

## APPENDIX VII

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Agenda Item 7

### Status of bloater chubs, alewives, smelt, and slimy sculpins in Lake Michigan (with observations on the performance of Green Lake strain lake trout planted on the Sheboygan Reef)<sup>1</sup>

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Young-of-the-year chubs increased in our fall survey catches for the fourth consecutive year, and adult chubs increased for the third straight year. The mean catch of adult alewives dropped to little more than a third that of 1979, but young-of-the-year alewives increased markedly. Estimated biomasses (in thousands of metric tons) of important forage species in fall 1980, and changes from 1979, are as follows: alewives (adults)--48, down 45%; alewives (YOY)--17, up 240%; smelt (adults)--17, up 10%; smelt (YOY)--2.5, up 260%; and slimy sculpins--1.0, essentially unchanged. Limited data suggest that as of September 1980 the Green Lake strain lake trout stocked as yearlings on Sheboygan Reef in 1976 were still common there, but much less so than in 1979. We caught several of these fish near shore in 1980. The trout remaining on the reef are growing slower, and apparently maturing slower, than shore-planted fish.

#### Bloater chubs

The outlook in regard to chub population continues to be encouraging. In our regular fall bottom-trawl survey, numbers of young-of-the-year chubs in the catches were greater than those of 1979 at seven of the eight lakewide stations visited, and the mean catch was more than six times that of 1979 (Table 1). Thus 1980 became the fourth consecutive year in which substantial increases in catches of young chubs were recorded. The catch at Ludington (69% of total for all stations) was much greater than at any other locality, as was also true in 1979 (57% of total). The improved reproduction is being reflected in marked increases in the abundance of adults. Catches of adult chubs increased over

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1979 at six stations, and remained about the same at one (Table 2). For the second straight year, catches at Sturgeon Bay were much smaller than at any of the other localities. Larger fish were considerably more common on the east side of the lake than on the west, where catches of adults were strongly dominated by yearlings and 2-year olds. The mean catch in 1980 was almost double that of 1979; over six times that of 1978; and over 40 times that of 1977, when populations were at extremely low levels. It seems probable that the 1980 figure will be surpassed in 1981, as a result of the entry of the strong 1980 year class into the adult population.

### Alewives

The mean catch of adult alewives for all stations combined in our fall survey was the lowest since we began the lakewide surveys in 1973; it dropped to little more than a third that of 1979 (Table 3). Although increases were recorded at the three southern stations (Saugatuck, Benton Harbor, and Waukegan), sharp declines occurred elsewhere. The decreases in the central and northern parts of the lake may have resulted from the heavy die-off that began in those areas in late winter, and continued through the spring. Although the die-off spread to the southern portion of the lake in early summer, it was not so severe there as northward. In contrast to the decline in adults, the mean catch of young-of-the-year alewives increased, as it has each year since 1977 (Table 4). However, catches of young-of-the-year alewife can vary so widely from day to day, even in the same area, that there is some question as to whether they actually reflect abundance in any more than a very general way. Nevertheless, it seems safe to assume that reproduction of alewives was at least reasonably good in 1980.

The estimated biomass of adult alewives in Lake Michigan in the fall 1980 was 48 thousand metric tons, down markedly from 87 thousand tons in 1979 (Table 5). However, the loss was partly offset by an increase in biomass of young alewives from 5 thousand to 17 thousand metric tons.

### Smolt and slimy sculpins

Abundance of adult smolt and slimy sculpins (both of which are important prey of lake trout) did not change much from 1979, but numbers of young-of-the-year smolt increased greatly. Estimated biomasses (thousands of metric tons) of smolt and slimy sculpins in the fall, 1980, and the changes from 1979, are as follows: smolt (adult)--17, up 10%; smolt (YOY)--2.5, up 200%; and slimy sculpins--1.0, essentially unchanged (Table 5).

### Observations on Sheboygan Reef lake trout

Limited data collected in September 1980 from the Sheboygan Reef (near mid-lake, off Port Washington) indicated that Green Lake strain lake trout stocked on the reef in 1976 are still common there, but only about 25% as abundant as in 1979. Greatest numbers by far were still on the shallowest part of the reef, i.e., where depths are 40-42 m. The decline in abundance doubtless resulted partly from mortality, but may also have resulted partly from a movement off the reef of a significant portion of this experimental planting in the intervening year between samplings. We caught several of these

fish near shore during lake trout surveys at Saugatuck and Port Washington. The Green Lake fish caught on the reef averaged only 483 mm in length, compared with 609 mm for lake trout of the same age planted elsewhere in Wisconsin in 1976 and caught near shore during the survey off Port Washington. The slower growth of lake trout on the Sheboygan Reef probably results mostly from the generally colder water these fish occupy during the growing season, but diet may also be a factor. Those fish on the reef were feeding mainly on Mysis, whereas fish of the same size taken nearshore had eaten mostly alewives. Of the 60 Green Lake trout caught on the reef, only one, a 576-mm male, would have spawned in 1980. It appears that the slower growth of the fish on the reef may have delayed the onset of maturity by at least a year, so most females remaining on the reef may not become mature until 1982 at the earliest. Some of the females that have left the reef, of course, may become mature by fall 1981.

Table 1. Numbers of young-of-the-year chubs per bottom-trawl transect at eight index stations in Lake Michigan, October-November 1973-80.<sup>1</sup>

Year	Benton Harbor	Saugatuck	Ludington	Frankfort	Manistique	Sturgeon Bay	Port Wash. <sup>2</sup>	Waukegan	Mean
1973	2	22	25	14	3	4	2	11	10
1974	11	5	62	76	0	15	13	2	24
1975	3	3	23	6	1	2	1	3	5
1976	1	0	2	4	2	0	-	0	1
1977	1	6	29	386	5	5	1	0	54
1978	33	144	335	451	23	60	88	31	146
1979	36	123	926	117	45	301	40	28	202
1980	105	258	7,222	541	269	118	1,826	90	1,304

<sup>1</sup> Each transect included standard 10-minute tows along the contour at 5-fathom intervals from 10 to 50 fathoms.

<sup>2</sup> No samples in 1976.

Table 2. Numbers of adult ( $\geq 120$  mm) chubs per bottom-trawl transect at eight index stations in Lake Michigan, October-November 1973-80.<sup>1</sup>

Year	Benton Harbor	Saugatuck	Dudington	Frankfort	Manistique	Sturgeon Bay	Port Wash. <sup>2</sup>	Waukegan	Mean
1973	19	74	271	566	49	7	16	27	121
1974	37	32	81	75	18	16	43	27	41
1975	67	41	76	84	20	3	25	40	45
1976	64	13	35	22	41	10	-	16	29
1977	34	36	19	8	42	11	14	15	22
1978	21	454	219	267	33	18	44	99	144
1979	128	819	953	1,263	116	63	350	333	503
1980	569	995	2,519	422	407	60	1,132	1,540	956

<sup>1</sup> Each transect included standard 10-minute tows along the contour at 5-fathom intervals from 10 to 50 fathoms.

<sup>2</sup> No samples in 1976.

Table 3. Numbers of adult ( $\geq 120$  mm) alewives per bottom-trawl transect at eight index stations in Lake Michigan, October-November 1973-80.<sup>1</sup>

Year	Benton Harbor	Saugatuck	Ludington	Frankfort	Manistique	Sturgeon Bay	Port Wash. <sup>2</sup>	Waukegan	Mean
1973	3,716	2,183	7,058	15,253	1,099	2,083	1,288	3,969	4,581
1974	4,125	3,520	3,244	394	101	1,566	2,692	5,104	2,593
1975	4,424	1,558	1,149	11,200	1,095	1,020	3,403	8,994	4,105
1976	1,017	1,142	2,467	2,065	1,955	1,238	-	2,343	1,747
1977	1,055	1,270	931	1,260	2,838	1,848	1,771	1,906	1,610
1978	1,153	1,231	876	1,383	747	10,778	2,540	2,498	2,651
1979	713	434	880	2,834	4,428	15,398	1,790	2,295	3,596
1980	2,730	526	233	300	541	1,988	1,318	2,745	1,298

<sup>1</sup> Each transect included standard 10-minute tows along the contour at 5-fathom intervals from 10 to 50 fathoms.

<sup>2</sup> No samples in 1976.

Table 4. Numbers of young-of-the-year alewives per bottom-trawl transect at eight index stations in Lake Michigan, October-November 1973-80.<sup>1</sup>

Year	Benton Harbor	Saugatuck	Ludington	Frankfort	Manistique	Sturgeon Bay	Port Wash. <sup>2</sup>	Waukegan	Mean
1973	46	488	860	1,320	372	1,305	1,382	240	752
1974	309	12,726	12,413	23,953	110	1,010	17,807	4,740	9,133
1975	2,591	3,692	8,008	4,041	1,703	40	2,676	129	2,860
1976	770	2,196	5,883	716	244	211	-	4,324	2,049
1977	168	2,316	3,642	2,931	7	19	3,571	78	1,592
1978	22	10,923	7,708	1,260	165	766	4,047	4,285	3,647
1979	5,683	873	2,210	278	4,810	5,836	91	14,381	4,270
1980	1,195	960	9,303	4,810	2,776	424	29,128	1,572	6,271

<sup>1</sup> Each transect included standard 10-minute tows along the contour at 5-fathom intervals from 10 to 50 fathoms.

<sup>2</sup> No samples in 1976.

Table 5. Biomass estimates (thousands of metric tons) of forage species available to bottom trawls in Lake Michigan, fall 1972-80; 90% confidence intervals are shown in parentheses.

Year of sampling	Alewives		Smelt		Slimy sculpins	Total forage
	Adult	Young of the year	Adult	Young of the year		
1973	114.4 (97.7-131)	3.9 (1.9-6.0)	14.3 (8.3-20.3)	0.25 (0.15-0.36)	0.99 (0.59-1.39)	134 (109-159)
1974	92.1 (79.5-106)	20.9 (19.4-42.4)	12.0 (8.2-15.8)	0.50 (0.27-0.73)	1.37 (0.80-1.94)	137 (107-166)
1975	109.8 (86.0-132)	13.3 (7.5-19.1)	13.1 (8.3-18.0)	0.59 (0.19-0.99)	2.39 (1.50-3.29)	138 (104-173)
1976	49.3 (35.7-52.7)	7.2 (3.9-10.4)	10.5 (6.9-14.2)	0.57 (0.38-0.76)	2.11 (1.32-2.90)	70 (51-88)
1977	44.9 (37.0-52.7)	6.9 (3.1-10.7)	11.8 (7.1-16.6)	0.18 (0.12-0.25)	0.93 (0.58-1.29)	65 (48-81)
1978	76.6 (52.4-95.8)	14.4 (8.6-20.2)	15.6 (11.3-20.0)	0.62 (0.45-0.79)	0.62 (0.42-0.82)	108 (78-138)
1979	86.5 (63.1-110)	5.1 (2.6-7.5)	15.2 (10.5-20.0)	0.70 (0.47-0.92)	1.01 (0.69-1.33)	109 (77-139)
1980	47.5 (31.9-63.2)	17.2 (7.4-27.1)	16.7 (12.6-21.0)	2.48 (1.75-32.0)	1.02 (0.52-1.52)	85 (54-116)