CHAPTER 6: SAMPLE DESCRIPTION AND ANALYSIS

Barrie

Faunal assemblage

As noted earlier, the faunal sample derives from the undisturbed areas of 29 features within two houses, four external refuse pits and three middens (Figure 4, Table 3). Some details on the unidentified component of the sample have already been provided in the section dealing with taphonomy (Table 11). No Euro-Canadian domesticates were identified, except for a pig mandible in one feature that has been excluded from analysis; the sample therefore appears to be free of intrusive skeletons. While it is possible that some bones of the major fossorial taxon identified, the woodchuck (*Marmota monax*), represent in situ deaths in a burrow, heat alteration on some of the bones, and their uniform state of preservation indicates this material probably represents food refuse. The current section provides more detail on the portion of the fish assemblage identified below the taxonomic level of class.

At the Barrie site, the 380 fish elements identified below class constitute 53 percent of the combined NISP for all classes. In order to allow comparison with other southern Ontario assemblages, NISP is calculated as a percentage of the combined fish, amphibian, reptile, bird and mammal sample. The sixth commonly recovered taxonomic class, Pelecypoda, or freshwater clams, has been excluded here because of unevenness in recovery and/or preservation between the three sites, and because a disproportionately large number appear to have been curated as tools or ornaments. Clams contribute three percent to the NISP of all six classes at Barrie, and even less at the other sites. The fish assemblage is quite rich, but not very even; it is dominated by lake sturgeon and yellow perch, which together make up over half of the fish NISP.

**Acipenseridae**

Lake sturgeon elements represent almost a quarter of the fish NISP at the Barrie site. Such an abundance of sturgeon elements is unusual for village sites in the region. As noted above, ossified dermal scutes were included in the NISP to compensate for the paucity of ossified cranial bones in this species. While elements of the reference specimen at University of Toronto were not labelled, some cranial bones were tentatively identified to specific element using illustrations (Bartosiewicz and Takács 1997; Desse-Berset 1994). It is hard to know how much food these 85 elements represent. The five pectoral spines represent a minimum of three individuals. Their size indicated that they belonged to mature individuals.

A dermal scute with a pronounced, sharp ridge, suggests at least one of the individuals was considerably younger than the individuals represented by the pectoral spines. Between 20 and 25 years of age, the sharp points on the dermal scutes disappear, associated with attainment of sexual maturity. This pointy scute, therefore, suggests at least one further, immature, individual is present. As noted above, lake sturgeon spawning migrations can include immature individuals. It is quite possible that these 85 elements derive from a single catch of a minimum of four individuals. However, the extensive spatial distribution of the finds suggests that fishing for lake sturgeon may have been more than an incidental activity. A successful biochronological application of the pectoral spines might have provided answers in the form of calendar year of capture.

The two spine fragments that appeared, macroscopically, to be best preserved were selected for sectioning. As the fragments were immersed in cold cure epoxy and hardener (Industrial Formulators, Canada), air bubbles escaped as air in the bone was being replaced by epoxy. The amount of air escaping was greater than in modern spines; this may relate to the fossilisation process. Thin-sections were made with a diamond blade saw operating in a tap-water blade bath.

As noted above, during microscopic examination of the sections it became obvious that the spines suffered from extensive demineralisation, delamination and probable iron-staining. Similar effects were observed also on the Hector Trudel material (Cossette 1995:544). As a result, our interpretations were limited to minimum age estimates on three of the sections. The sections exhibited undamaged segments of at least ten years of interpretable growth patterns. The age of these three individuals was in excess of 20 years. They can, therefore, indeed be assumed to have been sexually mature.

**Salmonidae**

Lake trout, lake herring and lake whitefish represent two percent of the fish NISP. At Barrie, mostly lake trout cranial bones were identified, although lake herring or lake whitefish is represented by one cranial bone and limited numbers of vertebrae. Lake whitefish can sometimes be identified specifically based on absolute size, since they grow larger than the other common member of the genus, lake herring. However, since these species have been known to hybridize and since dwarf populations of the former sympatrically co-exist with regular-sized fish (Scott and Crossman 1973:270), species identification based on archaeological material is problematic.

Two contexts contained only cranial bones. Five contexts, including Midden A and Midden B, contained only vertebrae. Two additional contexts, H1 F133 and Midden D, contained both Salmonidae cranial bones and vertebrae. Lake herring or lake whitefish (*Coregonus* sp.) contributed two percent to the identified vertebrae, while lake trout contributed 15 percent. This supports the statements made in Chapter 4 regarding greater ubiquity of vertebrae vs. cranial bone, although the larger, more robust lake trout vertebrae dominate.
Esocidae

Pike family fishes represented 12 percent of identified fish (NISP). The osteological similarities between the three local members of the genus and the lack of reference specimens covering the entire spectrum of age and sex are reflected in some less certain identifications. Vertebrae represent 21 percent of identified fish. The vertebrae appear to be mostly from larger individuals, whereas the cranial bones are mostly from smaller individuals.

Catostomidae

White and longnose sucker combined represent 11 percent of the identified fish, with white sucker four times as plentiful as longnose sucker. Because of the behavioural and habitat differences between the two species (Table 7), a special effort was made to identify each bone to species. Problems in differentiating the two species on many elements are reflected in the high proportion of genus level identifications. Vertebrae represent 39 percent of identified vertebrae. The proportional element sizes indicate mature individuals.

Ictaluridae

Catfish family fishes represent eight percent of the fish NISP. Only two of the 25 identifications pertain to pectoral spines. A single element was identified as channel catfish; two further elements were indeterminate bullhead or catfish. Vertebrae represent only two percent. This is surprising given the distinctiveness, robusticity and solid projections of Ictaluridae vertebrae.

Two brown bullhead pectoral spines from Midden A at the Barrie site were subjected to age and growth analysis (MNI 2) (Needs-Howarth and Brown 1998). Poor preservation, in conjunction with damage on the edge, made it impossible to obtain an age for one spine from the Barrie site, although the edge condition could be somewhat confidently interpreted as autumn. The other spine was somewhat confidently interpreted as being from a fish aged four, caught in spring.

Data from Northern Wisconsin (Scott and Crossman 1973:601-602) suggest brown bullhead reach maturity at three years. In the brown bullhead population in the Rivière aux Pins near Montreal back-calculated lengths at time of annulus formation for fish age three years averaged 201 mm for males and 194 mm for females. For fish aged four years, average sizes were 254 mm for males and 240 mm for females (Harvey and Fortin 1982). Maximum age in this population was 10+ years, with TL 350 mm. In a study from a eutrophic lake in New York State back-calculated lengths at time of annulus formation were 220 mm for males age 3 years, 215 mm for females age three (Sinnott and Ringler 1987: Table 3). In this population the maximum age was 7 years, with TL 317 mm.

Centrarchidae

The Centrarchidae, consisting mostly of small panfish, is moderately well represented, totalling 14 percent of identified fish. Only the more common taxa are represented. This is the only taxon for which proportions of vertebrae identifications more or less match cranial bone identifications.

Percidae

The current representatives of the family Percidae in the Lake Simcoe drainage are yellow perch and walleye, which comprises two sub-species, walleye (Stizostedion v. vitreum) and blue walleye (Stizostedion v. glaucum). The status of sauger (Stizostedion canadense) in precontact Lake Simcoe is uncertain.

Yellow perch is well represented at 32 percent of the NISP. Only one element was identified as Stizostedion sp. Percidae vertebrae represent only four percent of identified vertebrae. Since Perciformes vertebrae are quite similar, it is possible that some yellow perch were incorrectly identified as Centrarchidae, but this is not likely to account for all of the discrepancy.

The single Percidae fish scale recovered from the site was subjected to CSAGES analysis. A first requirement was to identify the species. As expected based on the cranial bone taxonomic distribution and robusticity of the different scale types, initial macroscopic examination of the scales from Barrie, Dunsmore and Carson indicated they belonged to the order Perciformes, which includes Centrarchidae and Percidae. Further examination showed that those selected for analysis were all Percidae. Based on the cranial bone NISP at all three sites (Table 24), it was assumed that the Percidae scales recovered would be from yellow perch. Less likely options would be the genus Stizostedion, either walleye or blue walleye, or, even less likely, based on current distribution, the Sauger, which was not specifically identified at any of the sites.

With the exception of the single scale from the Barrie site, the growth pattern around the focus was very uniform, possibly relating to juvenile feeding movements. The overall growth rate is similar. This suggests that the scales from Dunsmore and Carson belong to just one species. The scales of the three members of the family Percidae are similar in appearance, however, they can be differentiated. The focus of yellow perch and walleye scales is filled with ridges, whereas that of Sauger is largely empty, with only a few scattered ridges (Daniels 1996:80). The scales under examination were obviously yellow perch or walleye.

Perch has a more defined, and hence uniform, growing season because it is close to the northern limit of its range. Walleye has a more northerly distribution and hence is more tolerant of cold water; as a result, walleye has a less uniform growing season, which is reflected in more sub-annular checks. Walleye also grow much faster initially, and they live much longer (Figure 14). Based on these differences in growth pattern, David Brown is confident that the partial scale from Midden D at the Barrie site is yellow perch, and that all analysed scales from Dunsmore and Carson are
The yellow perch scale from the Barrie sites belonged to an individual caught in spring. It was probably five years old at time of death (Table 26) (Needs-Howarth and Brown 1998).

**Fish by feature**

**Introduction**

As was discussed in Chapter 5, there is some overlap in species composition within the Three Fisheries Model, particularly between the Spring Spawning-run Fishery and the Generalized Warm Weather Fishery. By utilizing information on fish co-occurrence in features, together with fish proportional element size distribution, an attempt can be made to establish when the fish found in the archaeological deposits were caught, and hence what kind of fishing activity they represent. The following is a description and interpretation of the fish finds in those features rich in fish bone (here arbitrarily defined as those containing more than 10 fish bones identified below family (Table 27)). These features are described here to illustrate the intra-site variability in fish deposits. Proportional element sizes for the Barrie site are provided in Figure 15.

**Barrie Feature 133, a refuse-filled depression in House 1**

This context includes heavy fraction. A clustering of larger yellow perch bones (Figure 15) and the presence of lake sturgeon, white sucker and cf. *Catostomus* sp. (including many *Catostomidae* vertebrae) may indicate net fishing during the Spring Spawning-run Fishery. Four lake trout cranial bones (representing at least two individuals) and 17 vertebrae, as well as four lake herring or lake whitefish vertebrae, may indicate an autumn Lake Fishery, which may have included the suckers as well (Needs-Howarth and Thomas 1998). Following the Three Fisheries Model outlined in Chapter 5, the northern pike and brown bullhead cranial bones and the Centrarchidae vertebrae may have been part of the Generalized Warm Weather Fishery around the site or in Kempenfelt Bay (Needs-Howarth and Thomas 1998), although the status of northern pike in pre-twentieth century Lake Simcoe is uncertain (MacCrimmon and Skobe 1970:85, 90, 91, 92).

Given the overall fish contents of the feature, however, it is possible these taxa also derived from the lake or river, as a by-product of a Spring Spawning-run Fishery for yellow perch and suckers in or a Lake Fishery for *Salmonidae* in spring or autumn. The *Salmonidae* and lake sturgeon may have been caught in the lake in spring as well as part of the spring component of the Lake Fishery. Alternatively, the autumn component of the Lake Fishery may have included the suckers. Either hypothesis can be supported by a humerus from a diving duck (probably bufflehead (*Bucephala albeola*)), a taxon that migrates through the area in April and early May, and again in late October and November. Lake sturgeon, however, were most likely obtained during the Spring Spawning-run Fishery, whereas the five whitetailed deer bones (MNI 2) found in this context would indicate that at least some of the faunal refuse was deposited in autumn, when deer are most likely to have been hunted. It is, therefore, likely that this feature contains at least two discrete episodes of deposition.

**Barrie Feature 136, an ash pit in House 1**

While the fish NISP, consisting of only two taxa, would suggest the conclusion that the fish assemblage of this feature is not very diverse, the vertebrae represent an additional two taxa. The 11 yellow perch bones show a restricted size distribution (Figure 15), including mostly individuals of spawning size. The only other zooarchaeological finds from this feature are a single clam shell fragment and some unidentified bird and mammal fragments. This admixture of finds conforms with the feature type interpretation.

**Barrie Feature 156, a pit in House 1**

This feature contains a mixture of fish, with no dominant taxon. It may include secondary refuse from several fishing events. Seven painted turtle (*Chrysemys picta*) elements indicate warm weather activity. This feature has an unusually high ratio of identified remains. As was the case for Feature 136, Feature 156 contained no identifiable bird or mammal remains.

**Barrie Feature 163, a pit in House 1**

The presence of lake sturgeon indicates a Spring Spawning-run Fishery in the Nottawasaga River. Some of the yellow perch, totalling 90 percent of the fish NISP in the feature, may derive from a spawning-run catch in Lake Simcoe tributaries (Figure 15) (Needs-Howarth and Thomas 1998). The presence of three common merganser bones may relate to fish exploitation; it is possible that these diving, fish-eating were unintentionally caught when they became entangled in nets set over shoals (e.g. Studer 1992). Attributes of immaturity on the common merganser bones indicate autumn exploitation of the lake shoals (Needs-Howarth and Thomas 1998). Nine *Esocidae* and three Centrarchidae vertebrae may have been obtained as part of the Generalized Warm Weather Fishery.

**Barrie Feature 216, a pit in House 2**

Almost three quarters of the fish bones in this feature are from lake sturgeon and suckers, indicating it mainly represents a Spring Spawning-run Fishery (Needs-Howarth and Thomas 1998). Suckers are also well represented in the vertebrae. A single large lake trout vertebra from this feature may represent a stored resource or an incidental early spring capture from the lake shoals (Needs-Howarth and Thomas 1998). This feature is notable for the large numbers of black bear (*Ursus americanus*) remains, consisting of thoracic and lumbar vertebrae, as well as phalanges, probably all from the same immature individual. While finds of (calcined) bear distal extremity bones at other sites have been interpreted as the possible remains of bearskin cloaks (Needs-Howarth 1992; Thomas et al. 1998), the inclusion in Feature 216 of vertebrae as well may indicate food or sacrificial refuse. There is mention in the ethnohistoric sources of young bears being kept in captivity.
by the Huron and subsequently being sacrificed during feasts (Trigger 1976:41).

**Fishing events**

Individual features sometimes contain taxa indicative of different seasons of exploitation. This admixture can be explained by often prolonged, and intermittent use, causing several procurement events to be represented in a single archaeological context. Fish may also have been dried and stored for later use, adding to the confusion. An attempt will be made, nevertheless, to generally characterize the Barrie fish assemblage in terms of fishing events.

Lake sturgeon appear in all but one of the major features discussed above. As noted under “diagnostic elements”, assessing abundance based on NISP is somewhat problematic. The 85 sturgeon bones identified from the Barrie site may only represent four individuals. As noted above, the fact that local sturgeon spawn in May does not mean they were exclusively caught during that time. These finds may derive from gill-nets used on Lake Simcoe, or from set nets used on the Nottawasaga River outside spawning season. The zooarchaeological, archaeological, zoological and ethnohistoric data, together with intra-site bone distributions, however, indicate that it is likely that the site occupants were mostly exploiting spawning populations (Needs-Howarth 1996). While lake sturgeon does not consistently co-occur with suckers, all features with suckers do have lake sturgeon bones as well.

Knowledge of lake sturgeon behaviour, seasonal distribution and local geography, together with the substantial number of finds, suggests that this taxon was targeted by the occupants of the Barrie during its spawning-run (Needs-Howarth 1996). The pectoral spines belonged to sexually mature individuals. This may support the hypothesis of spawning-run exploitation, although immature individuals do travel along with mature individuals on their spawning-run. The most productive and predictable place for a sturgeon fishing expedition would probably be at or close to the mouth of the Nottawasaga during the spring spawning-run. The site occupants may not have ventured out just for the lake sturgeon, but if they knew, from prior experience, approximately when the spawning-run would start, they could have combined lake sturgeon fishing with other activities.

While there are too few sized northern pike bones in individual features to make any clear statements on fish size distribution, the average size of northern pike bones suggests the kind of limited size distribution from a small fish-trap. The average proportional element size suggests that many of the northern pike identified at Barrie were of sexually immature individuals. These were most likely caught with passive technology, such as fish-traps, or nets. In contrast to northern pike, the distribution of brown bullhead sizes is much wider, with a distinct peak.

The average size of all yellow perch elements (screened and floated) is 92 percent, with the size distribution suggesting that the majority were large enough to have been sexually mature when caught (Figure 10). Although the large numbers of suckers and yellow perch in the Barrie fish bone assemblage do not necessarily represent exclusive exploitation during the spawning-run, the contents of certain features do appear to be the result of mass-capture events. This is especially noticeable in F133, with its fairly tight clustering of perch bone sizes.

As was noted in Chapter 4, the ratio of cranial bone to vertebrae may indicate that more off-site processing was practised at Barrie than at Dunsmore and Carson. Off-site processing may suggest exploitation of waters away from the site, such as the Nottawasaga River, Lake Simcoe, or Nottawasaga Bay, which may have made catch-site decapitation more desirable. Fishing at Barrie appears to make use of rivers and the lake shore, rather than the local stream, Dyment’s Creek. This is also reflected in the absence in the zooarchaeological collections of positive identifications of brook trout (Salvelinus fontinalis), which was apparently common in the cold streams in the city of Barrie earlier this century (Robin Craig, personal communication 1995). Sutton (1996a) suggests that the site occupants had prior knowledge of the area. The fact that the occupants knew of, and were able to successfully exploit, spawning longnose sucker and lake sturgeon lends support to this idea. Perhaps the Barrie people were familiar with lake sturgeon in their previous village, probably located south of the Oak Ridges Moraine, since there were lake sturgeon in Lake Ontario in the precontact period (Ontario Ministry of the Environment 1998).

**Dunsmore**

**Faunal assemblage**

As noted earlier, the faunal sample from the Dunsmore site derives from the undisturbed areas of three middens (24 m²), and 81 features within 10 houses (Figure 5, Table 4). Information on the “unidentified” component is provided in Table 12. The current section provides more detail on the fish assemblage. The 665 fish bones identified constitute 75 percent of the assemblage identified below family, expressed as NISP (Table 28). In terms of BW, however, fish represent only 40 percent. The assemblage is more diverse than at the Barrie site. It should be noted that discussions of the assemblage as a whole may obscure some of the variability between the three segments of the site.

In terms of NISP, yellow perch is the most important taxon, followed by brown bullhead, pumpkinseed, northern pike and white sucker. Each of these fish exceed the NISP of the next most abundant taxon, the muskrat (Ondatra zibethicus).

**Acipenseridae**

Lake sturgeon is represented by only four bones, or one percent of fish NISP; this is comparable to recovery at other sites in the region, with the exception of the Barrie site.
**Lepisosteidae**
Longnose gar is only represented by two of its highly distinctive vertebrae from Midden B, which are not included in the NISP.

**Salmonidae**
At Dunsmore, in addition to lake trout, both lake herring and lake whitefish were positively identified. Salmonidae represent three percent of identified fish. Lake herring or lake whitefish vertebrae are represented in similar quantities to their cranial bones, whereas lake trout vertebrae represent 28 percent. This may be partly explained by the large size and robusticity of lake trout vertebrae compared to lake herring or lake whitefish vertebrae and all Salmonidae cranial bones. Three contexts contained only cranial bones; seven contexts, including Midden B, contained only vertebrae. Only two contexts, H8 F230 and H11 F427, contained both cranial bone and vertebrae, again suggesting Salmonidae may have been subject to unique taphonomic processes.

**Esocidae**
Pike family fishes represent nine percent of identified fish. The positive identifications pertain to grass pickerel and northern pike only. Unlike at Barrie, vertebrae, representing 12 percent of those vertebrae identified to family, are not grossly over-represented.

**Cyprinidae**
A single pharyngeal arch was identified as a probable creek chub or fallfish (Semotilus sp.). Lack of reference specimens precluded a more detailed identification. This identification does indicate that the Dunsmore people occasionally obtained smaller carp family fishes. Alternatively, this element may represent stomach contents of a piscivorous fish.

**Catostomidae**
Suckers represent 12 percent of cranial bone. As at Barrie, there are many more white suckers than longnose suckers. Catostomidae vertebrae are very numerous, representing 39 percent of identified vertebrae. The proportional element sizes indicate mature individuals.

**Ictaluridae**
Catfish family fish contribute over one quarter of the NISP; most of the identifications at Dunsmore probably represent brown bullhead. In spite of concerted efforts to identify other species in the genus, only one element from a black bullhead (Ameiurus melas) was noted. Large Ameiurus sp. identifications could include yellow bullhead (Ameiurus natalis), but given the dominance of brown bullhead in the species identifications, this is unlikely. Five elements were identified as the larger, river-dwelling, member of this family, channel catfish (Ictalurus punctatus). As at Barrie, vertebrae are under-represented at only one percent.

Ictaluridae display a high proportion of thermal alteration, that has been linked by Thomas (1996d:145) to roasting of fish over hot coals, or, in the case of burnt spines, the selective burning of potentially hazardous debris. Some spines, however, were curated as expedient awls (Thomas 1996d:146).

Because Ictaluridae pectoral and dorsal spines are readily identified to family or genus, and because there are proportionately many of them at Dunsmore, the NISP of this family is over-represented with respect to other fish in the NISP (see Table 10, Figure 8).

Spines from Dunsmore did not appear decalcified and the edges were intact. A total of six brown bullhead pectoral spines were subjected to age and growth analysis (Table 25), five of which are from a single square in Midden B. Each spine represents a different individual. Ages range from three to six years, with an average of 3.8 years. The majority of the spines, therefore, derive from mature individuals.

Season of capture ranged throughout the warm weather, but with concentration on late autumn and spring.

**Gadidae**
Four elements were identified as burbot. It is generally a deep water species. Burbot spawn in mid-winter under the ice in lakes (Scott and Crossman 1973:643). Likely times of capture would be during the post-spawning movement into tributary rivers, or when it moves into shallower water on summer nights. Burbot may also have been caught during the autumn spawning-run when preying on Salmonidae roe (Molnar 1997: 171; Scott and Crossman 1973:226, 274; Smith 1985:101).

**Centrarchidae**
As at Barrie, Centrarchidae are well represented (20 percent of NISP), with vertebrae proportionate to cranial bones. Following the same logic as with *Ameiurus*, the *Lepomis* sp. identifications probably mostly represent pumpkinseed, rather than bluegill. Note that there are few *Micropterus* sp. identifications. In contrast to many other multi-species genera, the two representatives in this genus, the smallmouth and largemouth bass (*Micropterus salmoides*), are perhaps more readily distinguishable than the taxonomic lists in other works imply (Cooper 1996:22; Molnar 1997:145). Three elements were identified to the less commonly identified genus *Pomoxis*.

**Percidae**
With 188 elements, representing almost a third of the fish NISP, the Dunsmore yellow perch are the most numerous taxon at any of the three sites. Surprisingly, not a single Percidae vertebrae was identified.

The recovery of many scales from several features afforded the opportunity to examine seasonality of catch in detail for discrete refuse deposits (Needs-Howarth and Brown 1998). A total of 15 scales were impressed from the Dunsmore site (Table 26). This sample comprised the scales from the major features at the site and several others. Since the objective was to assess feature seasonality, it was decided
to exclude the scales from the middens. Only 12 impressions were analysable; using CSAGES, they were identified as walleye on the basis of both growth patterns and absolute age.

The age distribution of the archaeological specimens thus provides additional confirmation for the species identifications. Figure 14 provides yellow perch and walleye growth rates for several bodies of water. The graphs average out the often considerable sexual dimorphism in size, which increases with age in both species (e.g. McMurtry 1991). While growth patterns and rates may have been different in the oligotrophic Lake Simcoe of the 1300s and 1400s, this graph, nevertheless, illustrates a marked difference in relative growth patterns, which is likely to have persisted in prehistory. Some of the fish from Dunsmore and Carson were in excess of 14 years old, which is three years older than the maximum age for yellow perch in the modern Lake Simcoe populations.

Absolute scale size provides complementary support of the species identification, independent of the CSAGES analysis. While yellow perch scales are larger in relation to body size than walleye (about 2 percent of FL, vs. 1.6 percent, based on data of key scales on file, OMNR Sutton), their absolute size-at-age is much smaller. For the sake of (conservative) argument it is assumed that all the scales in our samples represent the largest scales on the fish body, which would derive either from the area posterior to the operculum, or between the dorsal fin and the lateral line. The anterior-posterior length of the scales from Dunsmore and Carson was compared to a non-random sample of the largest scales of the Lake Simcoe Perch caught in 1980, taken from behind the operculum (data on file at Ontario Ministry of Natural Resources, Sutton). Almost all the scales are larger than those of 10 and 11-year-old Perch. Bearing in mind the fact that modern populations are probably faster growing because of eutrophication of the lake, and that the archaeological scales are not necessarily the largest ones on the fish body, this effectively rules out yellow perch. The size-at-age and growth pattern of some of the younger identified below the level of family (Table 28). Relative size-at-age is much smaller. For the sake of (conservative) growth rate, and temperature. Of the four scales exhibiting the “+” condition, three had stopped growing, making season of death interpretation impossible. One scale with the “+” condition could be attributed to a very late autumn or very early spring capture. Most of the Dunsmore scales, however, exhibited the “o” condition: an incompletely formed annulus with a translucent check or zone present on the edge. This condition happens during the period of slow growth or growth arrest, which falls between November to May, depending on age, growth rate, and water temperature.

Fish by feature
Introduction
The following is a description and interpretation of the fish finds in the features containing more than 10 fish bones identified below the level of family (Table 28). Relative bone sizes are also provided (Figure 16).

Dunsmore Feature 110, an irregular shaped, shallow pit in House 1, northeast cluster
While the large sucker component (51 percent of fish NISP) (Table 28) might be taken to imply exploitation of spring-spawning fish, the fish assemblage from this feature may be more consistent with deep-water net fishing activity during the autumn component of the Lake Fishery (Needs-Howarth and Thomas 1998). This feature contained 10 bufflehead duck (Bucephala albeola) elements, attributable to at least three individuals. This non-resident duck migrates through the area in April and early May, and again in late October and November (Saunders 1947, 361). Attributes of immaturity noted on eight of these elements indicate at least some of these ducks were obtained during the autumn migration (Needs-Howarth and Thomas 1998). As hypothesized for merganser earlier, these diving ducks may
have been accidentally taken when they became entangled in fishing nets. The Lake Fishery is consistent with the large proportion of bottom feeders, such as suckers and bullheads (totalling 73 percent of the feature assemblage), and the presence of 12 sucker vertebrae. These taxa could have been caught in nets that touched the lake bottom. Lake fishing is also consistent with the average proportional element size of the yellow perch bones from this feature (Figure 16), which is well above the site average (Figure 10) (Needs-Howarth and Thomas 1998). The opercula of some of these yellow perch appear particularly robust, with an irregularly ridged surface.

Evidence from the fish scales in this feature suggests a certain amount of fishing activity in spring. Two of four walleye scales, aged 10 and 11 years, indicate a spring kill. The season of capture of the other two scales, both aged 14 years, could not be interpreted because the edge was failing (Table 26) (Needs-Howarth and Brown 1998).

Wheeler and Jones (1989:174) suggest that a spawning-run catch of northern pike would include the larger females and several more associated smaller males. The northern pike size distribution (Figure 16) might indicate exploitation during the spawning-run, including two or three recently mature males and a single associated female of the same year class; however, with a sample size of at most four individuals it would be difficult to argue against incidental capture. The brown bullheads are also large enough to have been caught during spawning, but again, it would be difficult to argue against incidental capture.

Apart from a single ruffed grouse (Bonasa umbellus) element, the fish and duck bones were the only identified bone.

**Dunsmore Feature 128, an ash pit in House 1, northeast cluster**
The small quantity of fish bones from this feature was a varied mixture. The single lake trout vertebra may have been a stored resource, or more likely, the feature represents an admixture from several different fishing and consumption events that got swept into this secondary deposit. Apart from two dog bones, fish were the only zooarchaeological find.

**Dunsmore Feature 206, a probable filled in sweatlodge in House 8, west cluster**
The midden-like nature of this feature results in a more ambiguous picture. Yellow perch bones make up 39 percent of this feature. They are on the small side (Figure 16), indicating they probably were not procured exclusively during spawning (Needs-Howarth and Thomas 1998). A substantial warm weather fishery is indicated by the quantity of Centrarchidae, Esocidae and Ictaluridae remains, representing one third of the fish NISP (Needs-Howarth and Thomas 1998). One brown bullhead right pectoral spine was sectioned. It represents an individual age three, killed in spring (Table 25). At this age, this individual may have been sexually mature, but this should not be taken to imply that the individual was actually caught while on its spawning-run. Two lake trout vertebrae and a possible lake herring or lake whitefish vertebra may represent a stored resource, or may have been procured from the lake with the six sucker bones and the larger yellow perch during either the autumn of the spring component of the Lake Fishery (Needs-Howarth and Thomas 1998).

To get an idea of how many individuals are represented among the 60 yellow perch bones in this feature, MNI values were calculated using element duplication, L/R matches and proportional element size. It must be noted that paired elements are not necessarily perfectly symmetrical (Brinkhuizen 1989:67, 73), so that matching of L/R pairs must be done within a certain range of proportional element size. Finding hypothetical “real individuals” in the database is of necessity somewhat arbitrary.

The conventional MNI, based on element duplication of the left operculum, is 13. With the inclusion of proportional element size (which automatically involves looking at all elements, not just the most numerous one), this figure is dramatically increased. With the arbitrary cut-off set at less than 5%, the MNI becomes about 24. If it is set more generously (or conservatively), at less than 10%, the resulting MNI is still increased by 25%, to about 16. With an NISP of 60, this suggests that, on average, only 2.5 to 3.75 cranial bones of each individual fish may survive to be identified. While some bones from these fish may have ended up in adjacent and associated Feature 230, these figures are, nevertheless, a dire reminder of taphonomic loss and/or the effects of element fragmentation on the identification rate.

**Dunsmore Feature 230, a filled-in semi-subterranean structure in House 8, west cluster**
This feature contained several autumn indicators: bones of Salmonidae, a migratory diving bird and a passenger pigeon. It contained three lake trout cranial bones, 10 lake trout vertebrae, and one basipterygium attributable either to lake whitefish or lake herring. Considered together, these items are good evidence for the autumn component of the Lake Fishery (Needs-Howarth and Thomas 1998). These autumn-spawning species are associated with one bufflehead duck bone. Instead of a deliberate capture, it may represent a bird that became accidentally entangled in a fish net set over lake shoals (Needs-Howarth and Thomas 1998). Brown bullhead and yellow perch account for almost half of the fish assemblage, suggesting also a substantial emphasis on wetlands, stream and nearshore species. While the measured sample size is very small, it is suggested that the larger proportional element sizes of both brown bullhead and yellow perch (Figure 16) may be consistent with procurement of fish from a lacustrine, rather than an upstream, habitat (Needs-Howarth and Thomas 1998).

This feature contained one barred owl (Strix varia) bone, and many bear bones. This may reflect the original
ceremonial use of the feature. As in Barrie Feature 216, the bear bones were all from the extremities, and were perhaps part of a tanned hide, used in ceremonies, or simply discarded into the feature as refuse.

Dunsmore Feature 347, a large filled-in semi-subterranean structure in House 7, south-central cluster

This assemblage more likely reflects the Generalized Warm Weather Fishery (Needs-Howarth and Thomas 1998). The most salient trait of this feature is the large component of brown bullhead and yellow perch (comprising 60 percent of the fish). The perch bones represent a wide range of proportional element sizes (Figure 16). Some of these could safely be considered sexually mature.

Based on cranial bone and vertebrae, it has been argued by Needs-Howarth and Thomas (1998) that, with the exception of two white sucker and two Catostomidae bones, this feature lacked convincing cranial bone evidence for a Spring Spawning-run Fishery or autumn Lake Fishery. As in Feature 110, evidence from the fish scales (Needs-Howarth and Brown 1998), however, suggests a certain amount of fishing activity in spring. Three of four walleye scales, aged 8, 11 and 12 years, indicate spring capture. The season of capture of the remaining scale, probably in excess of age 12 years, could not be interpreted because it had regenerated and was no longer growing.

This feature also has the largest amount of forest edge taxa. Its original function as a sweatlodge may be reflected in two hawk bones (Accipiter gentilis and Buteo jamaicensis), bone beads and dog bones (Needs-Howarth and Thomas 1994a). A single sandhill crane (Grus canadensis) element was modified into a bead. While the raw material for this artifact was probably obtained during the spring or autumn migration (Cadman et al. 1987:160-161), the finished item may have been curated and cannot be tied to season of deposition (Thomas 1996d).

Fishing events

Fishing events at Dunsmore are less concentrated on the Spring Spawning-run Fishery than at Barrie. The cranial bones can all be interpreted in terms of the Generalized Warm Weather Fishery or the Lake Fishery. Unequivocal evidence for Spring Spawning-run Fishery exploitation comes from CSAGES data on brown bullhead (H8, F206) and walleye (H1 F104, 106, 110 and H7 F347) (Table 25, 26), although the brown bullhead do not necessarily represent spawning-run exploitation.

Northern pike, brown bullhead and yellow perch are ubiquitous in the major features. Both the northern pike and brown bullhead size distributions show a marked curve (Figure 16). The brown bullhead are of a size at which both males and females are mature. The northern pike are quite small; contemporary female northern pike in Georgian Bay are not often sexually mature at this size (Wainio 1966).

The Dunsmore yellow perch proportional element sizes are on average smaller than those at Barrie (Figure 10), and represent a wider TL range. The difference is most marked in the heavy fraction, suggesting that more intensive flotation would have weighted the graph further in favour of smaller individuals.

As Thomas (1996d) has noted, the Dunsmore fish assemblage seems characteristic of the immediate local environs. Based on modern fish data (MacCrimmon and Skoble 1970), spawning-run exploitation of Cook’s Bay and adjacent Holland Marsh would be expected to have produced large northern pike, and even larger muskellunge, together with walleye and largemouth bass. While more recent research (Needs-Howarth and Brown 1998) has shown the walleye component of the assemblage to be more substantial than had previously been assumed, the small size of the pike and the dearth of muskellunge do not favour extensive use of the southern part of the lake.

The walleye scales likely represent fish caught during the spring. While the “o” condition walleye may have been killed in autumn, this is less likely because at this time they mostly inhabit inaccessible, deeper waters and may have been too inactive to be vulnerable to gill-netting. The limited amount of growth on the scales in the “+” condition indicates that these fish were probably caught during a narrow time frame in spring (Needs-Howarth and Brown 1998). Their advanced age made the scales harder to interpret, but it does provide useful information on fishing. It indicates that the site occupants were exploiting sexually mature individuals. The narrow time-frame of capture indicates they probably were all caught during their spawning-run.

Spring spawning-run exploitation conforms to our knowledge of walleye behaviour and habitat. The hypothesis that walleye were caught locally fits with other aspects of the fish assemblage. Walleye scales are distributed over four different features at the Dunsmore site. While three of these are in close proximity in House 1, further scales found in House 7 suggest that walleye fishing might not have been an isolated incident. The lack of walleye vertebrae suggests, however, that filleting may have been carried out away from the village. The alternative, though less plausible, explanation is that walleye were descaled and then thoroughly pounded up for inclusion in fish stew.

Carson

Faunal assemblage

The faunal sample derives from 141 features within seven houses, and 6 m2 in a midden (Table 5). The 558 fish bones identified constitute 67 percent of the assemblage identified below family, expressed as NISP. In terms of BW, however, fish represent only 19 percent. The NISP is dominated by brown bullhead, pumpkinseed and yellow perch.

Acipenseridae

Lake sturgeon is represented by only five bones, or less than
one percent of identified fish.

**Lepisosteidae**
Longnose gar is only represented by eight of its highly distinctive vertebrae from H1/F307, hence it is not included in the NISP (Table 13, 24).

**Salmonidae**
lake trout and lake herring or lake whitefish cranial bones were identified from five contexts (2 percent of NISP), whereas only vertebrae were recovered from 12 contexts. Only H1/F168, a large, stratified house pit measuring over 100 cm wide and 125 cm deep, which had the highest NISP of any context at the site, contained both cranial bones and vertebrae. While several squares in Midden 4 contained Salmonidae vertebrae, no cranial bones were identified. As at the other sites, lake herring or lake whitefish vertebrae were a very minor presence, whereas lake trout vertebrae were well represented at 19 percent of identified vertebrae.

**Centrarchidae**
Consisting mostly of small panfish, are well represented, totalling 21 percent of identified fish. Vertebrae are over-represented at 34 percent.

**Percidae**
Perch family fish represent 25 percent of the NISP. As at Dunsmore, it is likely that the five *Stizostedion* sp. cranial elements are walleye. Not quite as numerous as the brown bullhead, the yellow perch at Carson constitute 23 percent of identified fish. Percidae vertebrae (13 percent) are under-represented, but not to the extreme extent seen at the other sites. Since these vertebrae are quite small, this may be a function of the smaller dry screen mesh aperture.

The Carson site provided large numbers of fish scales. A non-random sample was selected, comprising 24 of the most complete scales from Carson, including a range of sizes, from two major features. All these scales are of walleye. The average age is 9.3 years; none are younger than 6 years. The fact that all analysed scales are walleye does not, of course, exclude the possibility that the smaller scales that were not subjected to CSAGES analysis are yellow perch or even Centrarchidae.

**Cyprinidae**
As at Dunsmore, a single pharyngeal arch was identified as a probable creek chub or fallfish.

**Pike family fishes** represent eight percent of identified fish. Most certain identifications are of northern pike. Vertebrad identifications are proportionate.

**Esocidae**
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As at Dunsmore, a single pharyngeal arch was identified as a probable creek chub or fallfish.

**Catostomidae**
Longnose and white sucker combined represented seven percent of the identified fish, which is slightly lower than Barrie and Dunsmore. Here white sucker bones are six times more common than those of longnose sucker. Unlike at Barrie and Dunsmore, vertebrae identifications were proportionate. The proportional element sizes indicate mature individuals.

**Ictaluridae**
Fragmentary dorsal and pectoral spines have resulted in a substantial number of non-specific identifications. The proportions in the database summary imply that most of the bullhead and catfish family identifications at Carson probably represent brown bullhead, rather than yellow bullhead or channel catfish. Of the specific identifications, brown bullhead constitutes 29 percent of identified fish, and yellow bullhead less than one percent. Because Ictaluridae pectoral and dorsal spines are readily identified to family, and because there were proportionately many of them at Carson, the NISP of this family is over-represented with respect to other fish. As at Dunsmore, Ictaluridae vertebrae were under-represented at 11 percent of identified vertebrae.

Eight brown bullhead pectoral and dorsal spines were analysed from the Carson site (Table 25). Each spine represents a different individual. Age varied from one to six years, whereas season of capture included spring, summer and autumn. The average age of 3.3 years is slightly lower than at Dunsmore.

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**Fish by feature**
**Introduction**
The following is a description and interpretation of the fish finds in the features containing more than 10 fish bones identified below family (Table 29). Relative bone sizes are also provided (Figure 17).

**Carson House 1, Feature 70D Level 2**
This is a stratified house pit 70x60x55 cm deep containing fish bone, scale, pottery and corn. Most of the fish derive from Level 2. The fish assemblage from this level is varied and otherwise also typical for the site, except for the large numbers of smaller pumpkinseed bones. The yellow perch proportional element size distribution is flat, going from very small to very large (Figure 17); this may suggest that some of these perch were caught by angling. There are few vertebrae. With one lake trout identification these do, however, add to the species variety. A river otter (*Lutra canadensis*) canine may indicate that procurement may have focussed on a river or stream, rather than the open lake or marsh. The alternative option, that this tooth may have been curated, is less likely, given that a river otter fifth cervical vertebra was found in Level 3. Since there were only five river otter finds in the entire Carson sample, it appears probable that some mixing has occurred between the two levels of this pit.

Evidence from 16 walleye scales (Needs-Howarth and Brown 1998), representing at least nine MNI suggests a certain amount of fishing activity in spring. Because of problems with regeneration and failing edges it was not
possible to assign a season of capture to all of these fish (Table 26).

**Carson House 1, Feature 168**
Feature 168 is a large, stratified house pit measuring greater than 100 cm wide and 125 cm deep. The fish assemblage is varied. Suckers represent nine percent of fish NISP, with white sucker dominating. Lake herring or lake whitefish make up eight percent of the assemblage, well above the site average. The proportional element size distribution may suggest that each bone may represent a different individual. The inclusion of eight lake trout vertebrae lends weight to the suggestion that this feature contains refuse from a autumn Lake Fishery event, which may also have included three Catostomidae vertebrae. The yellow perch size range is also very wide and flat (Figure 17), including several larger individuals that may have been caught in the lake.

Evidence from eight walleye scales (Needs-Howarth and Brown 1998), representing at least six MNI suggests a certain amount of fishing activity in spring. Because of problems with regeneration and failing edges it was not possible to assign a season of capture to all of these fish (Table 26). The fish are all eight years or older, indicating that they were sexually mature. Lake Simcoe walleye age eight averaged 613 mm, whereas Lake Huron fish averaged 642 mm (Kushneriuk et al. 1996).

Summer exploitation of lake, marsh or river may be indicated by a horned or red-necked grebe (cf. *Podiceps* sp.).

The scoter (cf. *Melanitta* sp.) derives either from the spring and autumn migration. Alternatively, the grebe and scoter elements may each represent one of the rare overwinterings noted by Godfrey (1986:26-28, 112-114).

**Carson House 1, Feature 182**
This is an interior ash pit measuring 25 cm across and about 45 cm deep, apparently related to a nearby hearth. The complete lack of bird and mammal bones raises the distinct possibility that these were bagged separately and missed due to lack of consistency in bag labelling procedures.

This feature contained fewer perch bones than most features. Suckers represent 12 percent, again with white sucker dominating. walleye also represent 12 percent. The yellow perch were mostly large enough to have been spawning when caught. The pike may have represented a spawning-run catch, if those in the 60 percent category are assumed to represent males, those in 80 percent and 90 percent females. In addition, this feature contained one large Percidae vertebra and two possible Catostomidae vertebrae. At least some of the contents of this pit would appear to have derived from spawning-run catches of suckers, yellow perch and walleye in April.

**Carson House 3, Feature 120**
While the sample size for this feature is small, it is interesting to note the absence of pike family fish and the large contribution of brown bullhead, a species that was probably routinely obtained in the same kinds of fishing events as Esocidae. None of the other finds help elucidate the nature of the fish deposit, although a hawk (cf. *Accipiter* sp.) culmen section, together with some human bone, may indicate a ritual function for the deposit.

**Carson House 3, Feature 132**
This is a probable semi-subterranean sweatlodge, measuring 240x190x90 cm deep. Its fish bone composition is atypical, with a large proportion of Catostomidae, including two vertebrae, and very few perch. The seven northern pike bones represent MNI three (proportional element size included). Although the sample size is very small, the size distribution may suggest this feature includes one female and two smaller males caught together at spawning time. Vertebrae include two lake trout and three Centrarchidae. Once again, the sample size is so small that it is impossible to draw conclusions. This feature also contained seven dog bones, representing 54 percent of the identified mammal remains in the feature.

**Carson House 3, Feature 164**
This ash pit contains smaller brown bullhead (Figure 17). One of these, a 4-year-old individual represented by a left pectoral spine, was caught in spring (Table 25). Two Centrarchidae vertebrae could have been obtained at the same time.

**Carson House 3, Feature 256**
Feature 256 is a large interior pit measuring 140x110 cm on the surface. The faunal sample is dominated by brown bullhead. The strongly curved size distribution with sharp incline starting at 70 percent may indicate a net catch. Only two non-fish bones were recovered from the entire feature.

**Fishing events**
As at Barrie and Dunsmore, white suckers co-occur in features with species typical of the Spring Spawning-run Fishery (e.g., House 1 Feature 182) and those typical of the Generalized Warm Weather Fishery (e.g., House 3 Feature 120). Only one feature, House 1 Feature 182, contains unequivocal cranial bone evidence for the Spring Spawning-run Fishery. House 1 Feature F70d and House 1 Feature 168 have CSAGES evidence for a substantial Spring Spawning-run Fishery for walleye. It is likely that at least a proportion of the unanalysed scales from other features are also spring-caught walleye. The Carson scale samples were selected to allow for a broad interpretation of fishing in two large features. It is not known, of course, how ubiquitous and numerous walleye scales are in the rest of the site. As at Dunsmore, the finds could have been from a single season’s catch. However, that argument can also be made about any of the cranial bone and vertebrae. Given the paucity of scales likely to survive to be analysed, it is probable that these scales do represent a substantial emphasis on walleye.

All major features with northern pike also contain brown bullhead and yellow perch. The later part of the northern
pike spawning-run overlaps with the start of the spawning-run of yellow perch and suckers. However, the consistent co-occurrence with brown bullhead suggests that pike were exploited throughout the warm seasons as part of the Generalized Warm Weather Fishery, probably mostly in fish-traps, rather than during their spawning-run. The peak in the size distribution of northern pike, at 60-69 percent, probably represents immature individuals.

Bullhead and yellow perch combined constitute at least one third of all major features, but their proportions vary, especially in House 3. The two features with the highest combined total, House 3 Feature 164 and House 3 Feature 256, are dominated by bullhead. These two features may largely represent single fishing episodes during the warm weather.

It appears that fishing for brown bullhead at Carson was somewhat more generalized than at Dunsmore, including earlier autumn catches and a wider age distribution. This range of interpretations is not entirely surprising, given that the samples derive from eight separate features. It is likely that brown bullhead was caught throughout the warm seasons in river, stream and wetland habitats. The co-occurrence of brown bullhead with yellow perch in all but House 3 Feature 256, and the presence of some very small yellow perch supports the hypothesis that yellow perch exploitation was not necessarily limited to the spawning season. Yellow perch could have been caught together with other species during the Spring Spawning-run Fishery, but they were also probably an important component of the Generalized Warm Weather Fishery.

With the high numbers of brown bullhead and pumpkinseed, the main focus at Carson appears to be on the Generalized Warm Weather Fishery. The substantial numbers of yellow perch, white sucker and northern pike could have resulted either from the same fishery, or from a more specialized Spring Spawning-run Fishery. A few of the Carson fish remains may have derived from a Lake Fishery on Kempenfelt Bay and Nottawasaga Bay for taxa like white sucker, smallmouth bass, yellow perch and walleye, including inshore exploitation of Salmonidae. However, the major emphasis appears to be on the Generalized Warm Weather Fishery, focussing on resident taxa such as northern pike, brown bullhead and Centrarchidae.