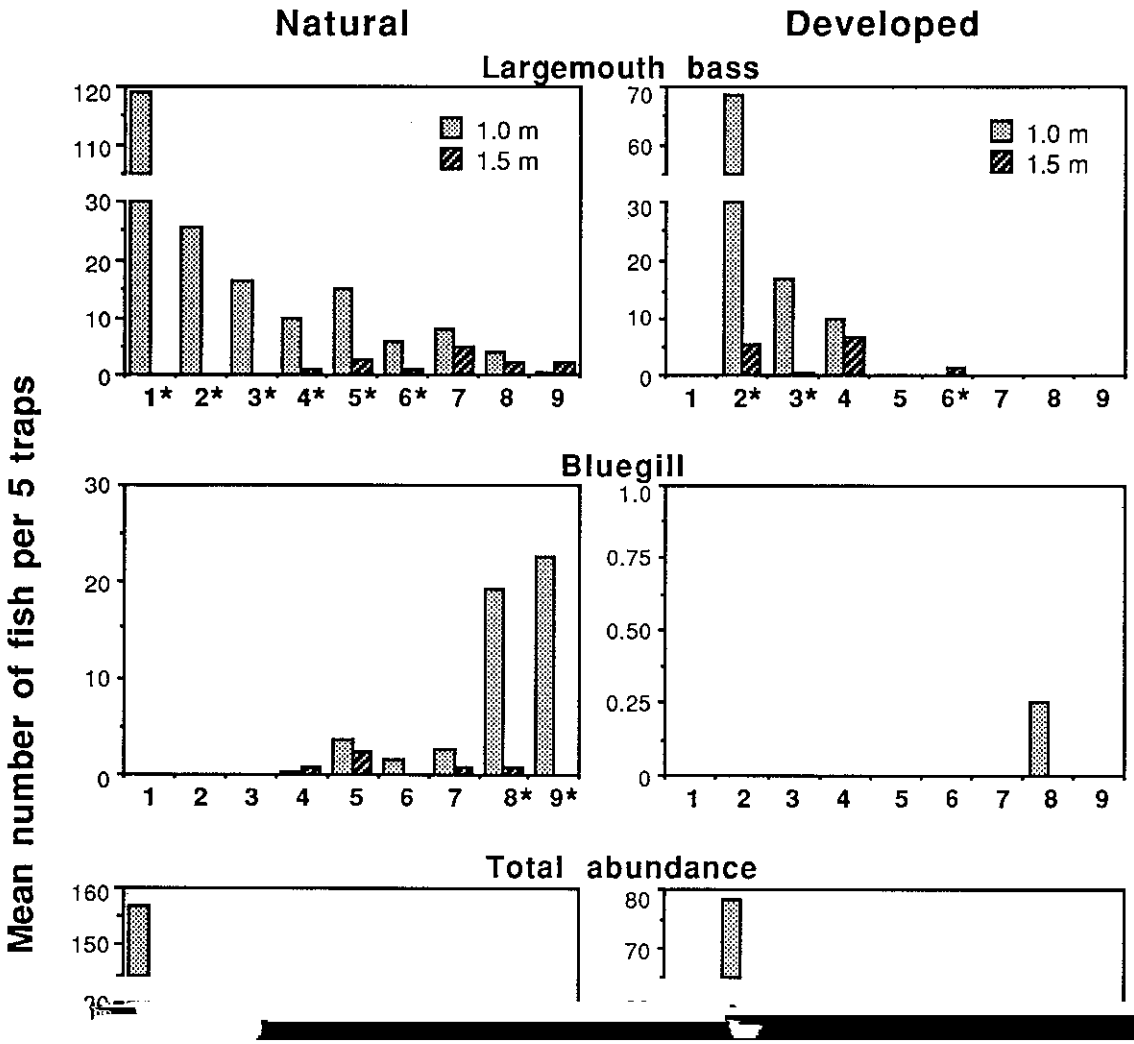
because of great variation in CPUEs between like shore-types (Fig. 3.). Young-of-the-year from 5 of the 8 fish species constituting Spirit Lake's sport fishery (yellow perch, largemouth bass, small-

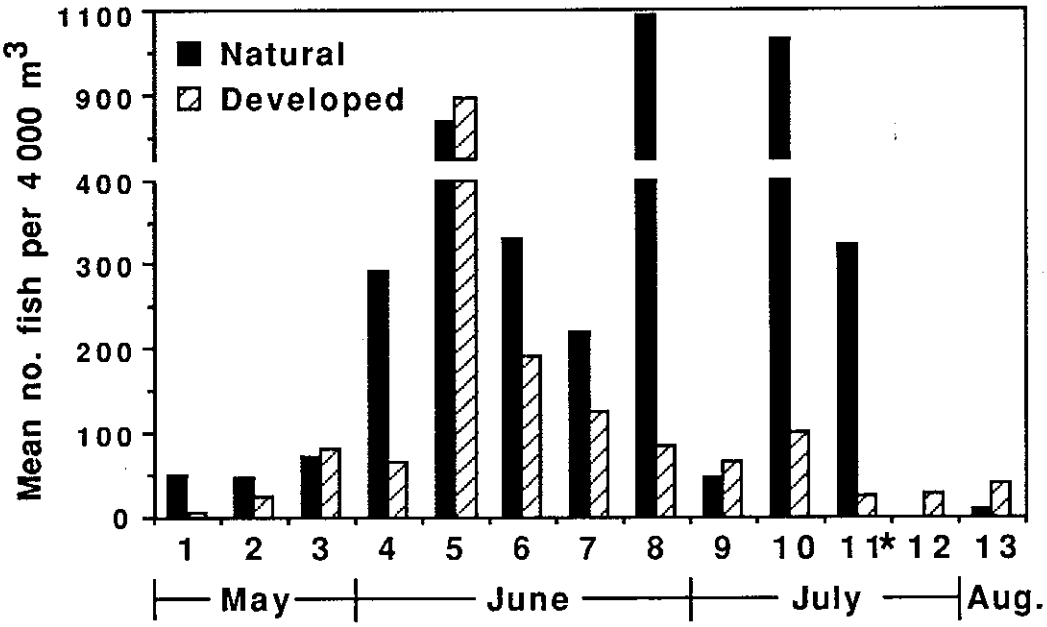
Percina caprodes) were occasionally collected in small numbers from natural sites, but few were taken from developed sites by seining.

Extensive black bullhead spawning was visually

lected on a weekly basis during both years of the

ural sites in 1988. All nests observed were placed


Natural
Developed
Largemouth bass
Bluegill
Total abundance
Mean number of fish per 5 traps
1.0 m
1.5 m
120
110
30
20
10
0
70
60
1.0
0.75
0.50
0.25
160
150
80
1* 2* 3* 4* 5* 6* 7 8 9
1 2* 3* 4 5 6* 7 8 9
1 2 3 4 5 6 7 8* 9*
1 2 3 4 5 6 7 8 9


Mean no. fish per 4 000 m3
1100
900
400
300
200
100
0
Natural
Developed
1 2 3 4 5 6 7 8 9 10 11* 12 13
May
June
July
Aug.

and bluegill were the most common species collect

ed in both natural and developed sites in 1988. With the exception of bluegill, mean weekly den-

with shoreline development. Smallmouth bass and darter species seemed to

observation). Similar observations were made by Barnett & Schneider (1974). Dense vegetation in shallow waters offers young fish two key ingredients for survival – food and protection from predators.

versely, the infrequent capture or absence of longnose gar, northern pike, spottail shiners, bluntnose minnow, yellow bullhead, banded killifish, largemouth bass, smallmouth bass, and green sunfish larvae in trawl samples suggests that these species

young fishes in the 1–2 m depth zone of developed sites is attributed to reduced vegetative cover at a depth of 1.0 m resulting from shoreline development and nearshore recreational activity. Reduced vegetative structure here had a pronounced effect on the distribution and abundance of vegetation-dependent species such as largemouth bass and bluegill, but had little affect on smallmouth bass which do not rely as heavily on vegetative cover

er (1967) and Amundrud et al. (1974) documented similar successional appearances of percid and centrarchid larvae in limnetic areas of two northern Wisconsin Lakes and Lake Opinicon, Ontario, respectively. Evidently, patterns of habitat use by young fishes shown in Spirit Lake are widespread among midwestern lakes with similar fish communities.

If larvae remained in open-water areas as juve-

More importantly, the long-term effects will be

Ridenhour, R.L. 1960. Abundance, growth, and food of young game fish in Clear Lake, Iowa 1949–1957. Iowa State J. Sci.

bluegill: the foraging rate-predation risk trade-off. Ecology 69: 1352–1366.

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Fish imagery in art 33: Beal's *The Fish Bucket*

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