Chapter 2

Bifaces from On Your Knees Cave, Southeast Alaska

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Introduction

On Your Knees Cave (OYKC) also known as 49-PET-408, is located on Protection Head, a peninsula at the northwest end of Prince of Wales Island in Southeast Alaska (Figure 1). The cave was used repeatedly by humans for more than 10,000 years and the oldest reliably dated human remains from Alaska and Canada have been found at the site. Bone, stone, and shell tools have been recovered from different chambers of the cave ranging between circa 12,050 (10,300 ± 50 ^{14}C yr BP) and 1470 (1760 ± 40 ^{14}C yr BP) calendar years ago that document at least four periods of use. The most extensive use of the cave occurred about 10,300 (9200 ^{14}C yr BP) calendar years ago and is chronologically associated with the partial remains of a young male who died approximately 10,300 calendar years ago. The assemblage of stone bifaces from OYKC consists of 12 complete, rearticulated, and fragmentary specimens. The points are derived from two localities: 1) eleven from the cave's main entrance and adjacent passage ways, and 2) two from the area in front of a smaller entrance called "Ed's Dilemma entrance" (Figure 2) (Dixon et al. 1997, Dixon 1999). Although the spatial analysis of the bifaces and other artifacts recovered from OYKC is not complete, this report provides preliminary morphological and chronological data.

Dating

Three AMS radiocarbon determinations on charcoal and two on human bone date the primary use of the cave's main entrance. They were run on charcoal identified as stem and/or branch wood of lodgepole pine (*Pinus contorta*) (Trieu and Newsom, 1997) collected from the cultural horizon (Unit 4) containing bifaces, irregular microblade cores, microblades, scrapers, flake cores, and lithic detritus. This period of occupation has been established by three ^{14}C AMS dates on charcoal: 8760 ± 50 BP (CAMS-43991), 9210 ± 50 BP (CAMS-43990) and 9150 ± 50 (CAMS-439899).

Two AMS radiocarbon dates run on human remains of an adult male dated to 9880 ± 50 BP (CAMS-32038, δ^{13}C = −12.1‰) (pelvis) and 9730 ± 60 BP (CAMS-29873, δ^{13}C = −12.5 ‰) (mandible) are associated with this stratigraphic level (Dixon et al., 1997). Delta ^{13}C values document the individual's diet was based largely on marine foods. This indicates that the ^{14}C determinations should be adjusted to c 9200 based on the regional marine carbon reservoir extrapolated from the Queen Charlotte Islands (Southon and Fedje 2003). These data suggest the human remains are roughly contemporaneous with the cultural occupation associated with Unit 4 at the main entrance of the cave.

One radiocarbon determination (CAMS-43991) is approximately 400 ^{14}C years younger than the others and may suggest later use of the cave's main entrance. However, the spatial distribution of the artifacts and the fact that it is possible to rearticulate artifacts and microblade fragments throughout level 4 suggests that most of the specimens recovered are

Figure 1. Regional map depicting the location of On Your Knees Cave (49-PET-408).

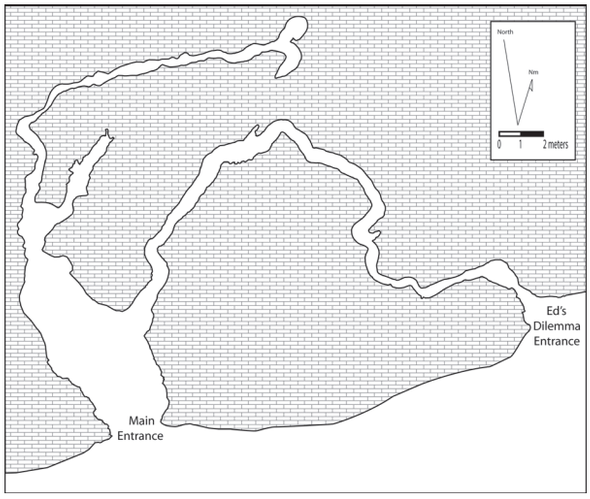

Figure 2. Site map illustrating the location of the two cave entrances.

contemporaneous. This analysis demonstrates that the most extensive use of the cave's main entrance occurred approximately 10,300 calendar (9200 ^{14}C) years ago.

The area adjacent to Ed's Dilemma entrance is smaller and fewer artifacts were recovered there. This locality is characterized by a high frequency of microblades struck from prepared cores, a single prepared microblade core, waste flakes, and three bifaces. Two radiocarbon determinations suggest the occupation at this locale occurred sometime between about 7900 (7140 ± 30 ^{14}C, CURL-7771) and 8150 (7405 ± 25 ^{14}C, CURL-7772) calendar years ago. Consequently the specimens from Ed's Dilemma entrance (Figure 6a and b) are probably about 1500 ^{14}C years younger than the projectile points from the main entrance.

Table 1. On Your Knees Cave (49-PET-408) complete, rearticulated, and fragmentary bifaces.

Figure	Artifact Catalog#	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)	Length / Thickness Ratio	Width / Thickness Ratio
3a	1997-134.5, 1997-134.6, 2000-29.4	16.5	5.1	1.2	65.8	13.8	4.25
3b	2000-29.6	15.4	3.9	1.3	29.2	11.8	3.00
4a	2000-29.2	3.6	2.9	0.8	7.4	n/a	n/a
4b	1998-73.68	2.8	2.2	1.0	3.5	n/a	n/a
4c	2000-29.3, 2000-29.5	4.2	1.9	0.8	5.9	n/a	2.38
4d	1999-49.445	0.8	0.9	0.2	0.2	n/a	n/a
4e	1999-49.205	1.5	1.1	0.4	0.4	n/a	n/a
4f	1999-49.47	6.8	2.4	0.9	12.4	7.6	2.66
4g	2000-29.1	7.0	2.7	0.9	16.1	7.8	3.00
5a	2000-33.22, 1997-134.7	10.1	3.1	0.8	22.3	12.6	3.88
5b	1997-134.4	7.4	2.7	0.6	12.2	12.3	4.50
6a	2005-1.171	3.8	2.3	0.9	7.7	n/a	n/a
6b	2005-1.172	8.5	4.3	1.0	43.0	n/a	4.30

The Biface Assemblage

The biface assemblage consists of 13 complete and fragmentary specimens recovered from both the cave's main entrance and Ed's Dilemma entrance. Eleven complete, rearticulated, and fragmentary specimens were recovered from the area of the main entrance (Figures 3–5), while two fragmentary bifaces (Figure 6a and 6b) were found at Ed's Dilemma entrance. At both entrances, the bifaces were spatially and temporally associated with microblades and microblade cores.

The weight and morphology of all the complete and rearticulated specimens precludes their use as arrow points (Table 1). This suggests that they were used to tip thrusting spears or possibly to tip atlatl darts. Some of the smaller specimens were probably used as knife blades.

Specimens from the Main Entrance

The largest complete biface (Figure 3a) is manufactured from black-gray rhyolite. It is broken along two oblique bedding planes and has been rearticulated from three fragments. The extreme surface flattening that characterizes this specimen was produced by percussion flaking which could have been executed with an antler, or ivory, baton using an anvil for support. Sequential, and sometimes parallel, pressure flaking was used to create and maintain its acute edges.

A similar specimen (Figure 3b) has been rearticulated from seven fragments. Although the lithic material from which it was manufactured is difficult to determine because it is heavily weathered, it was made from light and dark gray banded metamorphosed siltstone. It is fractured along bedding planes of the parent siltstone. Although heavily eroded, it appears to have been a leaf-shaped (foliate) point similar in morphology and size to the specimen illustrated as Figure 3a.

A smaller example of this leaf-shaped type (Figure 5a) was manufactured from black cryptocrystaline silicate. The blade was found in the interior of the cave and the base was recovered outside the main entrance. This suggests that it may have been used and broken in the cave and the base was subsequently removed from its haft and discarded outside the cave.

Another base (Figure 4b) of a similar leaf-shaped point was also recovered from the area of the cave's main entrance. It is made from black rhyolite and, like the base of the rearticulated point (5a), it appears to have been brought to the area near the main entrance in its haft and subsequently discarded. Although the presence of edge grinding is impossible to determine on one specimen (Figure 3b), the bases of the remaining three foliate bifaces (Figures 4b, 5a and 3a) all exhibit light edge grinding or wear, probably the result of hafting in closed sockets.

Evidence of previous damage resulting from impact is preserved on the base of one specimen (4g).

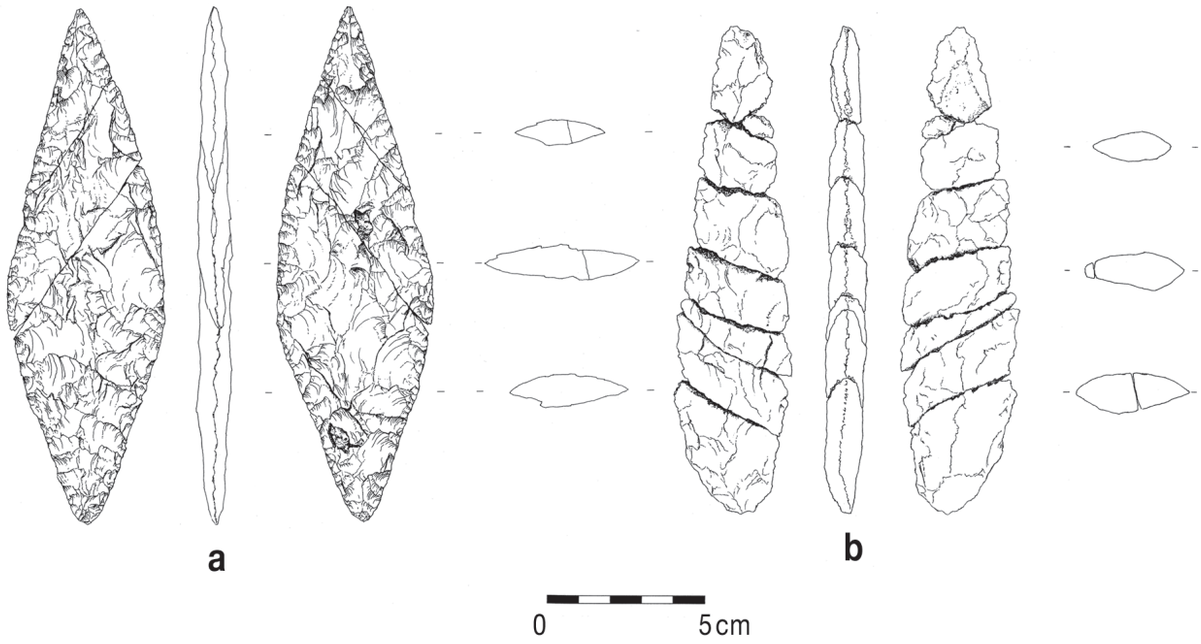

Figure 3. Line drawings of bifaces from the area of the main entrance of On Your Knees Cave (49-PET-408).

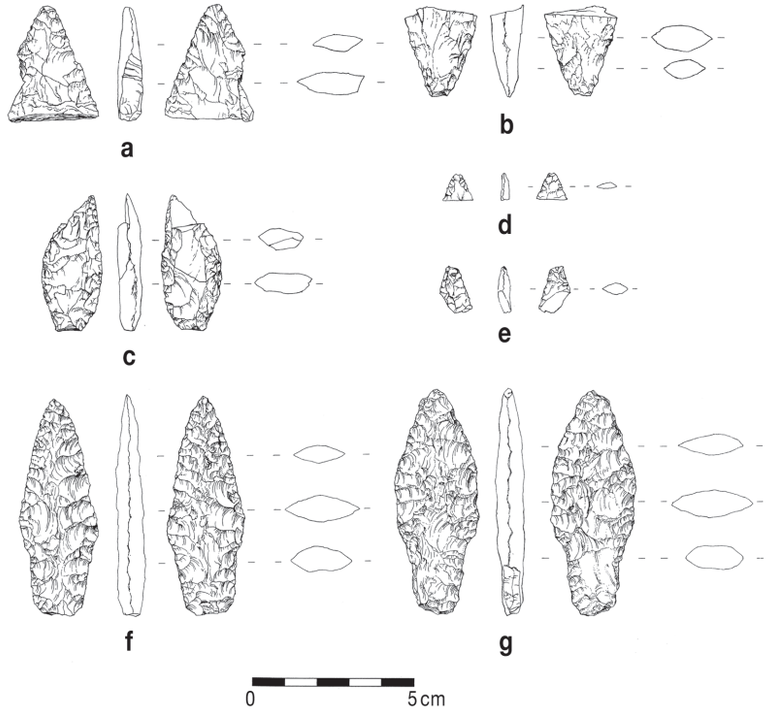

Figure 4. Line drawings of bifaces from the area of the main entrance of On Your Knees Cave (49-PET-408).

An "impact burin" facet extends from the base along the edge of the "stem" to the shoulder of this specimen. The "burin blow" probably results from shock to the base point exerted by the shaft upon impact, although it may have been done deliberately to facilitate hafting. The configuration and the distinctive length/thickness ratios (Table 1) for two stemmed specimens (Figures 4f and 4g) suggests that they may have been hafted as knives after having been broken and reworked. These two artifacts are made from obsidian from Suemez Island (Figure 1) and show considerable alteration probably representing several episodes of modification. They may have been manufactured initially to serve as leaf-shaped blades for thrusting or throwing spears and subsequently modified to function as stemmed knife blades.

The specimen illustrated in Figure 4c is the medial section of a leaf-shaped point. It is comprised of two rearticulating fragments and was manufactured from gray metamorphosed siltstone. The tip (or possible base) of another leaf-shaped specimen (Figure 4a) recovered from the area of the main entrance is made from gray cryptocrystaline silicate. This artifact has at least three burin-like blows terminating in hinge fractures along one edge, but it does not appear to have been used as a burin.

One specimen (Figure 5b) from the main entrance is unique. It is manufactured from a banded red brown chert. It is ovate in shape and exhibits distinctive edge grinding along one edge extending about one third of its length from the base toward the tip. This suggests that it was inserted in a slotted haft and ground to prevent damage to the lashing. It probably functioned as a knife blade secured in a slotted handle, rather than a projectile point. The remaining two specimens from the area of the main entrance are two small point tips. One (Figure 4d) is made of rhyolite and the other (Figure 4e) is black cryptocrystaline silicate.

Specimens from Ed's Dilemma Entrance

Two biface fragments (Figures 6a and 6b) were recovered from Ed's Dilemma entrance. The largest (6b) is ovate and made from lusterous black cryptocrystaline silicate. The tip, or extreme distal end, appears to be broken and there is slight edge grinding along the base, suggesting it was ground to protect lashing. Its spatulate shape suggests it may have functioned as a knife blade. The second specimen (Figure 6a) appears to be the medial section of a relatively small leaf-shaped biface. It is made from a coarser grained

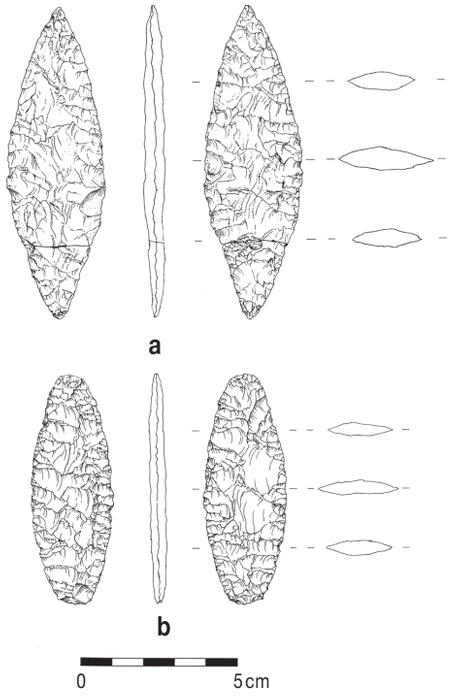

Figure 5. line drawings of bifaces from the area of the main entrance of On Your Knees Cave (49-PET-408).

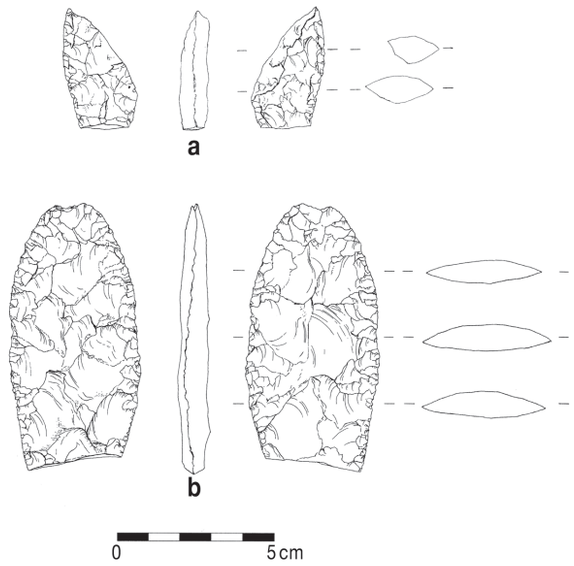

Figure 6. Line drawing of biface fragments from Ed's Dillema entrance On Your Knees Cave (49-PET-408).

black cryptocrystalline silicate that lacks the luster of the other specimen from this locale.

Interpretations

The relatively large number of projectile points recovered from OYKC compared to other sites in Southeast Alaska may be attributed to the age and function of the site. The faunal remains from OYKC indicate that the site was used by a variety of animals (Heaton 1996). It was likely a hibernaculum for both black and brown bear and the comparatively large number of bifaces from OYKC probably were used to tip weapons and knives for bear hunting and processing. There is a long tradition of subsistence hunting for bears at hibernacula, primarily because the danger associated with harvesting these powerful animals is greatly reduced if they can be taken during hibernation (McLaren et al. 2004). This was more often the case prior to the introduction of firearms. Although the site may have been used primarily for bear hunting, the presence of a wide array of other artifacts suggests that the cave may have been used for other activities as well.

The assemblage of bifacially flaked artifacts (knives and projectile points) represents a unified single lithic knapping tradition exhibiting various phases of biface rejuvenation and repair. The recovered projectile points and knives represent various stages in their life cycle as usable weapons and tools. Some specimens were first manufactured as large thin leaf-shaped projectile points that were subsequently reshaped into either smaller leaf-shaped projectile points or stemmed knives as their size and possible cultural needs required. The larger specimens were probably used to arm thrusting spears or javelins. When damaged or broken, they were reworked and recycled as smaller foliate and stemmed projectile points and knives. Both foliate and stemmed bifaces result from a continuous cultural process of manufacture, use, and retooling.

The OYKC bifaces are similar in flaking technique and morphology to fragments recovered from the lower component at Ground Hog Bay in Southeast Alaska (Ackerman 1968, 1996) and possibly examples from lowest components of the Namu (Carlson 1979, 1990) and Glenrose Cannery (Matson 1976) sites. They are clearly associated with other artifacts characteristic of the Northwest Coast Microblade tradition which is documented as early as circa 10,000 calendar years ago at several sites in northern British Columbia and Southeast Alaska (Ackerman 1992, Carlson 1990, Carlson and Dalla 1996, Davis 1989, Okada et al., 1992, Matson and Coupland 1995). Archeological sites ascribed to this tradition share the use of microblades, and exhibit a marine economy documented by limited faunal remains. The ecological setting of these archeological sites is generally on ancient beaches and other geographic features oriented to exploit marine resources, with the exception of OYKC which is not easily accessible from the shore and is located circa 0.5 kilometers from the ocean and about 135 meters above sea level. Northwest Coast Microblade tradition subsistence practices were adapted to an environment characterized by year round open water fresh and salt water fishing, collecting inter-tidal resources and shellfish, rugged coast with fjords, islands, rocky headlands, and calving glaciers.

Bifaces are rare in coastal sites along the Northwest Coast. This suggests that maritime subsistence activities probably required few bifaces and that these sophisticated lithic tools may have been more important for hunting large terrestrial mammals. The comparatively large number of bifaces found at OYKC is unusual for early archeological sites along the Northwest Coast. The bifaces recovered from On Your Knees Cave are associated with microblade technology and the oldest human remains known from Alaska or Canada. The $\delta^{13}C$ values from the human bone demonstrate the individual's diet was based on marine foods and that the ^{14}C age should be adjusted to circa 9200 (about 10,300 calendar years) based on the regional marine carbon reservoir.

The experimental character of the microblade technology at OYKC suggests it is in the formative stages of being adopted. It appears to be added to an extant and highly sophisticated bifacial technology. A similar technological transition appears to have taken place to the south in British Columbia between about 10,000–8800 calendar years ago (8900–8000 ^{14}C yr BP) in the southern Haida Gwaii (Fedje et al. 2005). These preliminary data suggest the widespread existence of an underlying bifacial technology predating a north to south diffusion of microblade technology along the Northwest Coast.

The assemblage from On Your Knees Cave also offers insights into the possible origins of very early lithic assemblages such as the Western Stemmed Point tradition and Cascade points commonly found throughout western North America. The radiocarbon dates from the main entrance of OYKC, and sites farther south in British Columbia, provide minimum limiting dates for these early leaf-shaped and stemmed bifaces along the Northwest Coast (Fedje et al. 2005, and this volume). These data suggest that these types of bifaces range in age between >12,650–8000 (>10,600–7500 ^{14}C yr BP) calendar years ago. By about 10,300 calendar years ago microblade technology appears to have been incorporated into preexisting bifacial technology.

The bifaces from OYKC may be used provisionally to help define a "Northwest Coast Biface tradition" typified by foliate and stemmed bifaces, and other artifact types. All these sites are located primarily on islands, and contain artifacts made from lithic sources located on the mainland and other islands. This suggests an economy primarily based on maritime resources and well developed coastal navigation using watercraft. Although these data are preliminary, the Northwest Coast Biface tradition appears to predate the introduction of microblade technology from the north and to be equivalent in age to Paleoindian complexes such as Cody, Folsom, and possibly Clovis in interior North America.

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References Cited

Ackerman, R.E.
1968 Archaeology of the Glacier Bay Region, Southeastern Alaska. Laboratory of Anthropology Report of Investigations No. 44, Pullman.
1992 Earliest Stone Industries on the North Pacific Coast of North America. *Arctic Anthropology* 29(2):195–208.
1996 Ground Hog Bay, Site 2. In *American Beginnings: The Prehistory and Paleoecology of Beringia,* F.H. West (ed.), pp. 424–430. University of Chicago Press, Chicago.

Carlson, R.L.
1979 The Early Period on the Central Coast of British Columbia. *Canadian Journal of Archaeology* 3:211–288.
1990 Cultural Antecedents. In *Handbook of North American Indians, Vol 7, Northwest Coast,* W.C. Sturtevant (ed.). Smithsonian Institution Press, Washington, D.C.

Carlson, R.L., and L. Dalla Bona (eds.)
1996 Early Human Occupation in British Columbia. University of British Columbia Press, Vancouver.

Davis, S.D.
1989 Cultural Component I. In *The Hidden Falls Site,* S.D. Davis (ed.), pp. 159–198. Alaska Anthropological Association, Monogroup Series No. 5, Aurora.

Dixon, E.J.
1999 *Boats, Bones, and Bison: Archeology and the First Colonization of Western North America.* University of New Mexico Press, Alberquerque.

Dixon, E.J., T.H. Heaton, T.E. Fifield, T.D. Hamilton, D.E. Putnam, and F. Grady
1997 Late Quaternary Regional Geoarchaeology of Southeast Alaska Karst: A Progress Report. *Goearchaeology: An International Journal* 12(6):689–712.

Fedje, D.W., M.P.R. Magne, and T. Christensen
2005 Test Excavations at Raised Beach Sites in Southern Haida Gwaii and Their Significance to Northwest Coast Archaeology. In *Haida Gwaii: Human History and Environment from the Time of Loon to the Time of the Iron People,* D.W. Fedje and R.W. Mathewes (eds.). University of British Columbia Press, Vancouver and Toronto.

Fedje, D., Q. Mackie, D. McLaren, and T. Christensen
2008 A Projectile Point Sequence for Haida Gwaii. This volume.

Heaton, T.H.
1996 The Late Wisconsin Vertebrate Fauna of On Your Knees Cave, Northern Prince of Wales Island, Alaska. *Journal of Vertebrate Paleontology* 16:40A–41A.
Lee, C.M.
2001 *Microblade Morphology and Trace Element Analysis: An Examination of Obsidian Artifacts from Archaeological Site 49-PET-408, Prince of Wales Island, Alaska.* Unpublished M.A. Thesis, University of Wyoming, Laramie.
Matson, G.R.
1976 *The Glenrose Cannery Site, Canada.* Mercury Series, National Museum of Man, Archaeological Survey Papers No. 52, Ottawa.
Matson, R.G., and G. Coupland
1995 *The Prehistory of the Northwest Coast.* Academic Press, San Diego.
McLaren, D., R.J. Wigen, Q. Mackie, and D.W. Fedje
2004 Bear Hunting at the Pleistocene/Holocene Transition on the Northern Northwest Coast of North America. *Canadian Journal of Zooarchaeology* 22:3–29.
Okada, H., A. Okada, Y. Kotani, K. Yajima,
W.M. Olson, Y. Nishimotot, and S. Okino
1992 *Hecata Island, Southeastern Alaska: Anthropological Survey in 1989 & 1990.* Department of Behavioral Science, Hokkaido University, Sapporo.
Southon, J.R., and D.W. Fedje
2003 A Post Glacial Record of ^{14}C Reservoir Ages for the British Columbia Coast. *Canadian Journal of Archaeology* 27:95–111.