Project Report February, 2001

BY

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1. **Project Title: Fish species diversity in Campbell Lake.**

2. **Summary:** This study was designed to gather baseline information on the fish species in Campbell Lake and Campbell Creek. Potential changes along the highway and the development of the Gwich'in Territorial Park in the area was considered motivation to learn more about the lake and creek system. The original proposal was made by the Inuvik RRC to the GRRB. However, by the time of the project initiation the main author of the proposal was not available to carry out the study. Therefore, the GRRB and DFO cooperated to re-design the project and commence sampling. In 1998, a netting program was initiated based on the sites used in an earlier survey by Read and Roberge (1986). There were 13 sites in Campbell Lake that were netted (when possible) using large mesh and experimental gillnets in a spring, summer and fall of 1998 (see attached map).

3. **Introduction:** There is a substantial sport and subsistence fishery in the spring on Campbell Creek near the highway. As well Campbell Lake is fished for pleasure and subsistence purposes. With the development of the Gwich'in Territorial Park there was a need to appraise the fish resources in Campbell Lake and Campbell Creek. To facilitate sampling the GRRB hired field workers, Harry Carmicheal and Alan Firth. Alan Firth was subsequently hired in a coioperative position with DFO Area office in Inuvik. As well, Aa contribution from the FJMC allowed the hiring of Forest Day for the initial field period.

Project Objectives: This study is designed to collect much needed biological data on the harvestable species in Campbell Lake and Campbell Creek. Data collection is broken into two objectives:

1. To quantify the relative abundance of the various species in the area.
2. To quantify the spatial variation within the lake of species composition.

Materials and Methods: Sampling was done with multi-mesh and 4.5" mesh gillnets set along the bottom of the river or lake. There were 13 stations within Campbell Lake (see Figure 1). We sampled in three time periods: mid-June, early July and after freeze-up in mid-November. We recorded the net type, depth and station that the net was set at, time that the net was set, the species caught. To examine growth patterns among species, fork length (cm) was recorded and otoliths taken for later age determination. Otoliths were prepared for age determination using the break and burn technique (Chilton and Beamish 1982). Age was recorded as the number of complete annuli observed on the prepared otoliths.

Results and Discussion:

Broad whitefish dominated the overall catch (Figure 2). The other species captured were in order of occurrence: lake whitefish, inconnu, Arctic cisco, least cisco and loche.

The growth patterns of change in fork length with age are shown in figure 3. Inconnu and broad whitefish had the same type of trajectory of very rapid growth in the younger ages. However, broad whitefish abruptly stopped growing we hey reached approximately 50 cm. The capture of a wide range of sizes of fish suggests that our sampling technique was relatively unbiased for the larger fishes. Lake whitefish had a slower growth rate than inconnu or young broad whitefish but eventually reached similar sizes to broad whitefish. This information is interesting because it suggests that a large lake whitefish is in most cases much older than a broad whitefish of similar size. Because they take much longer to reach full size lake whitefish appear to be much less productive than broad whitefish. Further examination of the growth patterns suggested that a number of specimens of least cisco had been mis-identified in the field. The growth pattern of all the ciscos cluster around one line. It appears that the supposed Arctic cisco is in fact least cisco. One least cisco was misclassified as inconnu.

Variation Among Sites

There was considerable variation in species composition among locations within Campbell Lake (Figure 4). Except for site 7 across from the Campbell Creek inlet the sites in the southern end of the lake (3, 5, 11, 12, 13) were dominated by northern pike. Sites 11-13 had exclusively northern pike. Site 3 had 64% northern pike in the catch and 36% broad whitefish. Site 5 had 87% northern pike and 13 % lake whitefish. Broad whitefish were an important part of the catch in all sites except 5, 11, 12, and 13. They were a dominant part of the catch in sites 2, 4, and 6. Lake whitefish were present at many sites: 1,2, 4, 7, 8, 9 and 10. Inconnu were present at sites 1, 4, 7, 8, 9 and 10 but were usually only a small portion of the catch. Least cisco represented 29% of the catch at

site 6 and were a relatively small part of the catch at sites 1, 4, 8, 9, and 10 as well. Loche were only found at site 10.

Our results show that the species composition has not changed substantially from the time that Read and Roberge (1986) sampled. The most important species in the system remains northern pike and broad whitefish followed by lake whitefish, least ciscos, inconnu and loche in order of apparent abundance.

Variation among time periods

The overall pattern of catch throughout the season may be interpreted as being related to fish movement patterns in and out of the lake. Alternatively, it might suggest seasonal variation in vulnerability to the gear used. Assuming that vulnerability to the gear was constant with time the species differed in their seasonal use of Campbell Lake (Figure 5). Very few fish were caught in August of any species. Broad whitefish were moderately abundant in May but had highest catches in early July. They were only present in small relatively small numbers late in the year (November). In contrast, the other coregonids gradually increased their presence with lake whitefish, least cisco and inconnu all abundant in November. There are a two likely explanations for the pattern. One Campbell Lake might be a refugium for the species when they are not spawning. Thus, fish are gathering there to over-winter. Broad whitefish are not present because they are elsewhere on their typically late season spawning migrations. Alternatively, some or all of the coregonids other than broad whitefish may spawn in the lake. Broad whitefish are thought to need flowing water to successfully reproduce but ciscos and lake whitefish are known to spawn in lakes over gravel bar shoals. I observed coregonid fry in lake the lake shallows early in the year and therefore suspect that at least one species is spawning in the lake.

For most locations sample sizes within time periods were small enough to make it uncertain whether there was a change over the course of the year. At site 1 however in the first time period (June), 2 lake whitefish were caught – in July 10 broad whitefish and 1 lake whitefish were caught – in the third time period 18 broad whitefish and 3 lake whitefish were caught. Thus, it appears that lake whtiefish maintain about the same level of abundance but that broad whitefish are immigrating into the area.

4. **Management Implications:** The results suggest that the fish species composition in Campbell Lake remains as it was 15 to 20 years ago. The system is probably in equilibrium with the present level of harvest. However, this research will not present precise estimates of the equilibrium yield in the system and therefore this should not be considered a comprehensive assessment of the state of the Campbell Lake system.

5. **Reporting to Communities/Resource Users:** Reporting to the Inuvik RRC on the project was carried out by GRRB biologists as they were the principle investigators (to my knowledge). This report represents a summary of the data collected during 1998. It will be made available to the Inuvik RRC.

6. LITERATURE CITED

Chilton, D. and R. Beamish. 1982. Age determination methods for fishes studied by the groundfish program at the Pacific Biological Station. Can. Spec. Publ. Fish. Aquat. Sci. 60.: 102 p.

Read, C.J. and M.M. Roberge. 1986. Creel census and biological investigation of Noell Lake, Campbell Lake and Campbell Creek, Northwest Territories. Canadian Data Report of Fisheries and Aquatic Sciences No. 571: iv and 33p.

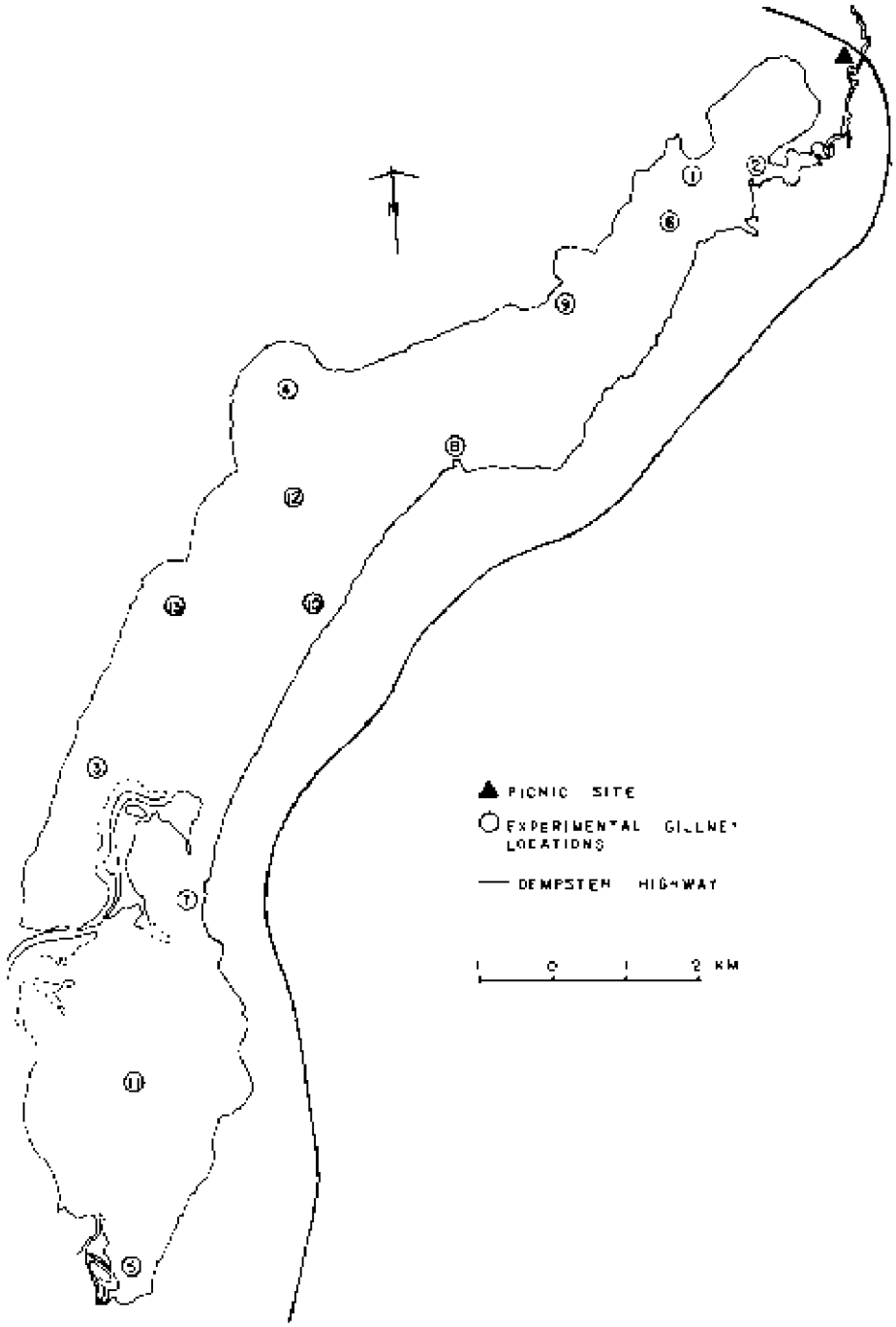


Fig. 4. Map of Campbell Lake showing the experimental gillnet locations and of Campbell Creek showing the sport fishing location (picnic site).

Figure 2. Species caught in Campbell Lake and Campbell Creek (pike is not shown).

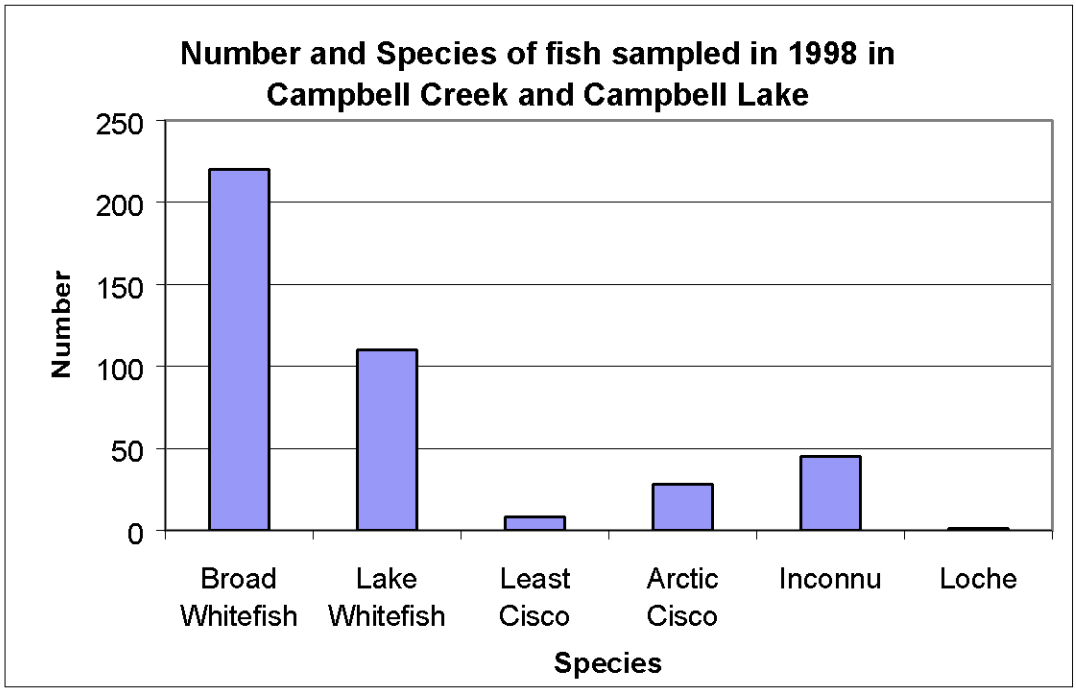


Figure 3. Growth patterns of species captured in Campbell Lake and Campbell Creek. (BDWT = broad whitefish; CISCO = Arctic cisco; INCO = inconnu; LKWT = lake whitefish; LSCS = least cisco).

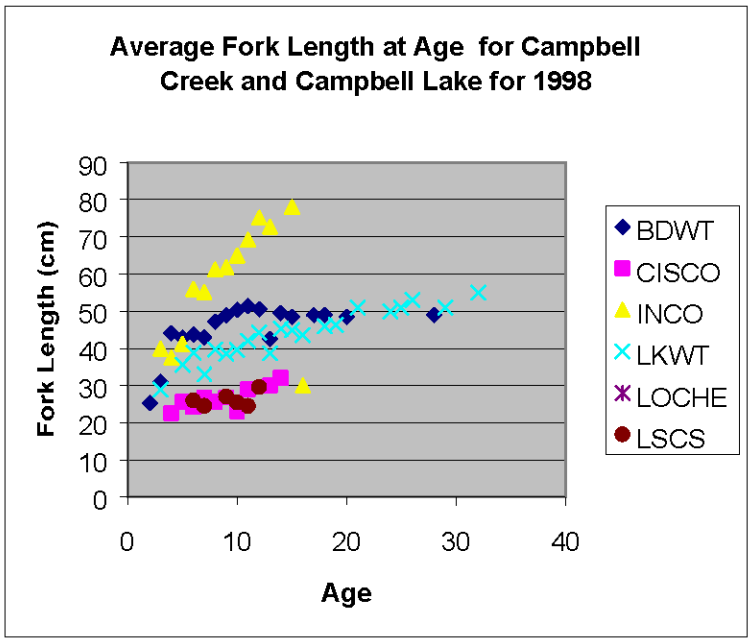
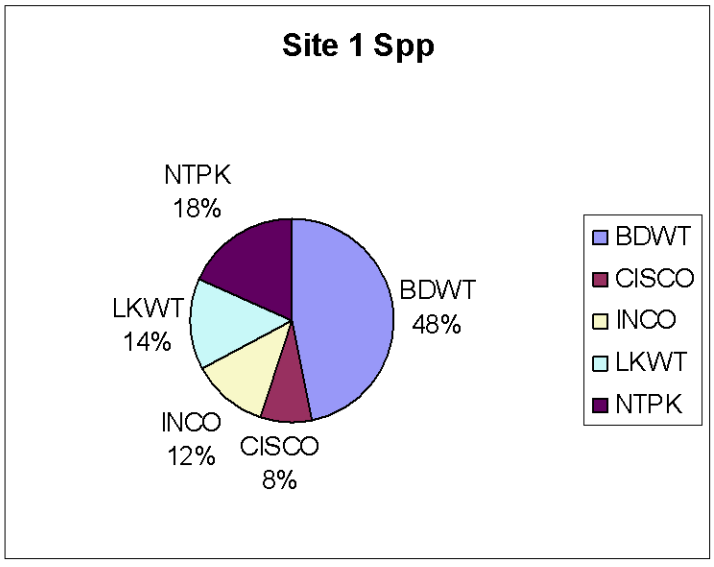
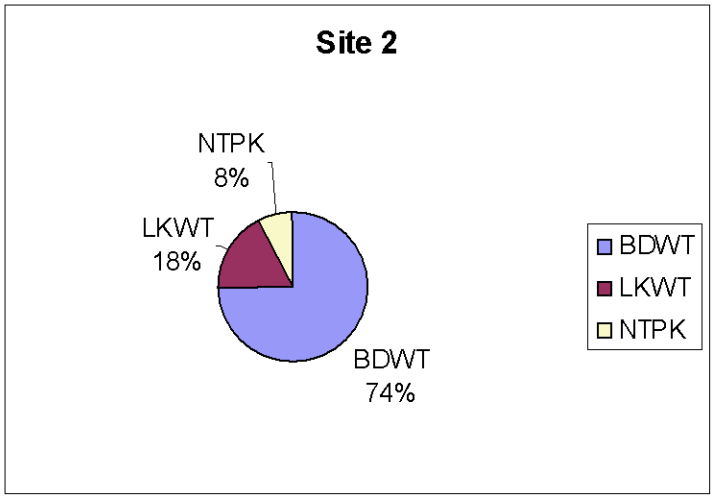
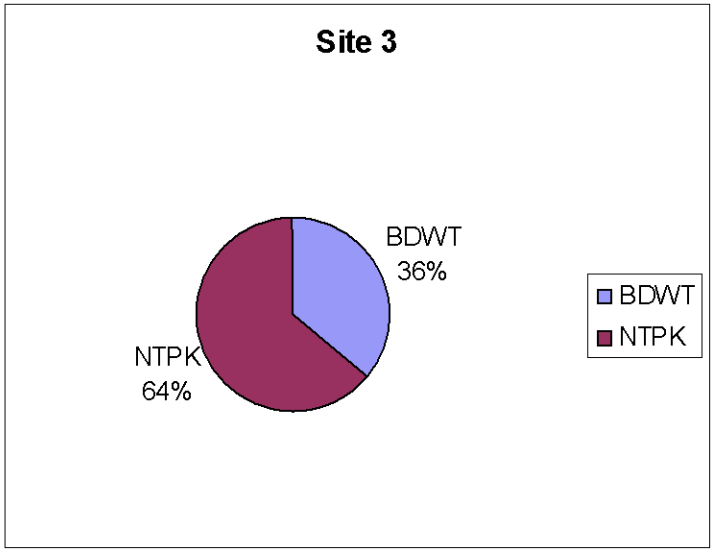
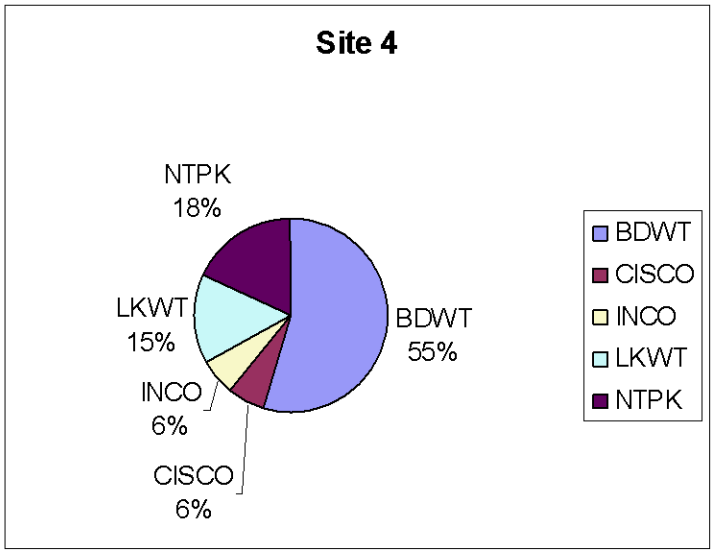


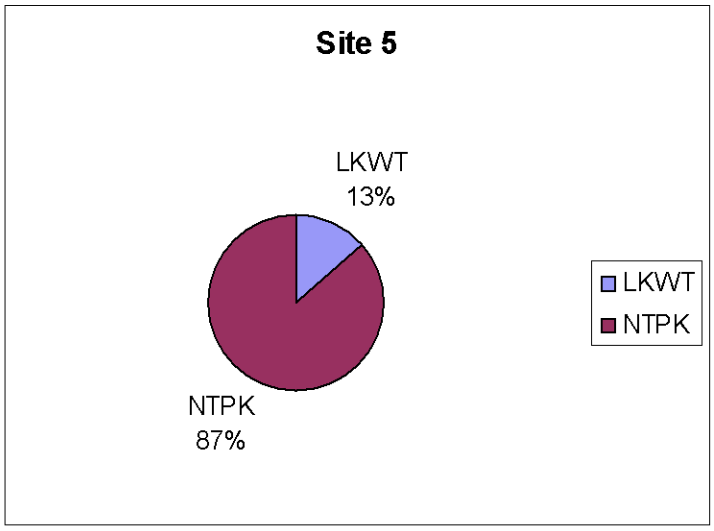
Figure 4. Species composition by site . NTPK = Northern Pike, BDWT = Broad Whitefish,



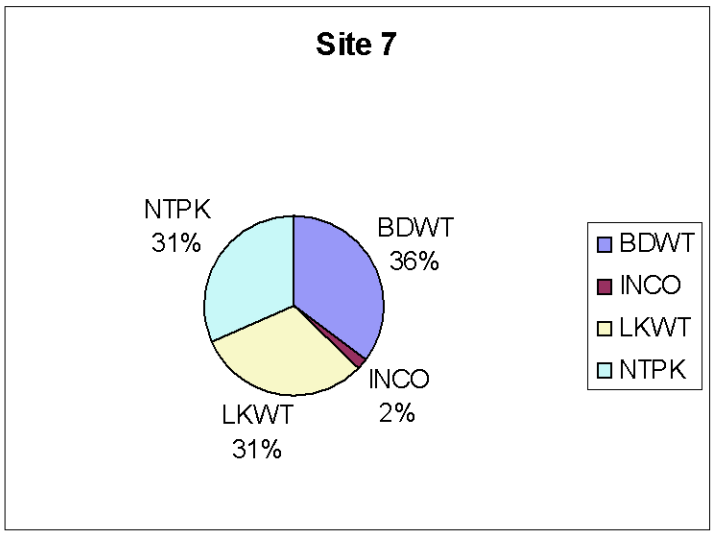

Site 2
NTPK
8%
LKWT
18%
BDWT
74%
BDWT
LKWT
NTPK

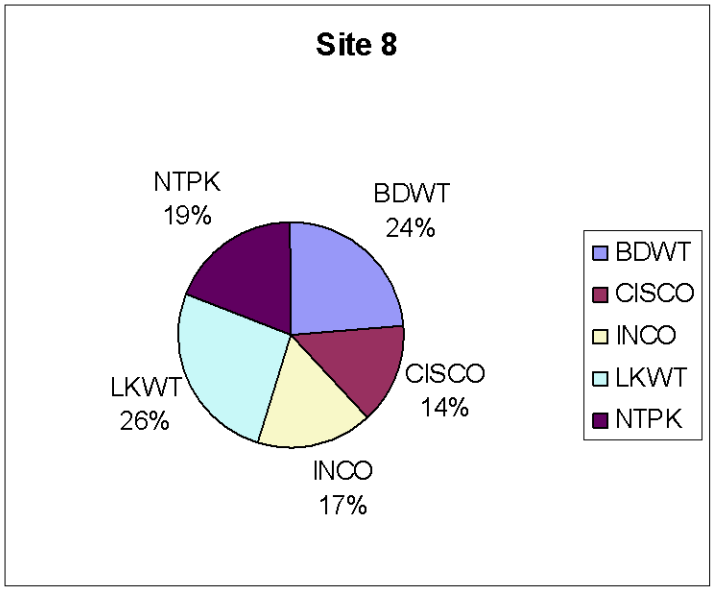

Site 3
BDWT
36%
NTPK
64%
BDWT
NTPK


Site 4
NTPK
18%
LKWT
15%
INCO
6%
CISCO
6%
BDWT
55%
BDWT
CISCO
INCO
LKWT
NTPK


Site 5
LKWT
13%
NTPK
87%
LKWT
NTPK


Site 6
CISCO
29%
BDWT
71%
BDWT
CISCO


Site 7
NTPK
31%
BDWT
36%
INCO
2%
LKWT
31%
BDWT
INCO
LKWT
NTPK


Site 8
NTPK
19%
BDWT
24%
CISCO
14%
INCO
17%
LKWT
26%
BDWT
CISCO
INCO
LKWT
NTPK

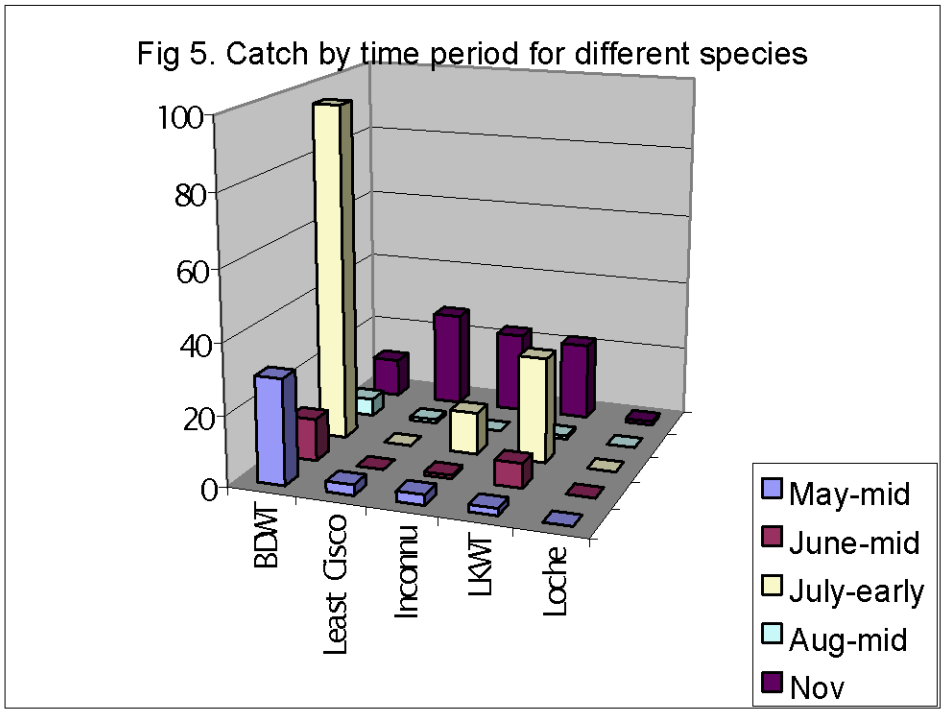


Fig 5. Catch by time period for different species
100
80
60
40
20
0
BDWT
Least Cisco
Inconnu
LKWT
Loche
May-mid
June-mid
July-early
Aug-mid
Nov