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2009 Summer Index Report

Compiled by

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INTRODUCTION

The fish community of Lake Superior has changed dramatically over the last 40 years. A fishery supported by the extensive stocking of native and non-native species has been replaced gradually by one maintained through the natural reproduction of native species. Although native species have been rehabilitated in many areas, a potential future concern for the fish assemblage of Lake Superior is the incidental introduction of exotic species. Changes in fish population characteristics must be analyzed over the long term to better understand the effects of these ecosystem disruptions. The summer index assessment is intended to monitor various population dynamics (e.g. abundance, population structure) of the Lake Superior fisheries and to record potential shifts in the fish community structure.

METHODS

In 2009, nineteen stations were sampled in the western waters (WI-1) (Figure 1) with the R/V *Hack Noyes*. From 1970 all Wisconsin waters were sampled annually, after 1979 WI-1 was sampled only in odd numbered years. Each site was sampled with 3,600 ft of monofilament graded-mesh gill net. Each gang had twelve 300-ft nets arranged in the following mesh (in) sequence: 5, 2, 4, 1.5, 6, 4.5, 2.5, 7, 3.5, 6.5, 3, and 5.5. Nets were set for one night (24 hr) at each station.

All live fish were measured (total length), checked for sea lamprey marks and fin-clips (lake trout), and then released. Dead piscivorous fish were processed in the same manner except stomach contents were collected, individual weights were taken when lake conditions permitted, scale and otoliths were removed. Aging structures were taken from other species as conditions permitted. Sub samples of the other species were measured (total length) and the remaining fish were counted.

Geometric mean catch-per-unit-effort (GMCPUE) was calculated using only catch data from the stations that were established in the early 1970s (15 stations). These stations have the longest data sets and allow for examination of long term trends. For all other calculations and summaries (e.g. length frequency, mean length), data from all stations were used.

RESULTS/DISCUSSION

In 2009, 216 lake trout were captured (52% were wild fish) (Figure 2). Mean lengths of wild and hatchery lake trout were 18.2 in (SD = 6.2) and 21.5 in (SD = 6.2), respectively. Length distributions of wild and hatchery lake trout were generally similar except a greater number of wild fish less than 16 in were captured (Figure 2). Geometric mean catch-per-unit-effort of pre-recruit wild lake trout (<17 in from 2.0-2.5 in mesh) increased from 2005 to 2009 (Figure 3). Total lake trout GMCPUE (all meshes) also increased from 2005 to 2009 (Figure 4).

During 2009, 395 lake whitefish were captured. Mean length of 331 lake whitefish was 15.1 in (SD = 3.9) (Figure 5). Lake whitefish GMCPUE (all meshes) has increased considerably since the 1970s (Figure 6).

During sampling, 340 round whitefish were captured. Mean length of 127 round whitefish was 12.8 in (SD = 2.3). Round whitefish GMCPUE (from 2.0-2.5 in mesh) increased from 2005 to 2009 (Figure 7). Until the late 1980s, round whitefish were a commercially important species. Their abundance has varied but has been relatively stable in W-1 since 1970.

In 2009, 695 lake herring were captured. The mean length of 209 lake herring was 11.0 in (SD = 2.0) (Figure 8). The GMCPUE from the one inch mesh shows the near absence of lake herring in the 1970s and the large but sporadic year classes since 1980 (Figure 9). Other cisco species were captured, including bloater, shortjaw, kiyi, and various hybrids. Species identification has been hindered by morphological variation within species, hybridization and changes in vessel personnel. Therefore catch-per-unit-effort (CPUE) was calculated for the entire cisco species group including lake herring. The ciscos reached their highest abundance in the 1990s (influenced by large year classes in lake herring and bloater) but have subsequently declined (Figure 10).

Seven smelt were captured. Smelt GMCPUE has declined dramatically since the 1970s (Figure 11).

Twenty-one burbot were captured, their mean length was 22.9 in (SD = 5.0). Although burbot GMCPUE has been variable since 1970, it has gradually declined since the 1990s (Figure 12).

In 2009, 134 siscowet lake trout were captured, their mean length was 20.1 in (SD = 5.9). The GMCPUE showed the increase in siscowet lake trout in the 1990s and the recent leveling of abundance (Figure 13).

Sixteen lake sturgeon were captured and their average length was 35.6 in (SD = 3.9). Lake sturgeon GMCPUE has increased since the mid-1990s (Figure 14). An extensive stocking program was initiated within the St. Louis River in 1983 and lake sturgeon were captured within the western end of Lake Superior by 1985.

In 2009, 80 walleye were captured, their mean length was 20.4 in (SD = 3.5) (Figure 15). The GMCPUE was highly variable from 1970 to 2009, likely due to the sporadic year class strength of walleye in the St. Louis River (Figure 16).

Since the 1970s, native species such as lake trout and whitefish have increased dramatically due to more conservative regulations, refuge areas, and sea lamprey control. The prominent forage species has shifted from the exotic smelt (which primarily inhabits near shore areas) to the native lake herring. The success of native species rehabilitation and the subsequent change in the forage base may be negatively affecting the current stocking programs. For example, Chinook salmon and stocked lake trout may have poorer survival due to lower smelt abundance and competition with native species. To increase survival, stocking strategies have shifted to stocking lake trout offshore and getting them away from nearshore predators. A portion of the lake trout stocked in 2003-2005 also were stocked in the fall as opposed to in the spring. Lake trout were given specific fin clips depending on time of year stocked. Survival resulting from these stocking strategies will be evaluated through this and other assessments in the future.

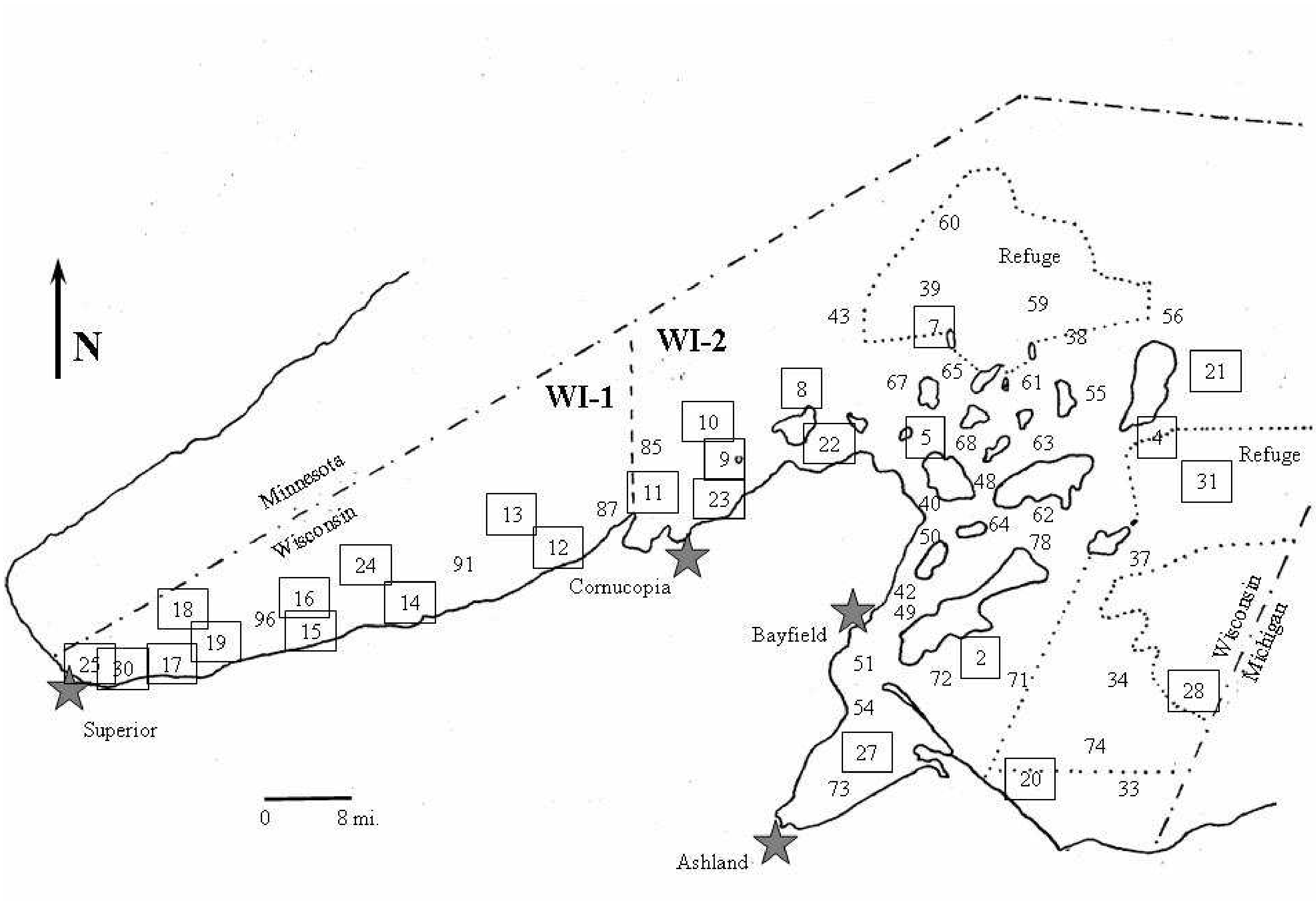

Figure 1. Summer index stations in Wisconsin waters of Lake Superior. Boxed station numbers indicate those used for geometric mean catch-per-unit-effort (GMCPUE).

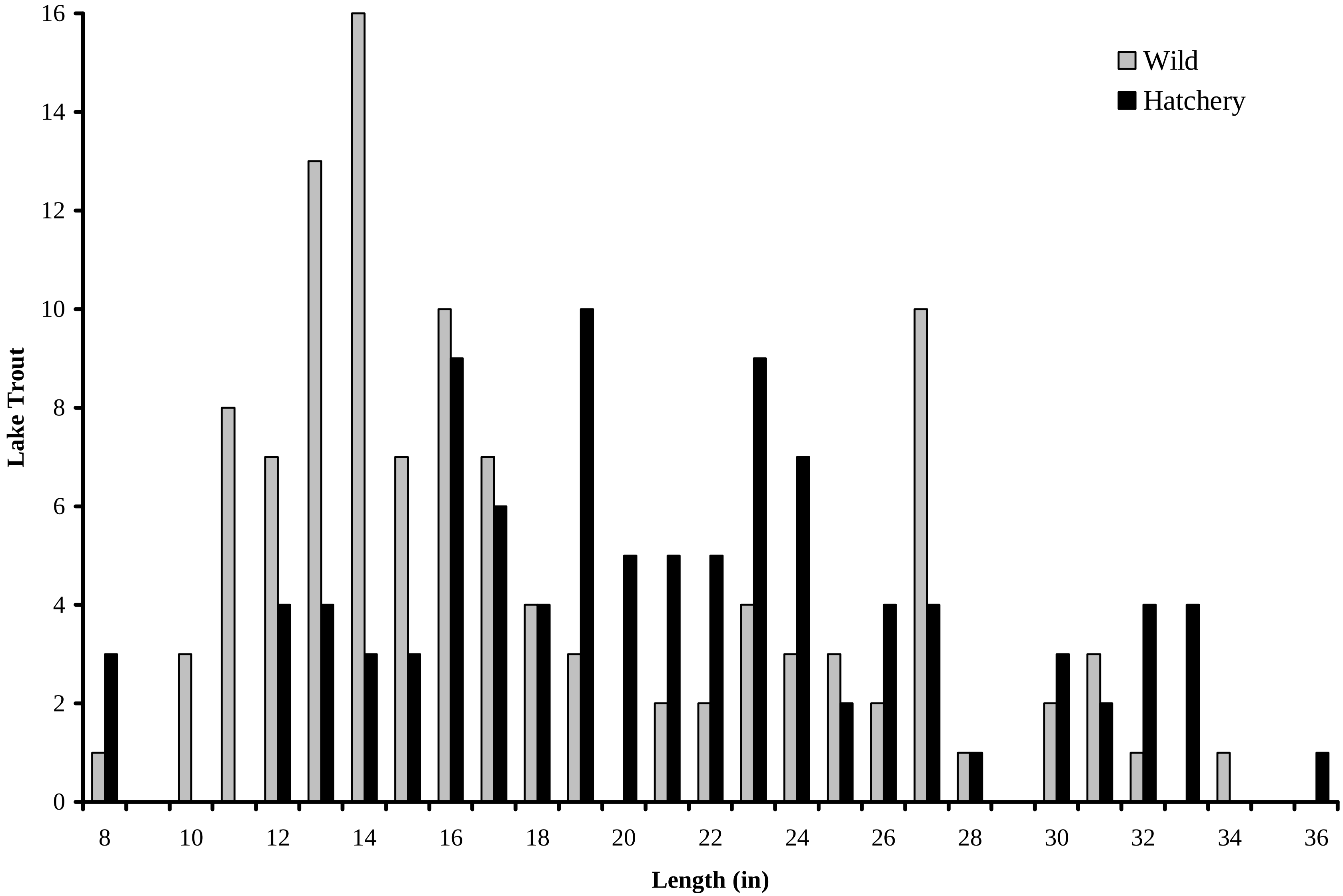

Figure 2. Length distribution of hatchery and wild lake trout captured in Summer Index (all meshes), 2009.

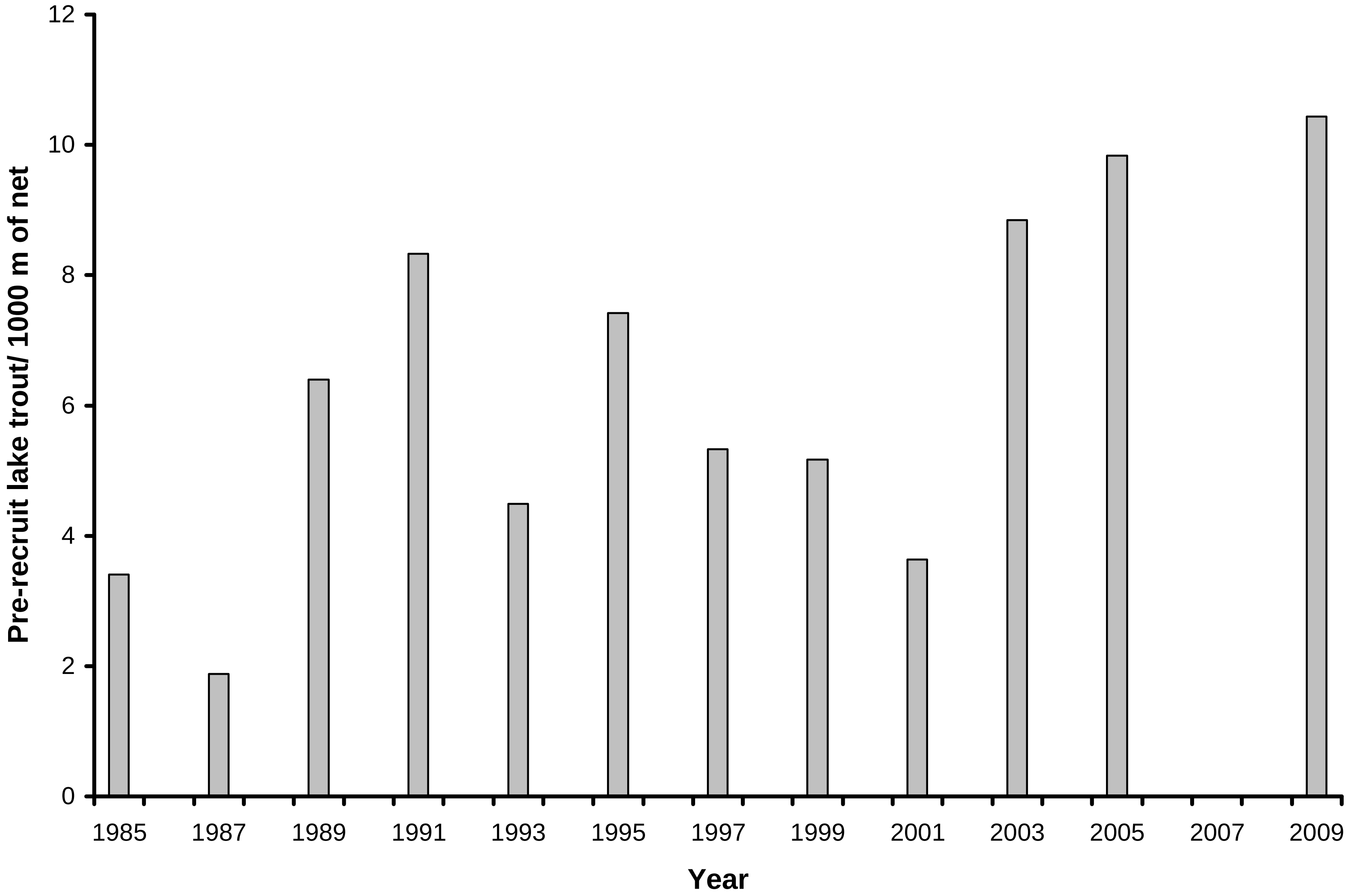

Figure 3. Geometric mean catch-per-unit-effort of pre-recruit lake trout (<17 in) from Summer Index (2.0-2.5 in mesh), 1985-2009.

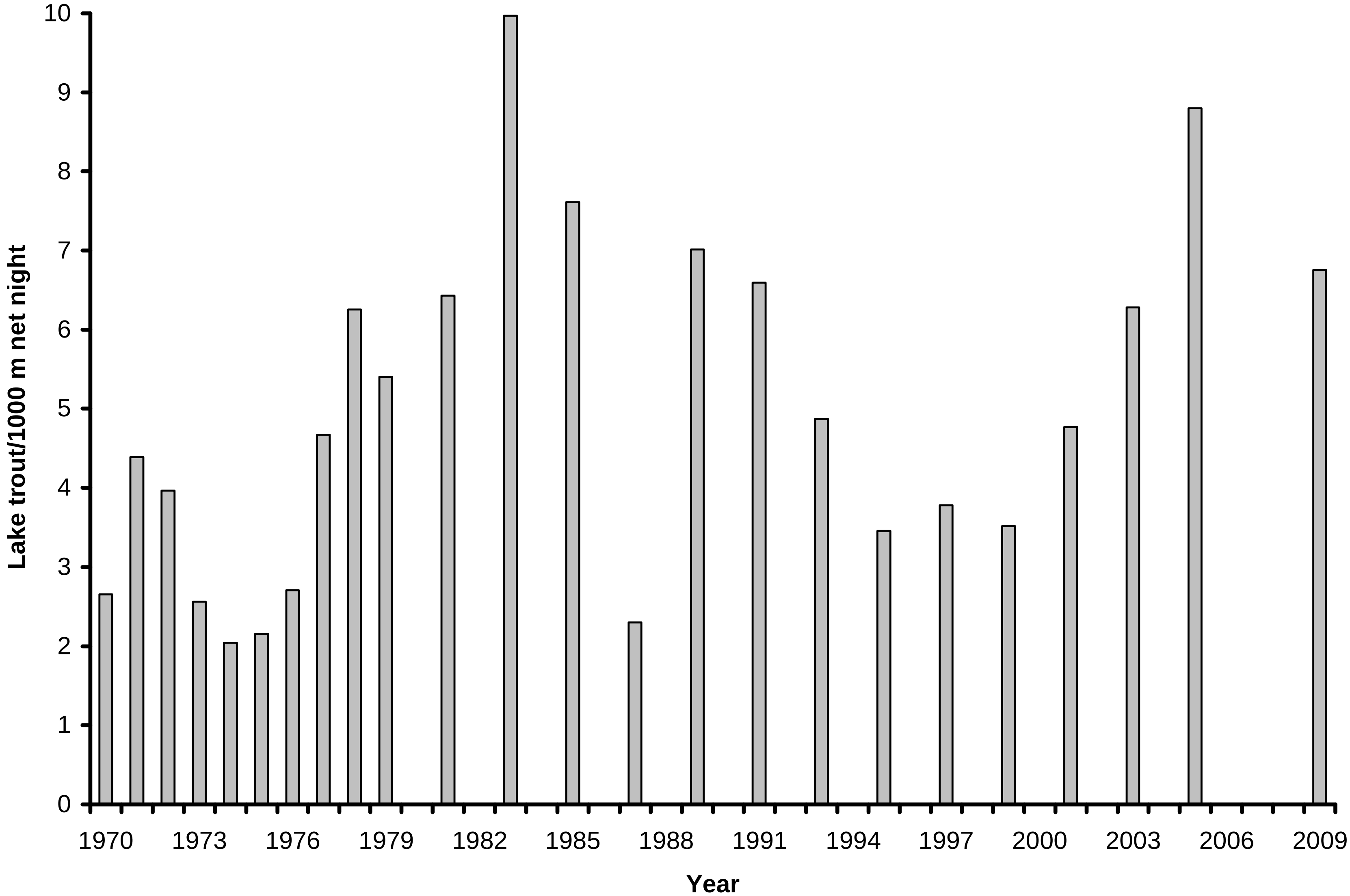

Figure 4. Geometric mean catch-per-unit-effort of lake trout from Summer Index (all meshes), 1970-2009.

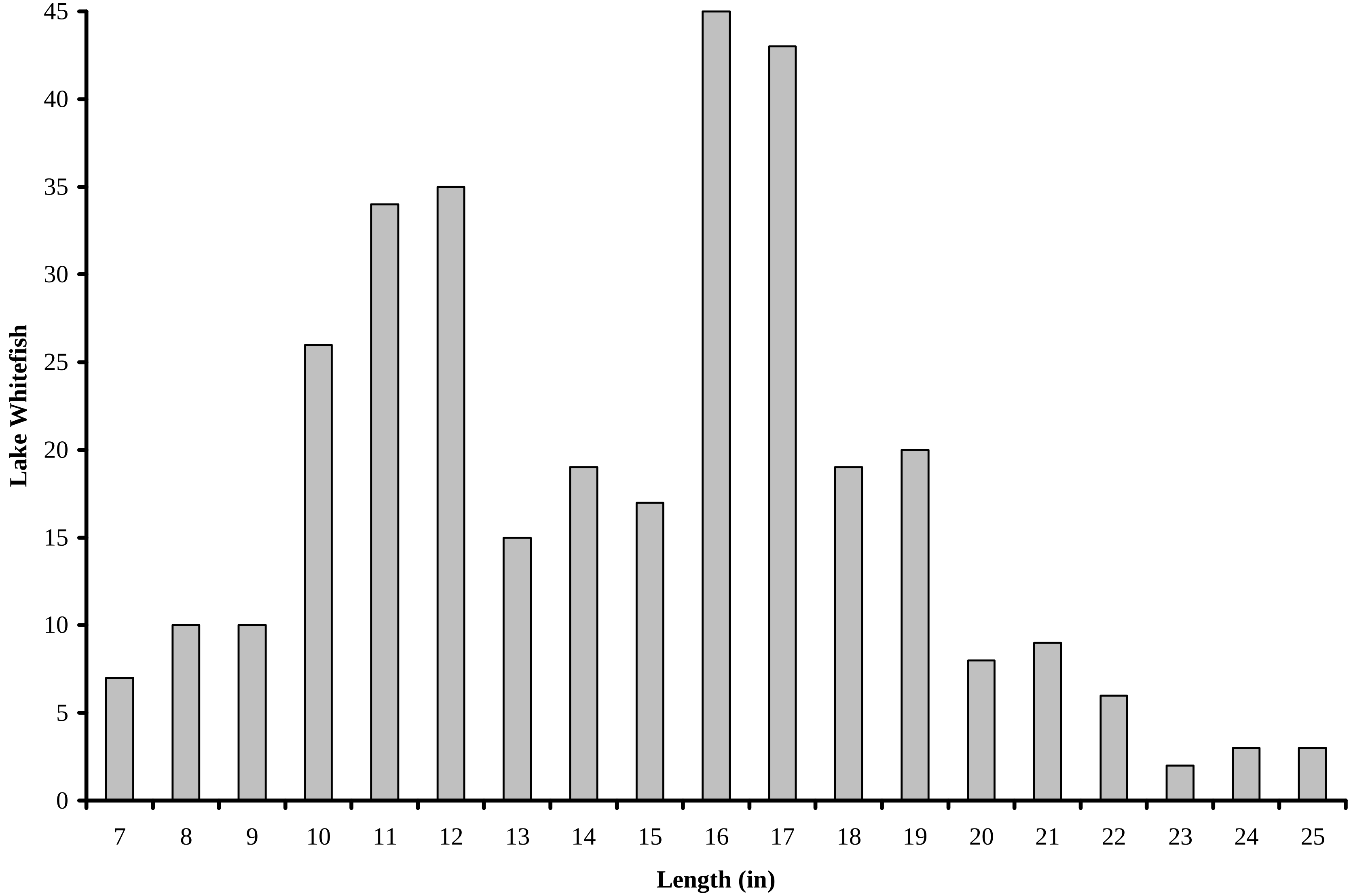

Figure 5. Length distribution of lake whitefish captured in Summer Index (all meshes), 2009.

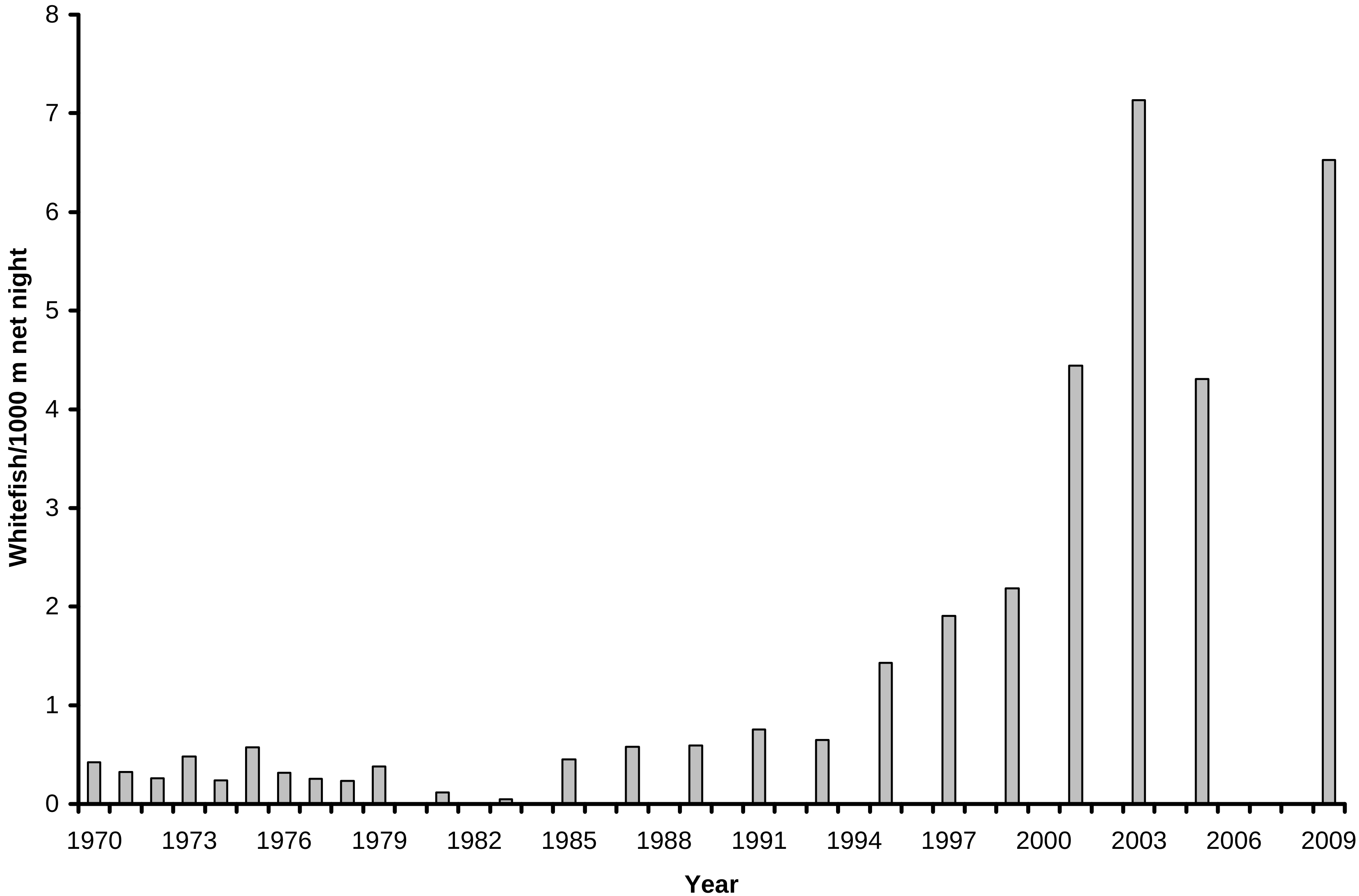

Figure 6. Geometric mean catch-per-unit-effort of lake whitefish from Summer Index (all meshes), 1970-2009.

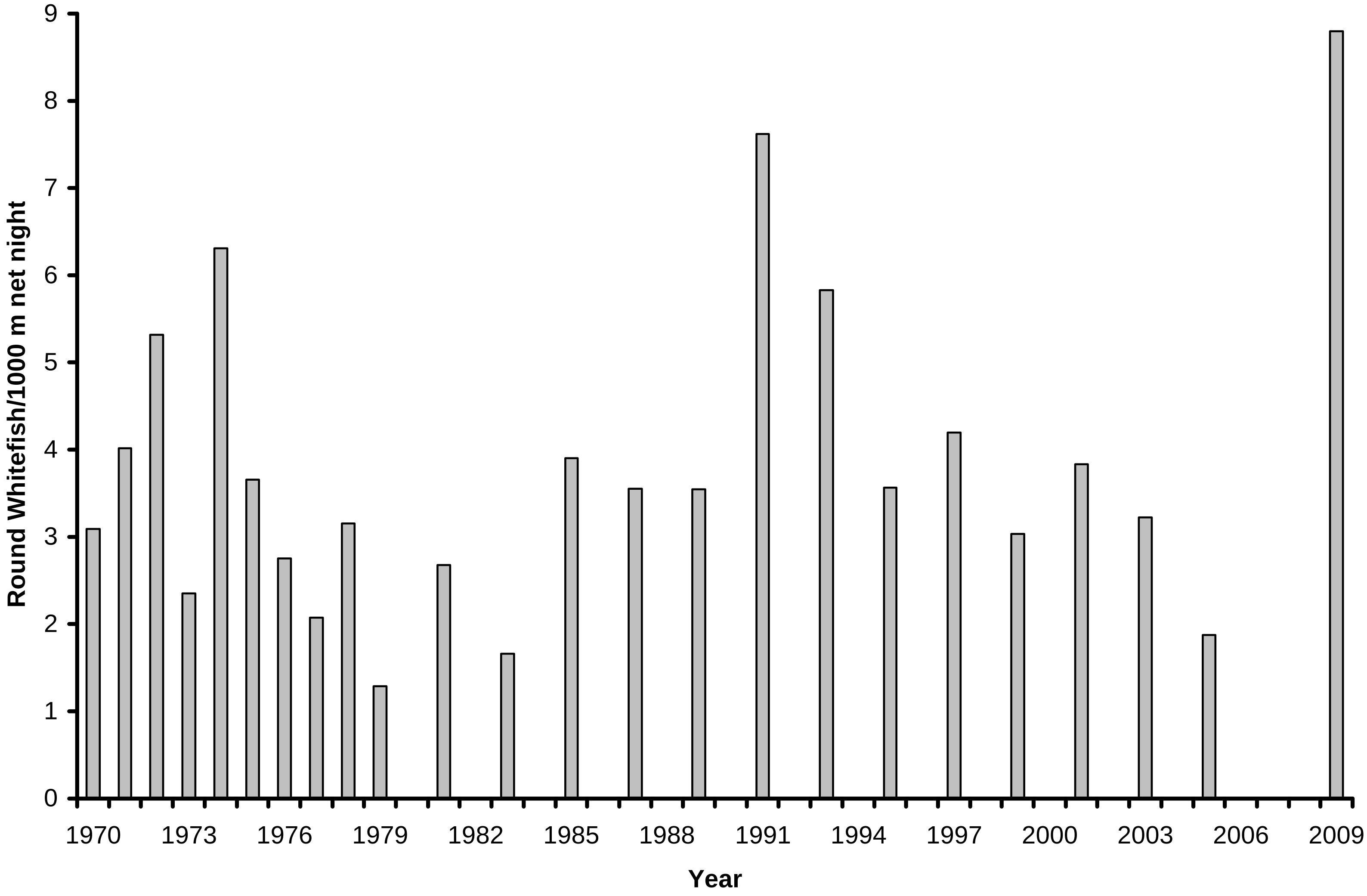

Figure 7. Geometric mean catch-per-unit-effort of round whitefish from Summer Index (from 2.0-2.5 in mesh), 1970-2009.

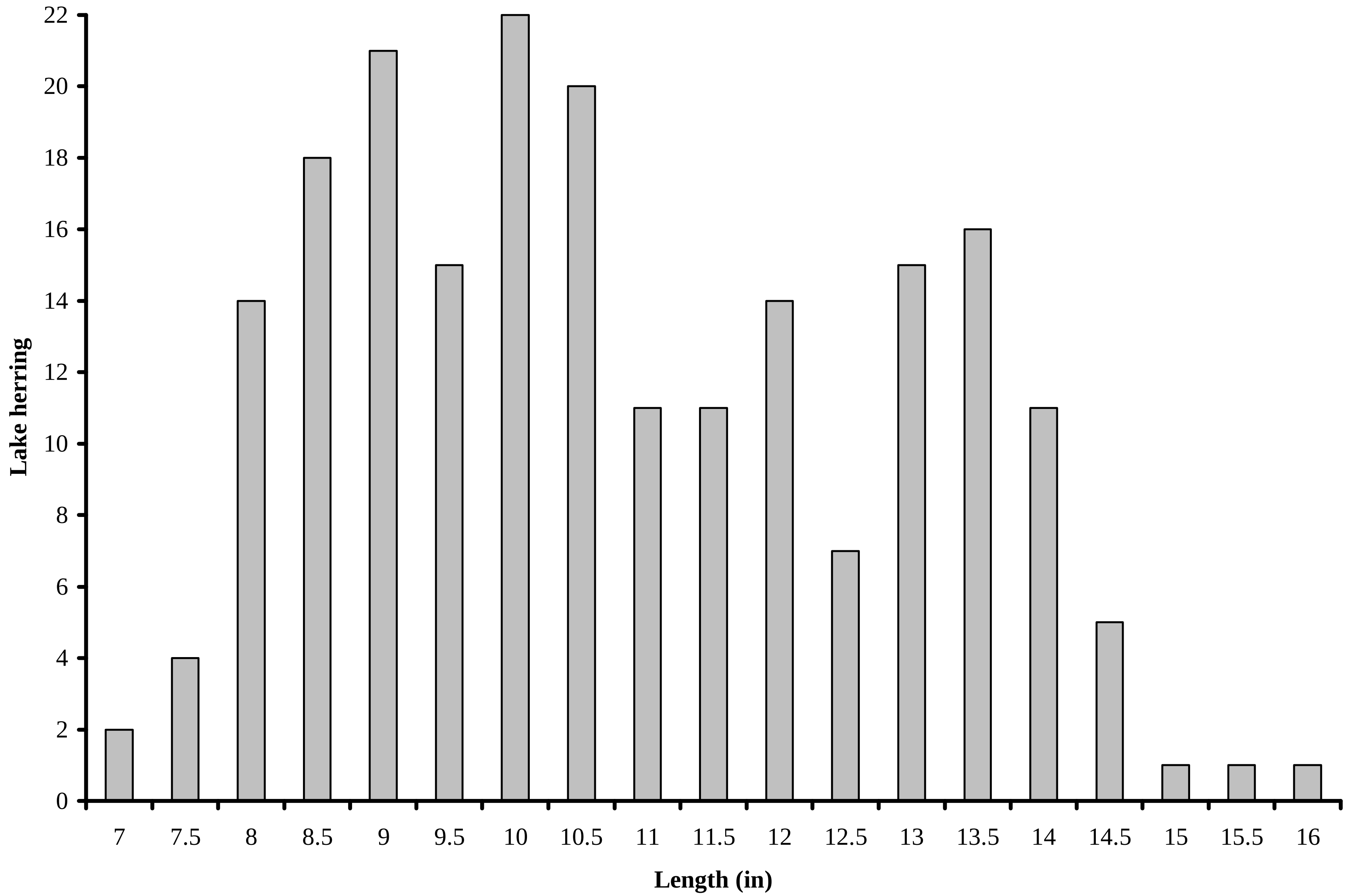

Figure 8. Length distribution of lake herring captured in Summer Index (all meshes), 2009.

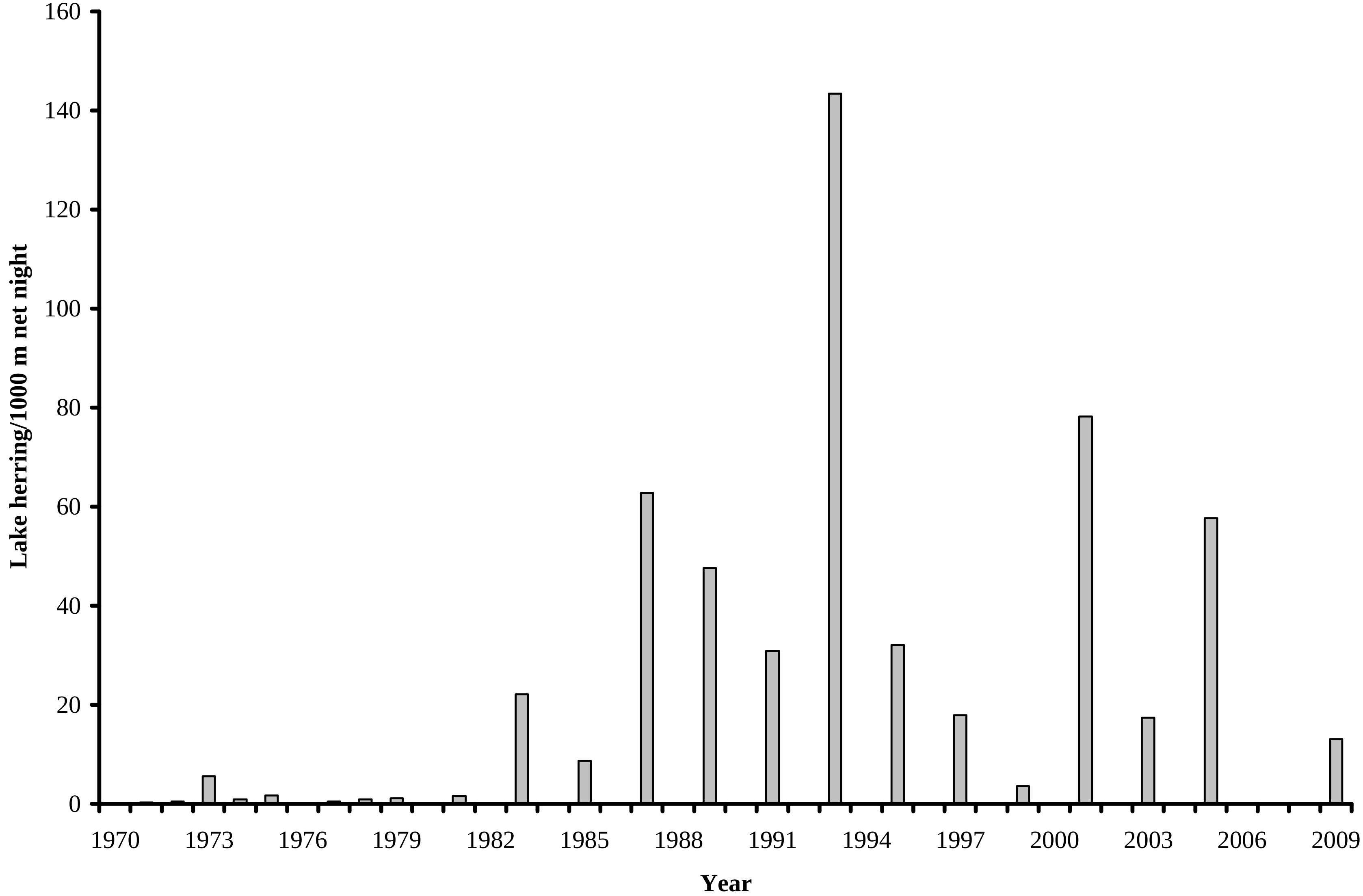

Figure 9. Geometric mean catch-per-unit-effort of lake herring from Summer Index (from 1.5 in mesh), 1970-2009.

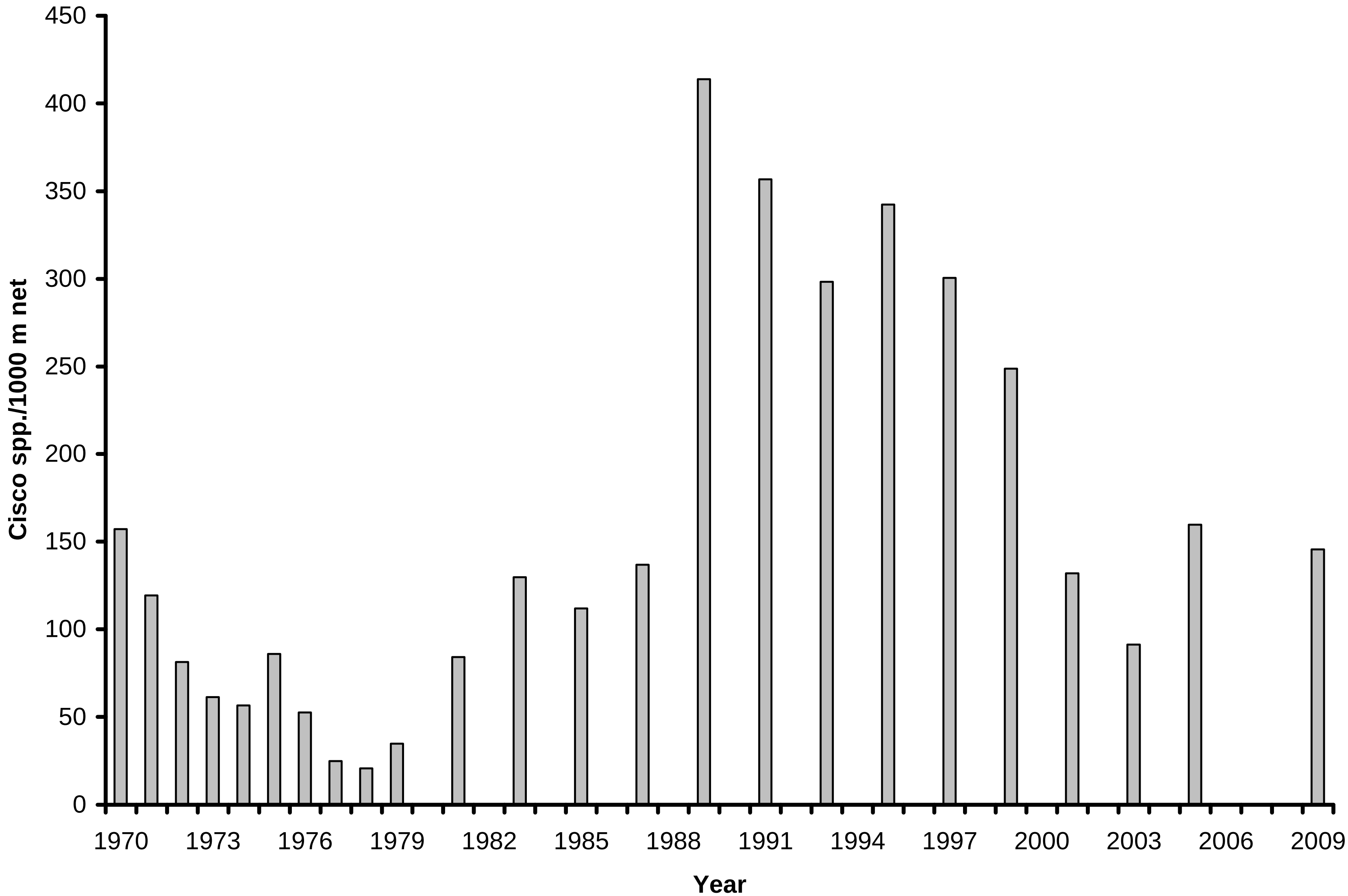

Figure 10. Catch-per-unit-effort of all cisco species from Summer Index, 1970-2009.

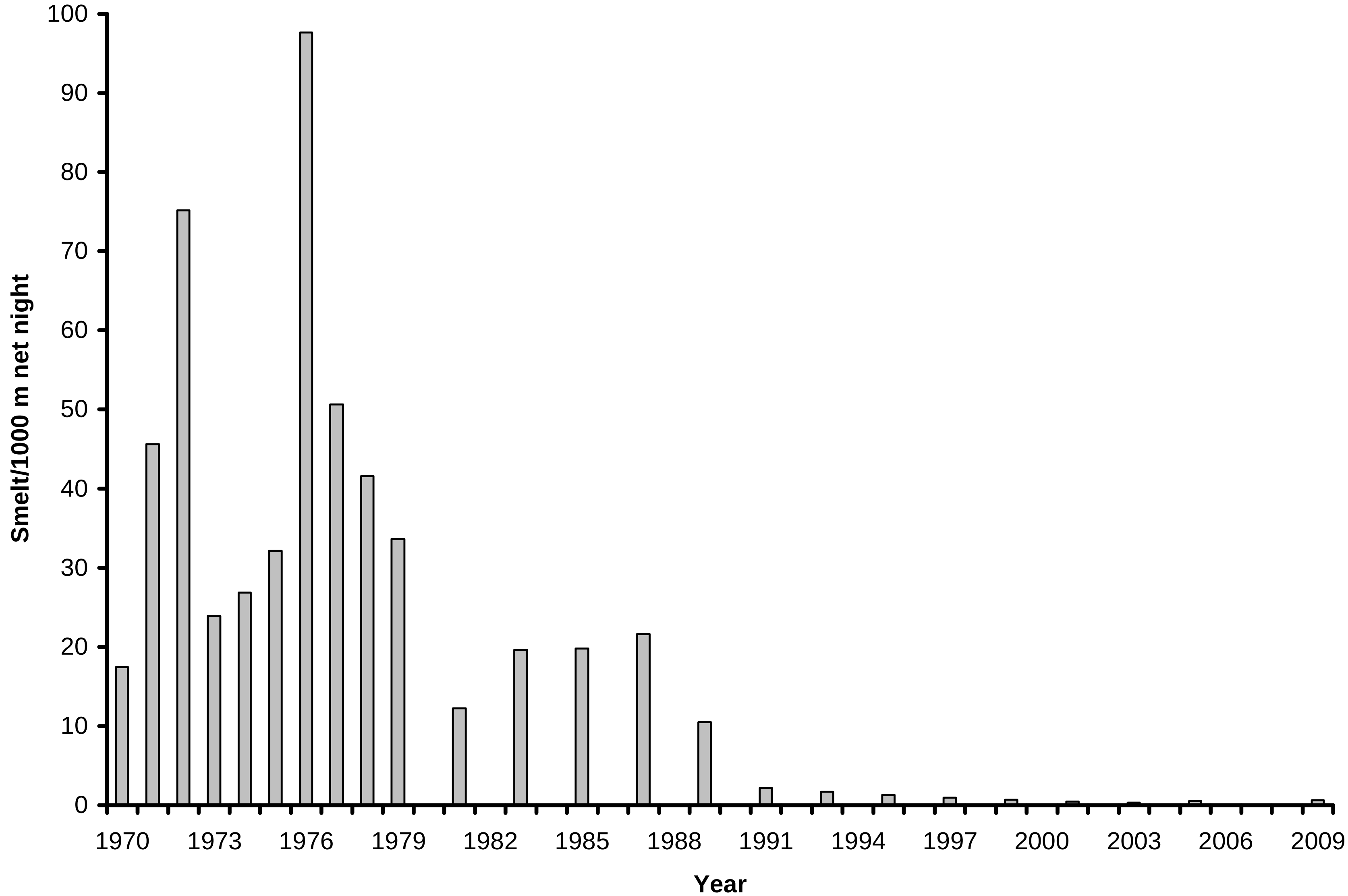

Figure 11. Geometric mean catch-per-unit-effort of smelt from Summer Index (1.5 in mesh), 1970-2009.

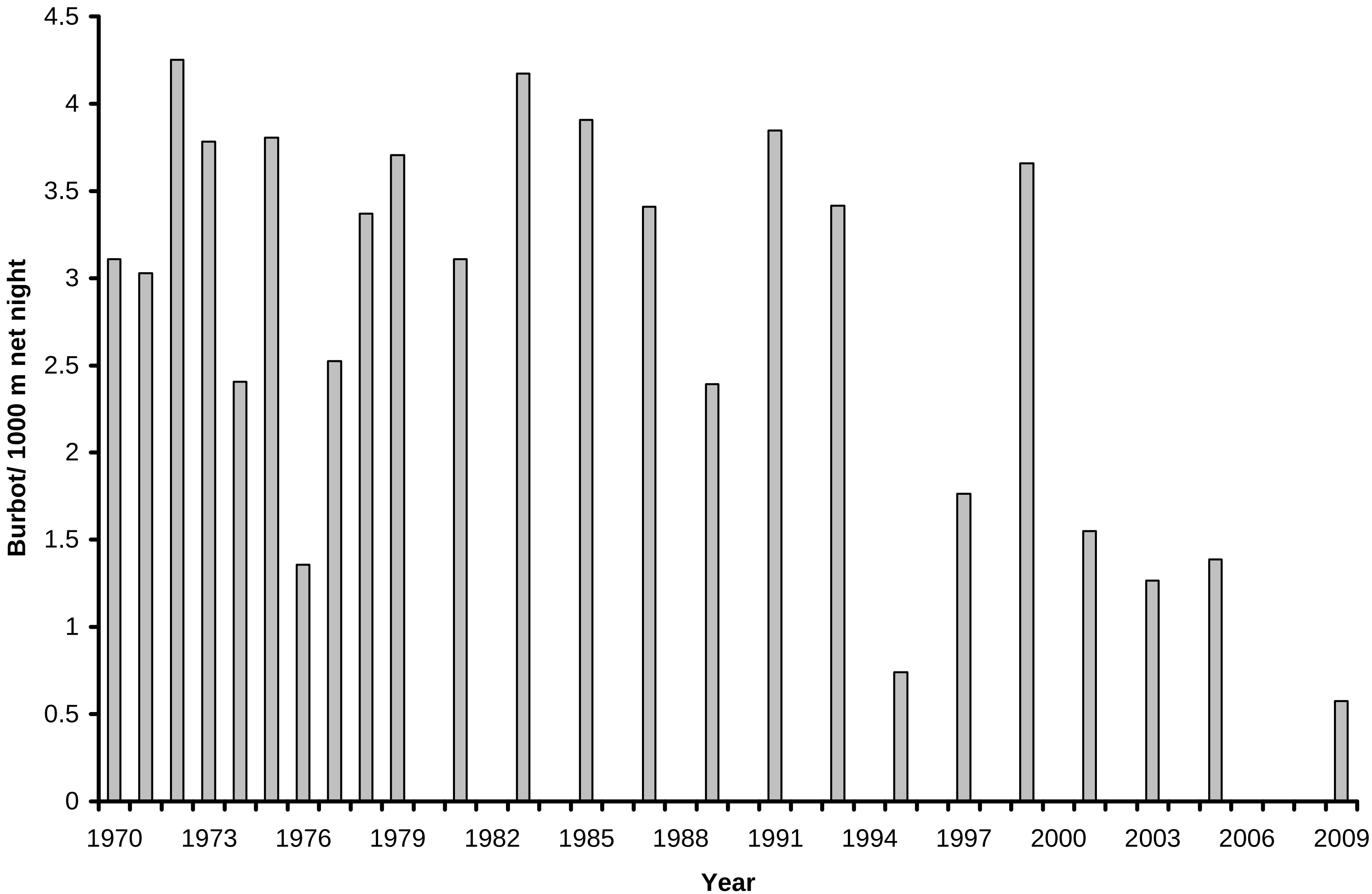

Figure 12. Geometric mean catch-per-unit-effort of burbot from Summer Index (all meshes), 1970-2009.

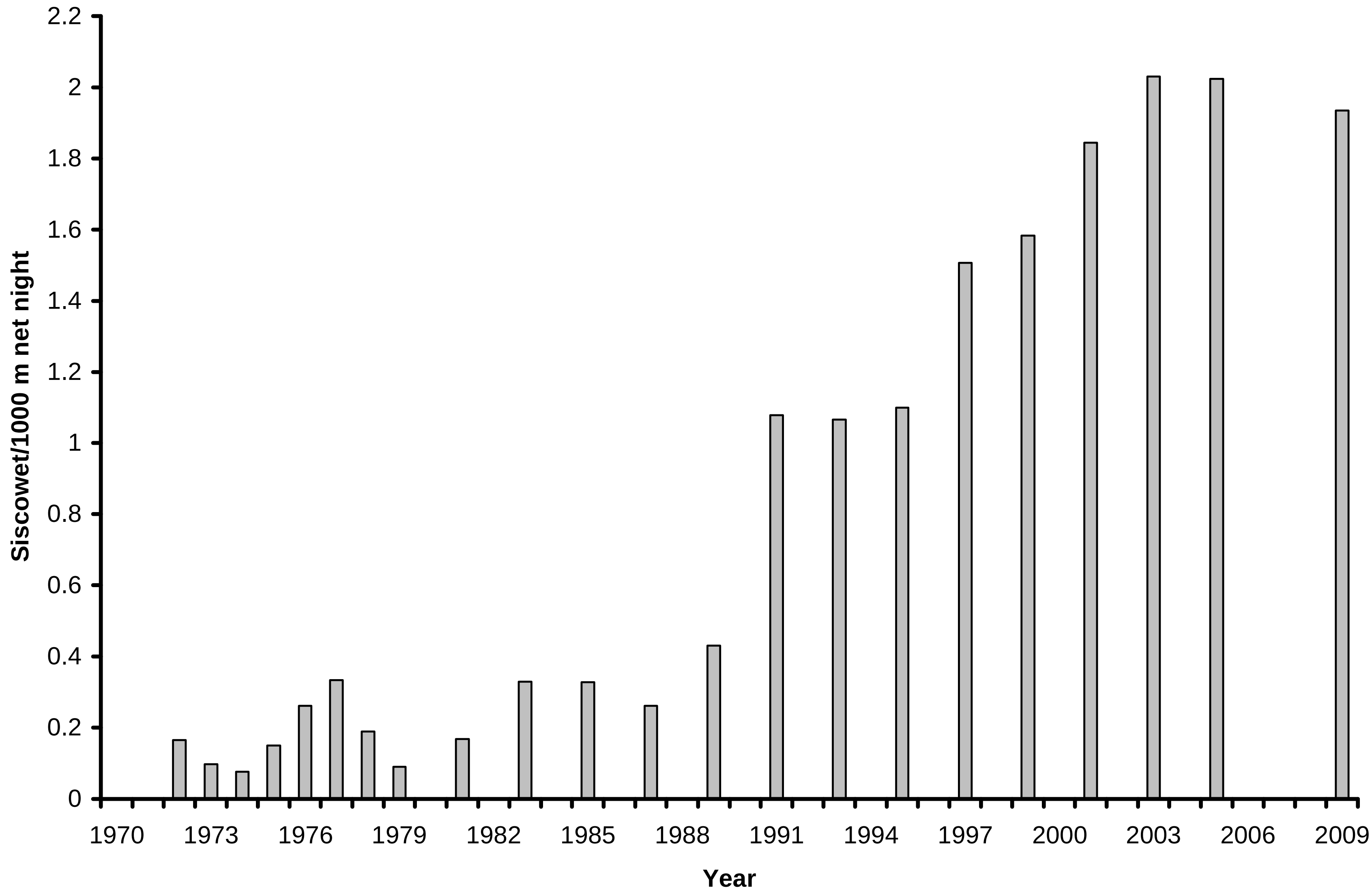

Figure 13. Geometric mean catch-per-unit-effort of siscowet lake trout from Summer Index (all meshes), 1970-2009.

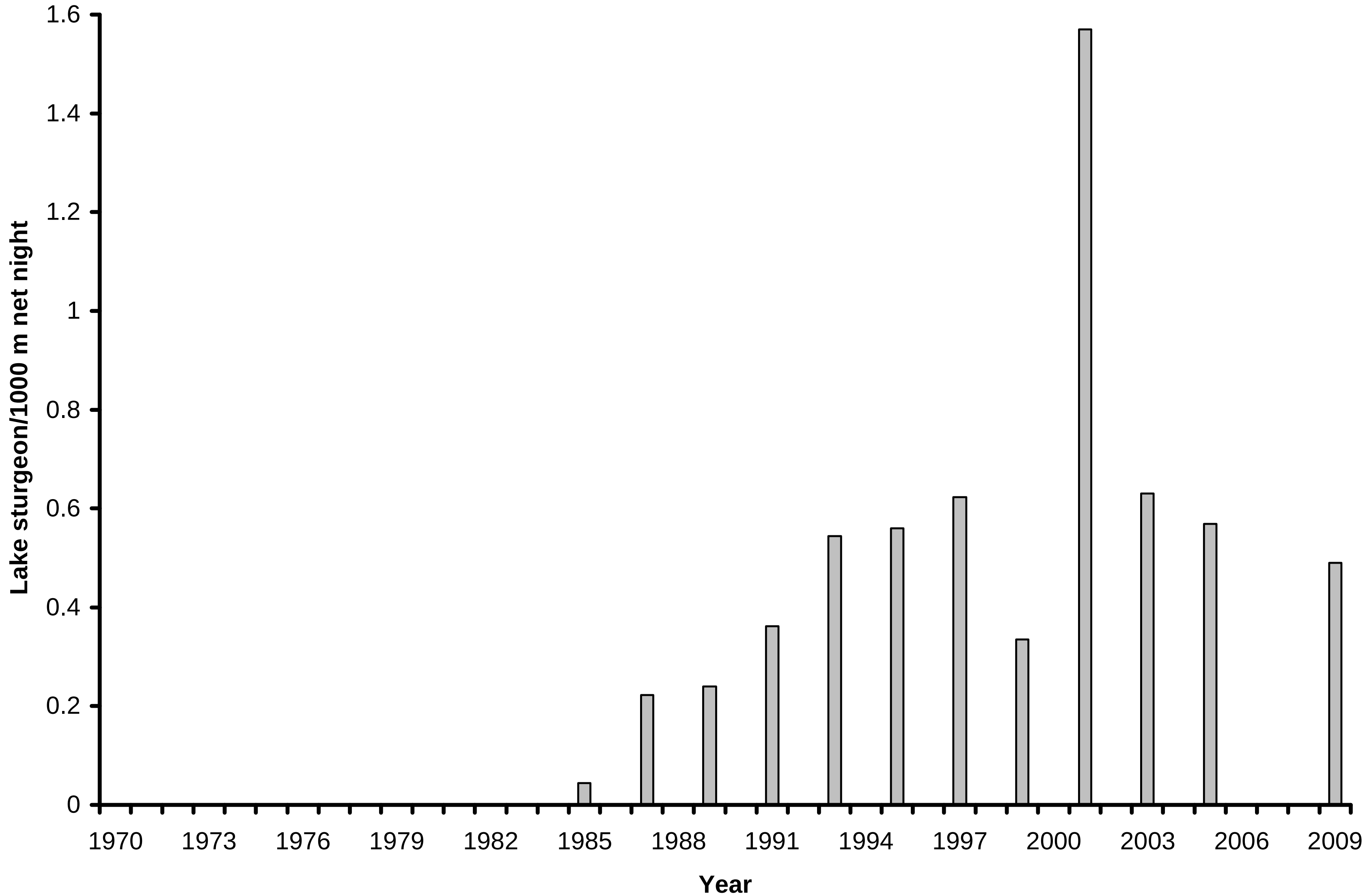

Figure 14. Geometric mean catch-per-unit-effort of lake sturgeon from Summer Index (all meshes), 1970-2009.

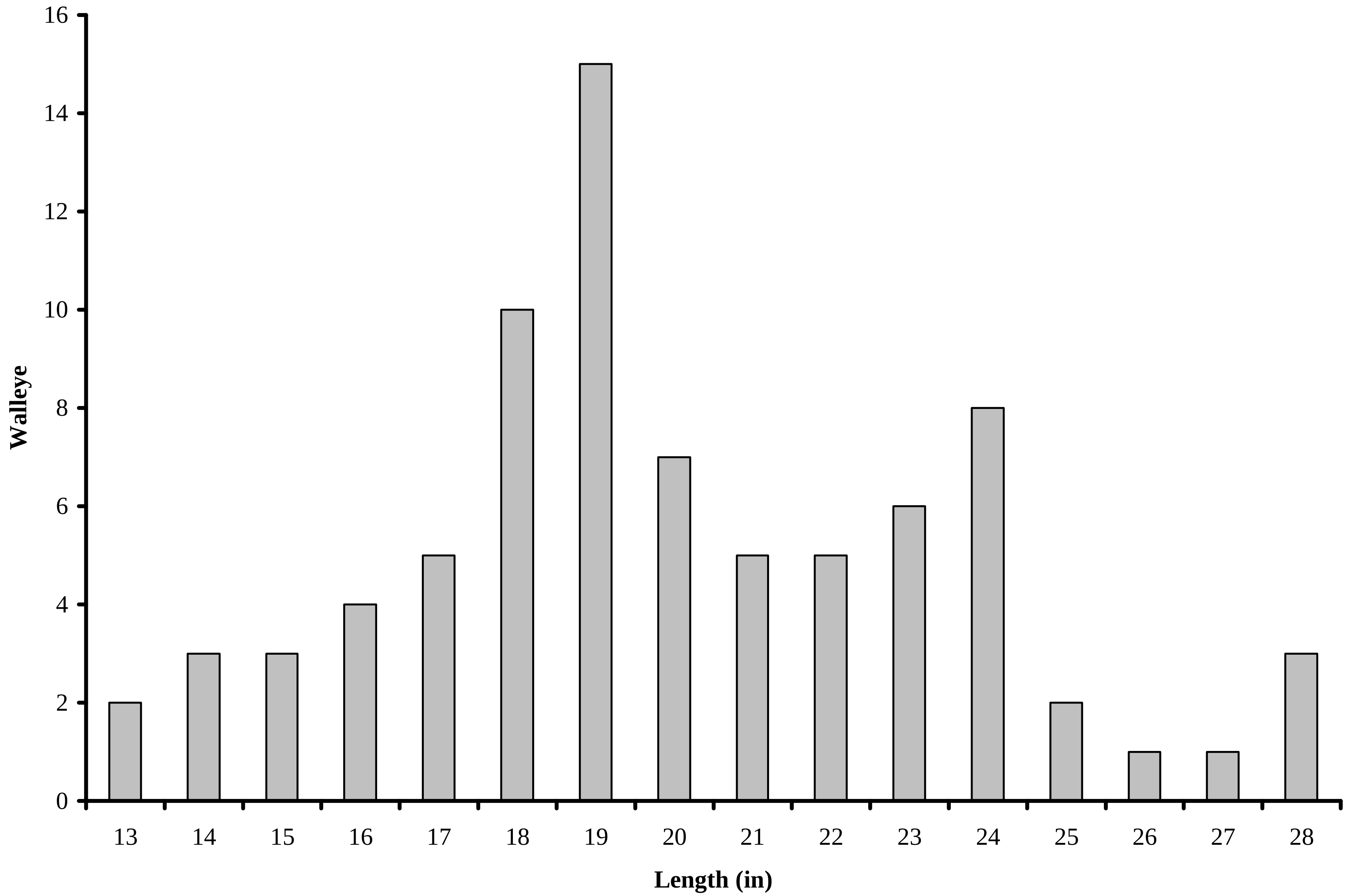

Figure 15. Length distribution of walleye from Summer Index (all meshes), 2009.

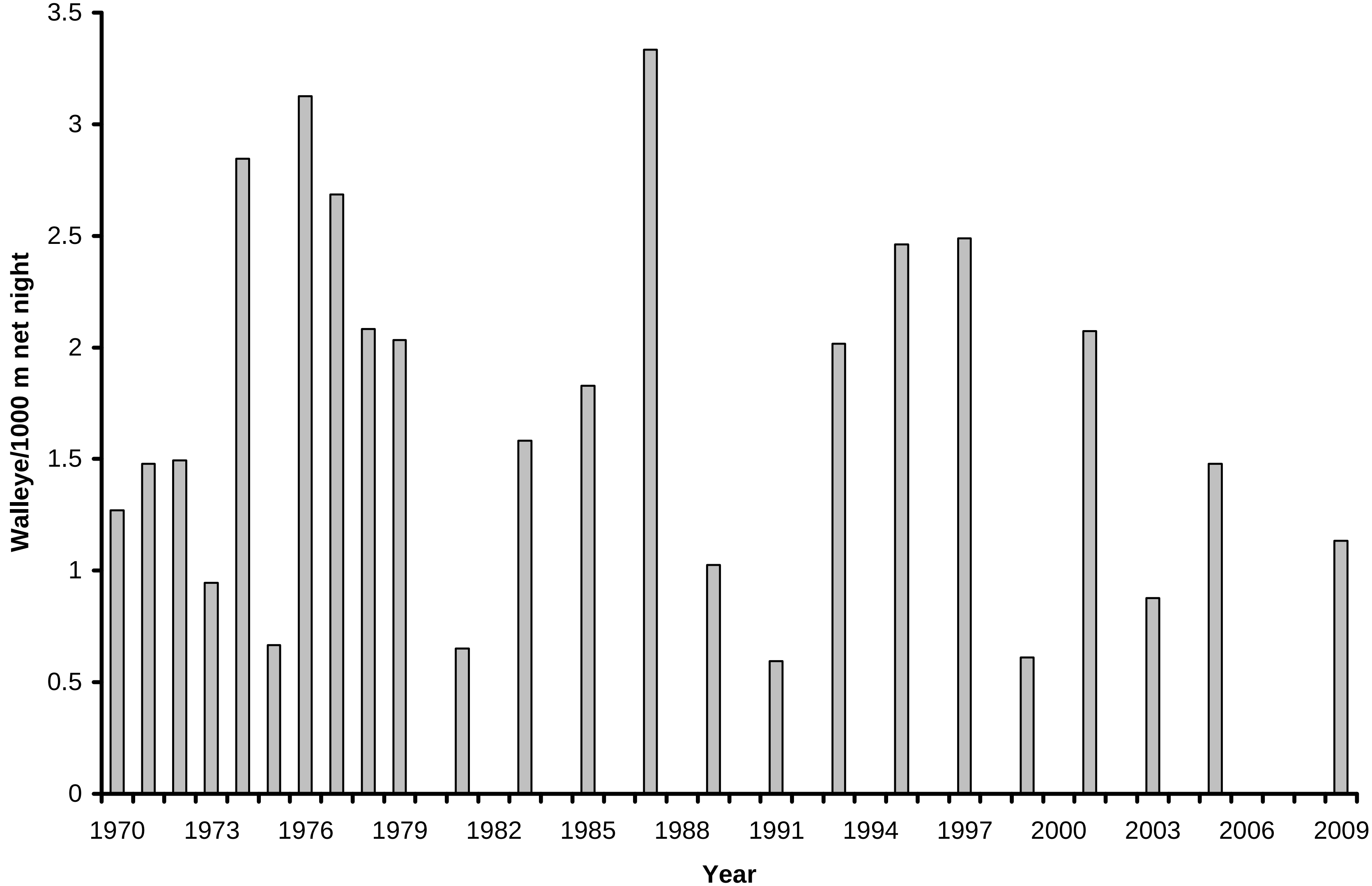

Figure 16. Geometric mean catch-per-unit-effort of walleye from Summer Index (all meshes), 1970-2009