CATHEDRAL CAVE FISHES

(by Jack M. Broughton)

Table XLI provides the numbers of identified fish specimens by element from Stratum II at Cathedral Cave. The criteria used to arrive at those identifications are provided in chapter nine. A total of 547 identified fish specimens are represented in this deposit; all of those are sculpin. The mottled sculpin (*Cottus bairdi*) is represented by three preopercles. Five preopercles were identified as either Bear Lake sculpin (*Cottus extensus*) or Utah Lake sculpin (C. echinatus). Both *C. extensus* and *C. bairdi* are represented in the Homestead Cave fauna as well as from the Hot Springs and Black Rock late Pleistocene deposits of Lake Bonneville (Smith and others, 1968). Since *C. echinatus* has yet to be securely identified in any Lake Bonneville ichthyofauna, the materials identified as *C. extensus/echinatus* most likely represent *C. extensus*.

That the Cathedral Cave deposits lack most of the fish species known to have occupied Lake Bonneville is intriguing and may reflect something unique about the sampling mechanism involved in forming that deposit. Indeed, ostracode data suggest that the material represents a deep-water phase Bonneville and Provo-level deposit that accumulated under 100-200 m (300-600 ft) of water. The presence of Bear Lake sculpin is consistent with this suggestion, since these are the most abundant fish that occur in the greater depths of Bear Lake. These fish are also known to actively burrow into the soft marl sediments in the bottom of the lake (McConnell and others, 1957; Dalton and others, 1965; Sigler and Sigler, 1996). Although *C. bairdi* is a bottom-dwelling, cold-water stream fish over most of its range (Sigler and Sigler, 1996), deep-water lake populations are also known for this species in eastern North America, such as in Lake Erie (Trautman, 1981, pp. 708-710; Keleher, 1952).

INTERPRETATION AND IMPLICATIONS

The primary purpose of the Cathedral Cave test excavations was to determine the nature of the cave deposits and to investigate the potential significance of any faunal record it might contain. To this end, we explored three test areas in the main chamber of the cave, and stratigraphically excavated a 1 x 0.5 m sample column of the upper post-Lake Bonneville deposits. Analysis of skeletal material larger than 2.5 mm suggests that deposition by raptors and woodrats was limited in both amount and duration. Only 750 faunal specimens were recovered from a 1.1 m deep depositional sequence which spans less than the last 5000 years. Compared to the 3 m deep, 11.3 ka sample column at Homestead Cave containing two million or more faunal specimens, the interpretive utility of the Cathedral Cave record is marginal. However, materials in the cave do provide some limited support for the Homestead Cave record which suggests bushy-tailed woodrats were reintroduced into the cool, moist cave habitats of the northern Lakeside Mountains during the late Holocene.

The identification of high-elevation, deep-water Lake Bonneville deposits spanning most of the last lake highstand is, perhaps, the most significant result of the test excavations. Detailed investigation of these deposits remains to be accomplished, but preliminary analyses suggest two deep-water phases, separated by a regressional event, are present. The former are represented by laminated marls, the latter by tufa/travertine deposits. The chronological placement of these lake deposits remains uncertain, but the single available limiting radiocarbon dates suggests that it occurred during the regressive phase of the last major lake cycle. There are, however, two possible interpretations.

The less probable, but more traditional, interpretation is that the sequence represents the early transgression of the lake to the Stansbury level about 22 ka, followed by the Stansbury oscillation about 20 ka, and a high lake phase from 20 to 13 ka. This interpretation is complicated by the presence of *Candona adunca* in lower marls. This species of ostracode has previously been found only in the deepest phases of Lake Bonneville, suggesting these lower marls date to the 18 to 14.5 ka period. It is not yet possible to distinguish which of two alternative hypotheses for the origin of the tufa/travertine deposits is the more likely. The intrepretation we favor, for the moment, is that the sequence is the result of only the last half of the last lake cycle, with the

Table XLI
Numbers of identified fish specimens per taxon by element for Stratum II of Cathedral Cave

ELEMENT	*Cottus* sp.	*Cottus bairdi*	*Cottus extensus/echinatus*	Total
Vomer	6	-	-	6
Frontal	1	-	-	1
Prootic	5	-	-	5
Basioccipital	10	-	-	10
Exooccipital	13	-	-	13
Parasphenoid	7	-	-	7
Articular-angular	14	-	-	14
Dentary	13	-	-	13
Maxilla	16	-	-	16
Otolith	2	-	-	2
Palatine	8	-	-	8
Premaxillary	16	-	-	16
Quadrate	13	-	-	13
Epihyal	16	-	-	16
Ceratohyal	19	-	-	19
Ventral hypohyal	3	-	-	3
Hyomandibular	9	-	-	9
Opercle	9	-	-	9
Preopercle	6	3	5	14
Subopercle	6	-	-	6
Cleithrum	4	-	-	4
Vertebra	335	-	-	335
Ultimate vertebra	8	-	-	8
Total	539	3	5	547

travertines and upper marls representing a pause and minor transgression within the overall regressive phase. This interpretation is supported by a limiting date of ~15.3 ka on pollen from the base of the upper lacustrine clays. It is complicated, however, by limited evidence for such an event elsewhere, together with the relatively deep-water conditions suggested by the upper marls.

Regardless, the mere possibility of these alternatives is illustrative of the uniqueness of the depositional setting and of the relative importance of Cathedral Cave. It may be that *C. adunca* has not been found in Stansbury level depostits because only central basin localities, as opposed to lake-margin environments such as at Cathedral Cave, have been investigated previously. Alternatively, it may be that a reversal of the post-Provo lake regression was so ephemeral that evidence of it is rarely preserved except in protected environments such as Cathedral Cave. It seems likely that one or more millennial-scale climatic cycles occurred during the regressive phase, however, and it is probable that such shoreline data will eventually be found.

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