Chapter XII

The Place of the Locarno Beach culture in the Development of the Ethnographic Northwest Coast Cultures

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Introduction

At the time this research was conceived in 1988 I had a very different understanding of the Locarno Beach culture than we have today. This project was developed with the expectation that large-scale salmon storage did not occur until the succeeding Marpole phase (Matson 1983) and that winter-time use of shellfish would be a very important part of winter time subsistence. As referred especially in Chapter VI, we were looking for evidence of resource control in shellfish, seeing this as a precursor to the ownership of salmon fishing locations seen in ethnographic accounts by Richardson (1982), and which I had argued was likely important in the developed of a stratified society (Matson 1983,1985). The importance of the "storage economy" had been just recently been attested to by Croes and Hackenberger (1988) in pre-publication drafts of their important paper. As reviewed by Matson and Coupland (1995:192-211) Marpole had long been considered as essentially "Northwest Coast", but I believed that Locarno was unlikely to fit this "Developed Northwest Coast" (Matson and Coupland 1995:5-8) pattern. During the fieldwork, Burley and Knusel (1989) presented compelling evidence that the Marpole phase did have ascribed status, and that the Locarno Beach culture likely did not – although Carlson (1991) argues otherwise.

Also during fieldwork, Mitchell's (1990) summary chapter appeared which suggested relatively equal numbers of Locarno and Marpole sites existed, which could be taken to argue for similar economic systems, which I thought was unlikely. The question of the relationship between Locarno Beach and St. Mungo/Mayne phases was clearly up in the air. I thought it was quite feasible that the Locarno culture may have originated off-shore, in the Gulf Islands, and that there was a real population displacement at that time. This impression may have been the result of my previous work at the Glenrose site (Matson 1976) which had a hiatus in Locarno time slot and thus there were large differences between the two neighbouring components there, and the fact that the only published good description of a Locarno component, from Montague Harbour (Mitchell 1971), presented a culture very different from the preceding St. Mungo culture on the mainland.

Now, in contrast, a very different picture of the Locarno Beach culture exists. Our work at Crescent Beach shows clearly that by 3000 RCYBP, the stored salmon economy was in full flight. The evidence is quite good that the timing of this event is similar between Vancouver and the Alaskan Panhandle (Matson 1992) although at no single area is it as compelling as it at Crescent Beach. In my previous review (Matson 1992), I pointed to many other lines of local evidence that pointed in the same direction and this review is updated in Chapter VI, with the important confirmatory sites of Decatur Island and West Point. In 1983 I argued that the development of an ascribed society and the stored salmon economy should go together, and that Locarno was before either. This argument was incorrect in at least two aspects, Locarno is based on large-scale use of salmon, but is unlikely to have an ascribed society. Elsewhere (Matson and Coupland 1995:245) we have shown that other investigators of "intensification" show that the economic changes usually occur before the social, making Locarno typical in this aspect as well. If large-scale salmon storage was in effect for the Locarno Beach culture one would expect relatively similar numbers of sites for it as for the succeeding Marpole, as suggested by Mitchell (1990). When we actually inspected this (Matson 1994a, 2006; Matson and Coupland 1995:157, 202) we found, in fact that relatively similar numbers of sites from each phase existed, particularly in contrast with the difference between Locarno and St. Mungo.

Given that household and social organization are apt to be tightly linked (Matson 1996a), one might

expect the large Northwest Coast houses to be associated with ascribed status. If this is the case, and if Locarno has achieved but not ascribed status, then we would not expect the large, planked houses of the ethnographic cultures. When we found Feature 9 the possibility of it being a winter dwelling structure was immediately apparent, although we had not prior expectations of such a thing. With only one other "habitation" feature previously known for Locarno (Howes 1982), and with only half of Feature 9 excavated, I was hesitant to push this too far. With the results of the fish analysis (Matson 1992) and shellfish seasonality (Chapter VI) the seasonality of the use of this feature is relatively clear. Feature 9 is a winter occupation structure. As the only one of its sort known for Locarno and only one of two known for Locarno at that time, presenting it as typical for Locarno, though was another step. In fact, Gary Coupland and I (Matson and Coupland 1995:198) disagreed on the likelihood that large planked houses would be found to be the usual domestic structure in Locarno components. The recent discoveries (Morgan 1999; Walker 2003) of Locarno components with an additional three (or four) small structures, three of which closely match Feature 9, makes it clear that small structures of the size inhabited by a single nuclear family are the usual domestic structure for Locarno Beach.

With our new understanding, then, Locarno Beach is the time of initial large-scale stored salmon economy, without, however, the other aspects of the Developed Northwest Coast Pattern. Thus, little evidence of ascribed society exists, and the most common winter dwelling type is a small, single family shallow pit structure. The question of relationships with other cultures still remains open in some ways. The succeeding Old Musqueam subphase of Marpole is so close in time and artifactual material (Matson 1980 et al., Matson 1989; Matson and Coupland 1995:213-18) that it is clearly is evolutionary. Clark (2000) in fact, argues that the Old Musqueam should be included into the Locarno Beach phase, and issue I will return to later in this chapter. The relationship with earlier cultures is not yet clear, but much clearer than when we began.

In this chapter we turn away from Crescent Beach and look at the Locarno Beach culture as a whole. First we look at its culture history aspect, focussing on the dating and extent. Then we look at its place, by evaluating the interassemblage variability, and return to the dating after this. Three issues are focussed on after looking at the variety found in Locarno Beach components, the difference between "Island" and "Mainland" components, including a detailed look at the artifactual differences between the two groups, the transition from Locarno to Marpole, and the ethnic boundaries likely present at this time and their relationships with current linguistic groups. A brief summary of Locarno subsistence is next given with a closer look at claims for much earlier reliance on the stored salmon economy. This chapter and volume ends with a very short conclusion.

Locarno Beach and Culture History

Pratt's investigations (Pratt 1992) demonstrated a close relationship between mainland Locarno Beach and St. Mungo components, to a much greater extent than I expected prior to this project. This continuum will be evaluated in detail later in this chapter, but important continuities in chipped stone tools, including projectile point styles are also matched by bone and antler tools. In particular cobble tools and bone chisels and wedges have similar frequencies in both cultures. The presence of shell and ground stone beads in both components at Crescent Beach are another point of similarity that reduces the differences one finds in the literature previous to our work. In contrast with the much reduced differences between St. Mungo and Locarno Beach, many of the differences within Locarno Beach components previously noted (Matson 1989) remain, and thus loom larger as something yet to be explained than when we began this investigation. Although our re-analysis of Whalen Farm and Locarno Beach site Locarno components do not allow us to compare them across the board with more recently excavated components because of the factors discussed

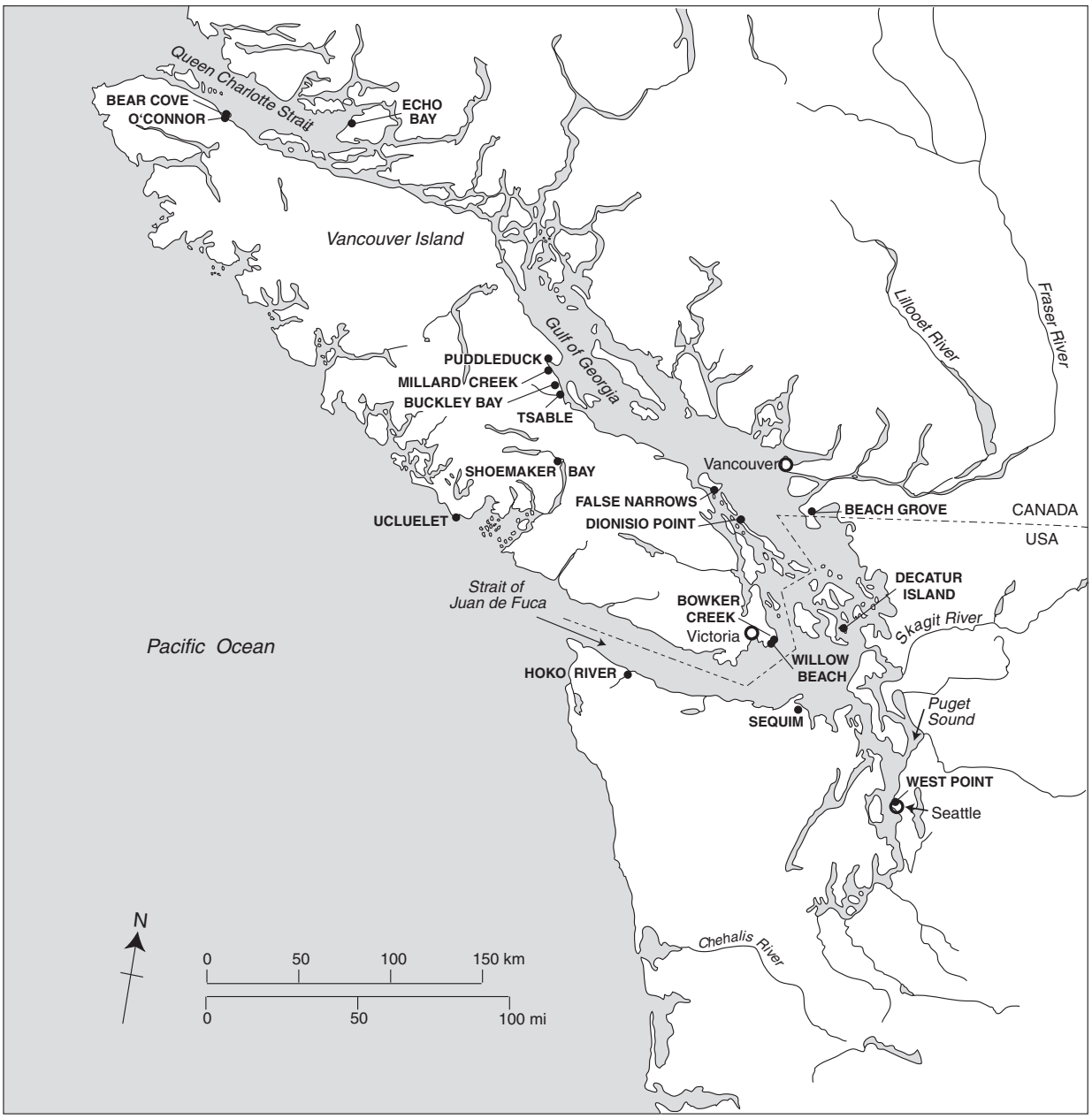

Figure XII-1. Location of Locarno Beach and similar components; see also Figure II- 1 for Gulf Island and Lower Mainland sites.

in Chapter X, we can be certain that some very large differences exist between these components and Crescent Beach. The absence of Ground Slate Knives and facetted ground stone points at Crescent Beach are just two of the differences that are indicative of significant variety within this culture. The relationship of the various Locarno components to each other is systematically investigated later in this chapter.

A relatively minor issue resolved has to do with the proper classification of the oldest component at Crescent Beach. Percy (1974) originally called it a "Mayne Phase" component, at a time when the St. Mungo Phase had yet to be formally defined (Matson 1976); although when I did so, I was merely formalizing an already informally established culture (Boehm 1973; Calvert 1970). The absence of labrets, microblades, and ground slate knives makes the older component at Crescent Beach clearly "St. Mungo"

Table XII-1 Excavated Locarno Beach Components

Site Name	Code (Fig. XII-3–9	Reference
Willows Beach	WllB	Kenny, 1974
Belcarra Park	BelP	Charlton, 1980
Jack Point (DgRx 5)		Murray, 1982
Puddleduck	Pudd	Mitchell, 1988b
Montague Harbour I	MH-I	Mitchell, 1971
Little Beach, Ucluelet		Arcas, 1991
Shoemaker Bay I (?)	SMB-I	McMillan and St. Claire, 1982
Hoko River		Croes, 1989, 1995
Pender Canal		R. Carlson, 1991; Carlson and Hobler, 1993; Hanson, 1990
Long Harbour		Johnstone, 1991
Bowker Creek	BowC	Mitchell, 1979
Georgeson Bay	GnBy	Haggarty and Sendey, 1976
Helen Point	HP-1b	McMurdo, 1974
Valdes Island (DgRv 9)	DgRv 9	Apland, 1981
Pitt River		Patenaude, 1985
Telep, Fraser River		Peacock, 1982
Buckley Bay (DjSf 13)		Mitchell, 1974
Tsable River Bridge		Wigen, 1980
Marpole	Mrp-I	Burley, 1979; Pratt 1992
Beach Grove North		Ball, 1979
Deep Bay		Monks, 1977
Millard Creek	MilC	Capes, 1977
Locarno Beach		Borden 1950a, 1951b; Arcas 1993
Whalen Farm		Borden 1950a, 1951b
Musqueam NE (DhRt 4)	MuNE	Borden 1976; Borden and Archer 1974
Crescent Beach	CB-II, CBT-I	Percy, 1974; Trace, 1981; Matson 1992
Simonarson (45WH46)		Gaston, 1975
Decatur Island (45SJ165)		Walker, 2003; Bard et al. 2007
(45SJ169)	Deca	Walker, 2003; Bard et al. 2007
West Point Component 2	WPt-2	Larson and Lewarch, 1995
Sequim, Component II		Morgan, 1999
St. Mungo, Block C	BlkC	Ham et al. 1986

and not "Mayne" (Carlson 1970), since the latter culture differs from the former in the main by having those three distinctive artifacts present. Whether, in fact, any "Mayne" component exists that is not really "St. Mungo" remains an open question.

In another culture history aspect, that of dating, our work is more confirmatory than revealing new information. The redating of the original Locarno Beach material at Locarno Beach and Whalen Farm now shows that these two components date to the 2500-3300 RCYBP period that others (e.g., Mitchell 1971, 1990) had found for this culture. This redating is supported by the dates from 1993 excavations by Arcas (1993) on the lot next to the one where Borden carried out his original Locarno Beach site excavations as reviewed in the previous chapter.

Except for the problems with dating the Marpole/Locarno Beach transition, our dates from Crescent Beach (and the Locarno Beach site itself) support the usually accepted dates for the archaeological cultures – 4400-4300 to 3300 for St. Mungo, 3300 to 2500 for Locarno Beach. Our investigations can also be used to support the transition between St. Mungo and Locarno being as early as 3500 RCYBP. These two apparently contradictory stances are the result of a more fundamental research finding, that the transition is

Table XII-2 Locarno Beach Culture Radiocarbon Dates

Site	Date (RCYBP)	Lab No.	Reference
"Definite" Locarno Components			
Locarno Beach (DhRt 6)	2430± 160*	S-3	McCallum and Dyck 1960
	2270± 100*	S-3 bis	Borden 1970
	2840± 80	SFU 767	Chapter IX
	3280± 70	SFU 766	Chapter IX
(Arcas)	2730± 90	Beta 71115	Arcas 1993
	3120± 90	Beta 71116	Arcas 1993
	3160± 90	Beta 67252	Arcas 1993
	2460± 80(?)	Beta 70602	Arcas 1993
Whalen Farm I	2450± 160*	S-18	McCallum and Dyck 1960
Montague Harbour (DfRu 13) I	2890± 140	GSC 406	Mitchell 1971
	3160± 130	GSC 437	Mitchell 1971
Georgeson Bay I	2820± 100	GaK 2753	Haggarty & Sendey 1976
Crescent Beach (DgRr 1)	3060± 80	SFU 727	Chapter IV
	3210± 110	WSU 4247	Chapter IV
	3010± 85	WSU 4246	Chapter IV
(Trace)	2980± 80	WSU 1702	Trace 1981
	3030± 80	WSU 1703	Trace 1981
	3260± 80	WSU 1701	Trace 1981
	2570± 90	WSU 1948	Trace 1981
Musqueam NE (DhRt 4)	2550± 85	I-7790	Borden and Archer 1974
	2970± 90	I-7791	Borden and Archer 1974
Bowker Creek (DcRt 13)	2740± 100#	GaK 2761	Mitchell 1971,1979
	2330± 100 (corrected)		Robinson & Thompson1981;Deo et al. 2004
	2910± 100#	GaK 2760	Mitchell 1971,1979
	2500± 100 (corrected)		Robinson & Thompson1981; Deo et al. 2004
DgRv 9 (Valdes Island)	3000± 160	SFU 128	Apland 1981
	3440± 280	SFU 131	Apland 1981
Belcarra Park	1710± 90*	GaK 3903	Charlton 1980
Beach Grove North	2810± 70	Wat 561	Ball 1979
	3200± 150	SFU 1	Ball 1979
Decatur Island 45SJ169 Analytic Unit 5	2490 ± 60	Beta 170645	Walker 2003
	2600 ± 60	Beta 170653	Walker 2003
	2460 ± 40	Beta 170649	Walker 2003
	2570 ± 60	Beta 168999	Walker 2003
	2450 ± 90	Beta 170650	Walker 2003
	Average 2508 ± 21		

Table XII-2 Locarno Beach Culture Radiocarbon Dates, Continued

Site	Date (RCYBP)	Lab No.	Reference
"Locarno Related" Components			
Willows Beach	2630+ 95	GaK 5102	Kenny 1974
	2490+ 85	GaK 5103	Kenny 1974
Puddleduck (II)	2210+ 80(??)	SFU 114	Mitchell 1988b
	2780+ 240	SFU 124	Mitchell 1988b
Buckley Bay	2640 + 90#	GaK 7347	Wigen 1980
	2230+ 90 (corrected)		
	2770 + 90#	GaK 7348	Wigen 1980
	2360+ 90 (corrected)		
Tsable River Bay (Upper Comp.)	3220+ 140#	GaK 7350	Wigen 1980
	2810+ 140 (corrected)		
	3060+ 110#	GaK 7351	Wigen 1980
	2650+ 110 (corrected)		
Millard Creek	1780+ 145*	GaK 4856	Capes 1977
	3520+ 110	GaK 4857	Capes 1977
	3480 +195	GaK 4858	Capes 1977
Shoemaker Bay I (Zone C)	1730+ 80*	GaK 5107	McMillan & St. Claire 1982
	1730+ 90*	GaK 5106	McMillan & St. Claire 1982
	2860+ 90	GaK 5104	McMillan & St. Claire 1982
Little Beach	2510+ 60	Beta 47923	Arcas 1991
	3310+ 70	Beta 47925	Arcas 1991
	4000+ 170	Beta 47655	Arcas 1991
	4000+ 90	Beta 47924	Arcas 1991
West Point Component 2			Larson and Lewarch 1995
20 radiocarbon dates between 2760 + 100 and 3240 + 80 RCYBP.			
Sequim, 45CA426 Component II, Analytic Unit A Features (Including features 310 and 416)			
Accepted dates.	2540 + 60	Beta 99264	Morgan 1999
	2470 + 80	Beta 111181	Morgan 1999
	2510 + 100	Beta 107606	Morgan 1999
	2480 + 50	Beta 107612	Morgan 1999
	2430 + 60	Beta 111182	Morgan 1999
	2610 + 40	Beta 118952	Morgan 1999
	2560 + 90	Beta 118957	Morgan 1999
	Average 2529 + 23		
Hoko River (Area B)	2750 + 90	WSU 1443	Croes 1995; Croes and Blinman 1980
	2610 + 100	WSU 2015	Croes and Blinman 1980
	2530 + 60	WSU 2014	Croes and Blinman 1980

Table XII-2 Locarno Beach Culture Radiocarbon Dates, Continued

Site	Date (RCYBP)	Lab No.	Reference
St. Mungo Block C	3380 ± 70	WSU 2840	Ham et al. 1986
	3410 ± 75	WSU 2841	Ham et al. 1986
	3340 ± 65	WSU 2842	Ham et al. 1986
	3420 ± 70	WSU 2843	Ham et al. 1986
	3455 ± 60	WSU 2811	Ham et al. 1986
	3370 ± 90	WSU 2812	Ham et al. 1986

* Indicates date rejected by investigator or by reanalysis in this volume.
(?) Date questioned by investigator.
Shell date, therefore likely 410 years too old (Taylor 1987:126- 132; corrected as per Deo et al. 2004 and Robinson and Thompson, 1981).

gradual, evolutionary in nature – at least at Crescent Beach – making the point of exact transition depending on definition.

A more extensive survey of Locarno radiocarbon dates is given in Table XII-2. The list of probable/possible Locarno Beach components given in Table XII-1 with locations shown in Figure XII-1, is from Table 6-1 of Matson and Coupland (1995) with a few additions, but was originally developed out of the present research project. The rejected dates indicated by asterisks in Table XII-2 are those rejected here, either by redating directly (as at Locarno Beach itself in Chapter X), or indirectly because of this redating, or by their reporters. The dating of components that have assemblages described in sufficient detail to be reasonably certain of their affiliation to the Locarno Beach culture and located in the southern Gulf of Georgia region, that is, those dates plotted in Figure XII-2, show a high degree of correspondence to the period 3350 to 2500 RCYBP. Of particular interest is the well-dated Block C component from St. Mungo (Ham et al. 1986), either right at the beginning of Locarno Beach (our interpretation) or terminal St. Mungo. The beginning of the Locarno Beach culture is very securely dated. It will be noted that the dates from Bowker Creek are not plotted. Mitchell (1979) classified Bowker Creek as Locarno but relied on uncorrected shell dates. If corrected as per Taylor (1987), Robinson and Thompson (1981) and Deo et al. (2004) they become the latest Locarno accepted dates. Mitchell's discussion of this assemblage and judgement as Locarno (1979:97-100) relies extensively on the validity of the uncorrected dates and I am not certain what his judgement would have been if he had used the "corrected" versions, and thus I left the dates (both corrected and uncorrected versions) off the "accepted" dates plot (Figure XII-2).

It is remarkable that all the accepted Locarno dates overlap at the one-sigma level with the 2500 to 3350 RCYBP period. It is also true, however, that for the last 30 years or so dates on Locarno assemblages that do not date to this range have generally been rejected by investigators. This is particular true with the important, but complicated recent CRM investigations at West Point (Larson and Lewarch 1995) and Decatur Island (Walker 2003). The sole questionable date (Beta 70602) on Figure XII-2 is also the most recent. This survey of dates supports the now conventional dating of the Locarno Beach culture, first argued for by Mitchell (1971:65) in a slightly more relaxed form. As pointed out earlier, and discussed in more detail below, the Old Musqueam subphase of the Marpole phase has a number of apparently valid dates at 2300 RCYBP or earlier, indicating that the Locarno culture did not last until that time, at least on the mainland, as discussed below. Dates less than 2400 RCYBP on Locarno assemblages should thus be treated with suspicion, as they apparently have been by most archaeologists in the recent past.

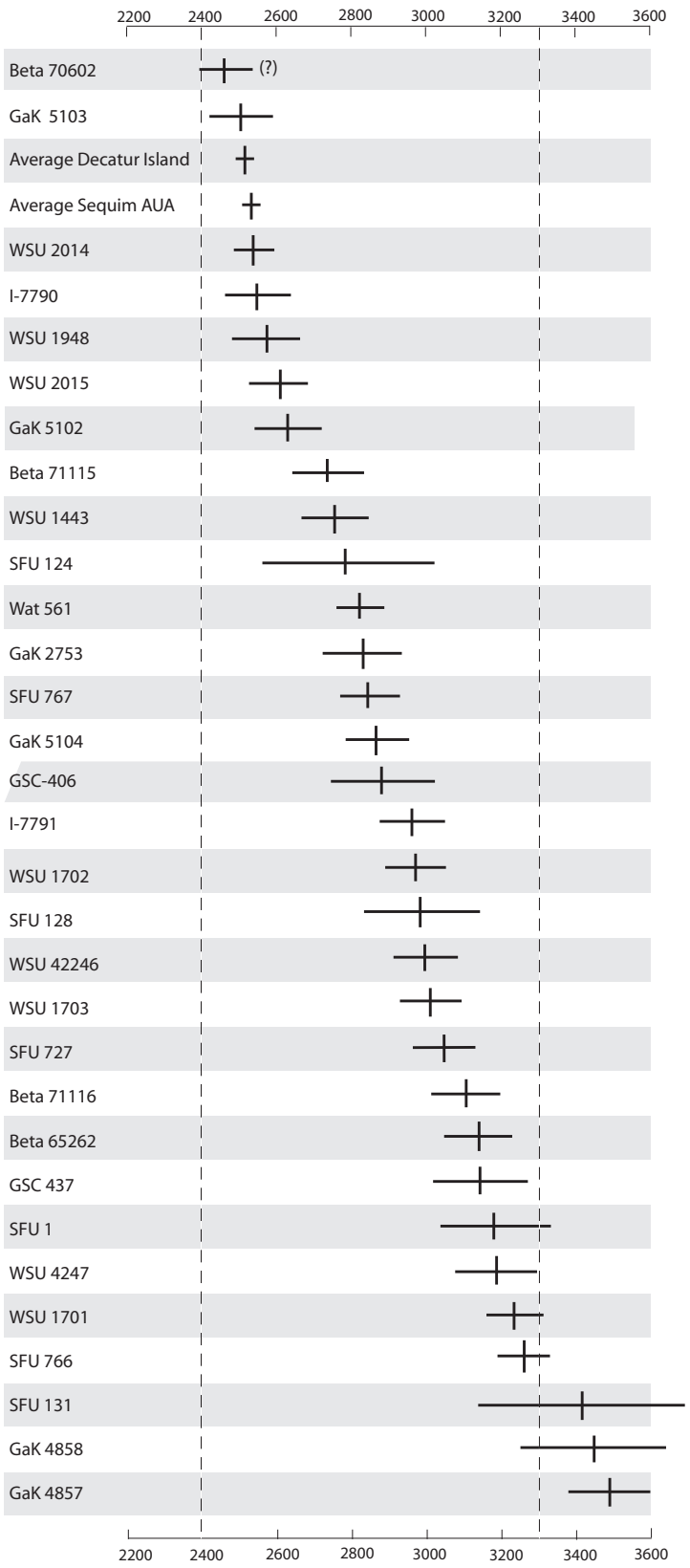

Figure XII-2. Plot of Locarno Beach Dates. No shell dates, or dates from Little Beach and St. Mungo Block C are included. All dates RCYBP.

It may be surprising that there are not more dates for the younger portion of the Locarno culture, but I think this can be explained by the tendency to try to find out how "old" something is rather than how "recent" it is. Thus I would bet most Locarno dates are from the lower portions of each component. Locarno radiocarbon estimates in the 2300 to 2500 RCYBP range then are probably usually rejected, because they are usually from the lower portions of the components, not because they are not valid estimates of the termination of this culture. In any event, the dates from the Old Musqueam subphase indicate the end of this culture.

Figure XII-2 indicates a beginning date of about 3300 RCYBP, in contrast to our arguments earlier that this culture may date to 3500 RCYBP. As Pratt (Per. Com.) observed in the late 1980s, Locarno Beach components are usually the oldest components on sites where they are found and Crescent Beach was a rare exception to this. Thus, if Locarno Beach culture is an evolutionary development out of St. Mungo, one might expect to find its earliest examples at sites with St. Mungo components, and that only later, when more fully developed, does it "found" additional sites, and this appears to be the case with the Block C component at St. Mungo (Ham et al. 1986) and the apparent early beginning at Crescent Beach. Less abstractly, as the stored salmon economy developed, at first it would be a variation upon the St. Mungo culture, but then when the greater carrying capacity was realized, additional local communities – and sites – would be added to the previously existing base. At both the St. Mungo site and Crescent Beach we have evidence of this transition. We have stated that it is somewhat arbitrary which layer we designated as the first Locarno layer at Crescent Beach and Ham et al. (1986) have designated a small "component" (Block C) that appears to be transitional securely dated to about 3400 RCYBP (Table XII-2). Although similar to St. Mungo in many aspects, the Block C material includes such 'Locarno' and non-St. Mungo attributes as a stone celt, decorative ground stone other than incised schist, formed abrasive stones, an antler haft, and a number of decorative objects, including a labret. With these observations in mind, I continue to maintain the "transition" probably dates to 3500 RCYBP. Figure XII-2 shows that the "expansion" of the new Locarno culture dates to after 3300 RCYBP, and that this expansion happened rapidly with five dates with mean equal to, or greater than, 3200 RCYBP.

In summary, the dating of the Locarno Beach culture can be divided into several different aspects, initiation, spread, termination, and replacement. The initiation probably began at about 3500 RCYBP and lasted to about 3300 RCYBP. By 3300 RCYBP Locarno Beach assemblages are clearly different from the previous St. Mungo assemblages on the mainland, even if one rejects Block C as fully Locarno. The spread of this culture can begin to be discerned about 3300 RCYBP and it was evident at least four new sites by 3200 RCYBP. The termination is not nearly so clear, with few dates from the end of Locarno components, but it appears to have been still distinctive at 2500 RCYBP. By 2300 RCYBP, the Old Musqueam subphase is clearly present on the mainland, indicating that a different culture had developed by then, albeit one with many similarities with the preceding Locarno Beach, as discussed later in more detail. We also have the first good evidence for large shed-roofed houses in this Marpole subphase (Johnstone 1991; Lepofsky et al. 2000; Matson 1994b)

The present of a number (six currently) of probable small winter pithouses in Locarno times certainly suggests that the absence of evidence for large planked structures in Locarno times is valid and that this structure form is a development that did not occur before Marpole times, when the first evidence for this is found. The presence in interior B.C. of abundant pithouses at about this time, although of a more substantial architecture in accord with a more robust winter, is also suggestive of a participation of a widespread settlement seasonality and habitation type. Pithouse winter sites are well known from the interior of B.C. and Washington from the period 3500 RCYBP up to historic times. The coastal manifestation found at Crescent Beach, Sequim, and Decatur Island can be seen as a variety of this, less

permanent in line with the less severe winters perhaps. The presence of small structures at four different Locarno sites (the three indicated above plus Hoko River) indicates that this is the standard dwelling type. This does not preclude large planked structures from existing at some places at some times during this phase, but large houses are not likely to be the usual dwelling form.

At Long Harbour on Saltspring Island, Johnstone (1991) found some post-molds indicative of a large shed roof house in what he considered a Locarno component. As argued elsewhere (Matson and Coupland 1995:215) this small, undated component is a better fit as an Old Musqueam subphase component. This may be the oldest evidence of a large shed roof house in the Gulf of Georgia region (if one calls Scowlitz too far inland to be considered in the Gulf of Georgia), but its Locarno-nature remains to be demonstrated, although a Locarno component is present at this site. Currently, the oldest dated shed roof house, as indicated in Chapter VII, is at Scowlitz. I obtained a date of 2460 $\pm$ 90 RCYBP (WSU 4542) in 1993 when I excavated a trench at Scowlitz through what I inferred was a house structure and identified the structure as a shed roof house (Matson 1994b). This structure was later extensively excavated which confirmed my interpretations and resulted in three additional similar dates (Lepofsky et al. 2000).

The Place of Locarno Beach; Interassemblage variability.

From the above summary it is clear that a number of questions exist about the variety that exists during this time period within the Gulf of Georgia. In this section I evaluate the variety that exists in described Locarno Beach components and provide support for the dating summary. In Matson and Coupland (1995:157) we listed 28 excavated probable Locarno Components (Table XII-1). In spite of that impressive list, few can be reliably compared with each other even at the gross artifact level. Many of these sites either have small collections or lack preservation of bone and antler material, making extensive comparisons with larger components that do have bone and antler material, even if the artifacts are well described (another limiting problem), extremely difficult. Despite our reanalysis of the types sites of Whalen Farm and Locarno Beach (DhRt 6) these two collections must be added to that group. However, as indicated in the previous section, it is possible to use the dates from many of these components even though the artifact assemblages can not be used with confidence in the following quantitative analysis.

The two most securely dated and described Locarno Beach sites are Montague Harbour I and Crescent Beach. Even though it is far from fully published, Musqueam North East (DhRt 4) has a reliable artifact list (Matson 1974a, but only from the first of two years of excavation) and dates, and is clearly in the core Gulf of Georgia area. From these three one takes a big step down in quality or usefulness of assemblage information. The Georgeson Bay site (Haggarty and Sendey 1976) is relatively well described, but is small (two excavation units). Helen Point Ib, as described by McMurdo (1974) is a useful component, but with a several caveats. First, no dates exist for it. Second, it is probably an admixture of an earlier component ("Mayne") and Locarno Beach. Third, it is an excavation carried out more than 40 years ago and written up by someone who was not present during excavation. Upon inspection and preliminary analysis, however, I found little sign of a substantial earlier contribution. I believe these five components, buttressed by our re-analysis of Whalen Farm and Locarno Beach collections, and the 1993 excavation of the Locarno Beach site (Arcas 1993) give a reasonable basis for an understanding of this culture and a useful basis to compare with more problematic assemblages.

At some point, though, one needs to take in how much weight one places on details in the following analyses. As before (Matson 1989) the following analyses are based on the 51 class artifact list generated by Burley (1980), with four additions. As Burley (1980: 46-47) points out his style of analysis and his artifact list are largely based on my 1974 report (Matson 1974a) which in turn in terms of artifact classification (as so much is) is based on Mitchell (1971). Many of these classes are not well described and many artifacts can not

be placed in any of these, and so are placed outside. Working with an artifact description that is not oriented to this list, and making judgements on the basis of written description means that there is room for a lot of error. Some of these tabulations (Matson 1974a) are more than a quarter of a century old, and I would not claim that a tabulation I would do today, on the collection, or from a description, would be more than "close". Furthermore, we have demonstrated with Whalen Farm and Locarno Beach how changing field techniques and interests in archaeology causes changes in what ends up at a "repository", let alone what is well described in reports. In a number of cases these collections were excavated more than 30 years ago, and although I can not point with certainty to any specific changes over that time in these collections, I believe there are some, likely more present in small items (beads, microliths) and more in the descriptions than in the actual collections. These kinds of problems can be more easily ignored in large, well described and illustrated collections, than in the ones that follow.

Willow Beach (Kenny 1974) is a site in Victoria that has a relatively large collection that is thought by most to be Locarno, but which is not so certainly assigned by the investigator, and has dates that place it at the end of the usual dating of this culture. It fits well within the core southern Gulf of Georgia area and is relatively well described. DgRv 9 is a disturbed, but relatively well-dated single component site on Valdes Island (Apland 1981). By adding the artifacts from both the intact horizons and the disturbed strata, but eliminating the surface collection, a total of 35 artifacts was arrived at, surely a rock-bottom sample size. The question of whether this component is definitely "Locarno", though, can be asked. Belcarra Park (Charlton 1980) is a site on the northeast outskirts of the Vancouver metropolitan area that is said to have a Locarno component and is relatively well described. It was investigated for use in this analysis, in spite of having only five classified bone implements present. A final Lower Mainland component, is a mixed, older one from the Marpole site excavated in the 1973 by Baker (1974). Burley (1979) describes this as a "Mayne" component, but I know that the late C.E. Borden after looking at the collection thought it was a Locarno component, as I did. Burley (1979) reports no dates from this component, and argues that it is "Mayne" on the basis of quartz crystal microliths, chipped slate discs, celts, earspool and 1-piece toggling harpoon head. These are all items not present in the St. Mungo, but in Locarno. In addition a bilaterally barbed harpoon point is present, and that is an item found both in St. Mungo and "Mayne". To call this "Mayne" and not Locarno is to suppose within 10 kilometers on the same river, two cultures exist (St. Mungo and Mayne) that are significantly different, and that one is replaced by the other, with very little change and lasts for two thousand years (4400 to 2400 RCYBP). Without dates this would seem to be a difficult position to defend. Pratt (1992:241-248) reviews this component and comes to similar conclusions. This is a likely Locarno component, but not well separated from the succeeding Marpole component and may include at least some St. Mungo material and so must be treated carefully.

A number of sites have been referred to as "Locarno" but exist so far from the southern Gulf of Georgia area that introducing them in an initial analysis seems unwise. These include those to the north, the Puddleduck site, the Little Beach, Millard Creek, Buckley Bay and Tsable River Bridge sites. Others exist but lack bone and antler assemblages making any definitive assignment impossible at this time. These include Telep, Pitt River, and Deep Bay sites. Another set either have very small assemblages and/or evidence of admixture with another component. These include the Jack Point, Shoemaker Bay I, Long Harbour, Beach Grove North, Tsawwassen, and Simonarson sites. A few other sites have large assemblages but are yet not fully described. These include Pender Canal and probably the Simonarson site. To the south we have Hoko River, 45CA426 at Sequim, West Point 2, and 45SJ169 and 165 on Decatur Island. As we will see, although I am convinced several of these are Locarno, definitive quantitative comparisons are not possible for a number.

Before we begin this series of analyses, a few words are appropriate about the nature of the techniques

chosen, cluster analysis and metric multidimensional scaling (Torgerson 1958). Metric multidimensional scaling belongs to the wide variety of DiDo – Data in, Dimensions out – techniques which have fairly been also referred to as GiGo – Garbage in, Garbage out. These techniques include procedures such as factor analysis, principal component analysis, principal coordinates analysis and correspondence analysis, as well as non-metric multidimensional scaling. In all of these techniques, data sets, which in the current circumstances consists of sites and numbers of artifacts in each category, are used to produce some sort of distance or covariance matrix that is then transformed into orthogonal vectors or dimensions with the sites or artifacts located on each dimension. Orthogonal merely refers to the fact that these dimension are statistical independent of each other, or at right angles from each other. The results are classically displayed as two dimensional plots. All such techniques produce "goodness-of-fit" measures since all these techniques essentially attempt to fit a large dimensional data set into a much lower dimensional final result and some measure of how much of the original variability fits into the lower dimensional results is necessary. All except non-metric dimensional scaling also produce the "vectors" in order of their importance with some measure of how important each is.

All of these "scaling" techniques are closely related and all but non-metric dimensional scaling can be seen as variants of principal components analysis (Davis 2002). In fact it is possible to obtain the exact same results by picking the appropriate options using principal components, metric dimensional scaling and principal coordinates analysis and correspondence analysis. Principal coordinates and metric dimensional scaling are, for all practical purposes, identical. Since some variants of these techniques are considered factor analysis by some and by principal components analysis by others, the above statement about identical results could be extended to include factor analysis. The only exception, non-metric multidimensional scaling, in practice does not turn out to be much of an exception since popular packages such as KYST (Kruskal and Wish 1978) commonly use metric dimensional scaling as an initial configuration, and if one uses the appropriate number of dimensions, does not change this initial configuration significantly. So even though the basis of this technique is very different from the rest, the results in practice are dependent on them and, in many situations, do not differ significantly.

The advantage of scaling techniques is that they use the same distance measures used in cluster analysis and thus give a better representation of the same configuration that is clustered. Metric multidimensional scaling is the one chosen (Torgerson 1958), as the types of distance measures used are metric (city-block distance and Euclidean distance in most cases) and in this situation metric has no disadvantages and several useful advantages over non-metric scaling. My own experience with this technique ranges over some time (Matson 1974a; Matson and True 1974, True and Matson 1970). The cluster analysis techniques used are that of Furthest Neighbour and Ward's method, both well-known variants (Davis 2002:490-499; Sneath and Sokal 1973:222,241). Furthest neighbour has the advantage in the results of the joining do not change if the distance matrix is monotonically transformed; i.e., if it is transformed in any way as long as the rank order of the distances remains the same. This is not true with Ward's method. The actually programs used are ones that I wrote in 1986/1987 in Modula 2. (At least I know who is responsible for any errors!)

The first analysis is to look at the four best known Locarno components and the three well-described St. Mungo components. The characters used are the 51 described by Burley (1980:46-49) with the four added by Matson (1989), those of ground slate knives, perforated bone pendants, incised schist/shale and small antler bilaterally barbed harpoons.

The tabulations for Glenrose, St. Mungo (Ham et al. 1986) and Crescent Beach I and II are taken from the artifact classifications carried out by Pratt (1992). Pratt reanalyzed the St. Mungo components from Glenrose (Matson 1976) and from the St. Mungo excavations reported by Ham et al. (1986), but left aside Ham's "Block C" component as it appeared to be transitional between Locarno and St. Mungo. In addition,

as reported above, she reclassified the assemblage recovered by Percy (1974) at Crescent Beach. Thus, all four of those components were analyzed by the same person, using the same classification system. I then transformed these tabulations into the 55 classes used here, making a few minor changes along the way. The St. Mungo component identified as "StMm" is that reported by A. Mackie (1982), an assemblage recovered from the 1981 testing, which I also transformed into the 55 classes used here. I did not look at this assemblage. This should also be relative free of problems, although with two caveats, discussed below. The Montague Harbour I tabulation is from Mitchell (1971) and the Musqueam NE is the tabulation in Matson (1974a) actually made by D. Archer and I. It should be noted, that with the exception of the St Mm entity, the other two St. Mungo components and the Locarno component from Crescent Beach are all different data sets than reported in Matson (1989) and tabulated in Matson and Coupland (1995:160). In those the Crescent Beach assemblages were extracted from Percy's (1974) report and the Glenrose from Matson (1976). The Locarno tabulations for Montague Harbour and Musqueam NE are the same as used in the previous analyses.

The first caveat about the Crescent Beach tabulations are that the component definitions used by Percy (1974) was likely higher in the stratigraphic sequence than the definition that we used, so that the Locarno Beach components probably includes material that we would have placed in the St. Mungo component. We have also previously documented that the number of beads is much greater in the 1989/90 excavations probably the result of water screening using 3 mm mesh. It is likely that other small items, such as the Quartz Crystal Microliths are also under represented in Percy's assemblages.

The first analysis is seen in Figure XII-3, where a cluster analysis based on unstandardized city block distance analysis is presented along with the first two dimensions of the metric multidimensional analysis. The first dimension (vertical direction) accounts for 60% of the total squared distance from the center, the second (horizontal direction) for 15% of the distance. This result is similar to previous analyses presented elsewhere (Matson 1989; Matson and Coupland 1995:164), although an additional assemblage is present in the current one for both the St. Mungo and Locarno cultures.

Although the cluster analysis presented earlier (Matson and Coupland 1995:164, Figure 6-4A) could be interpreted as indicating a lack of separation between St. Mungo and Locarno cultures, with the Crescent Beach Locarno component being between the two, the scaling results (Figure XII-3, Matson and Coupland 1995:Figure 6-4B) shows that this component is merely the Locarno one closest to the St. Mungo components. The current cluster analysis (Figure XII-3) shows all the Locarno and all the St. Mungo components clustering in separate clusters. However, the difference between Montague Harbour and Georgeson Bay and the other Locarno sites is quite substantial, and this difference between mainland and island Locarno components is a continuing theme in these analysis and has also been shown to be a theme in interassemblage variability in the Marpole Phase as well (Burley 1980; Matson et al. 1980; Matson and Coupland 1995:211-218). Part of the difference is the relatively low numbers of chipped stone artifacts of all sorts on Gulf Island components. Note that this is something we found with Borden's excavations, and that Helen Point, Georgeson Bay, and Montague Harbour were all excavated in the 1960s. Further along in this section a more detail discussion of the differences between Locarno and temporally adjacent cultures will be given; here just a brief summary of the differences between Locarno and St. Mungo is given. In general ground stone tools increase in Locarno components as well as the introduction of new stone tool types. Bone and antler assemblages also appear to increase, although not to the same extent as the ground stone. Slate and sandstone disks are also more abundant in Locarno and Ground Slate Knives, Labrets, Gulf Island Complex items and composite toggle harpoon valves are only found in Locarno. Surprisingly, cobble tools are equally common in both cultures.

This analysis of the "best" Locarno components demonstrates a close relationship between mainland

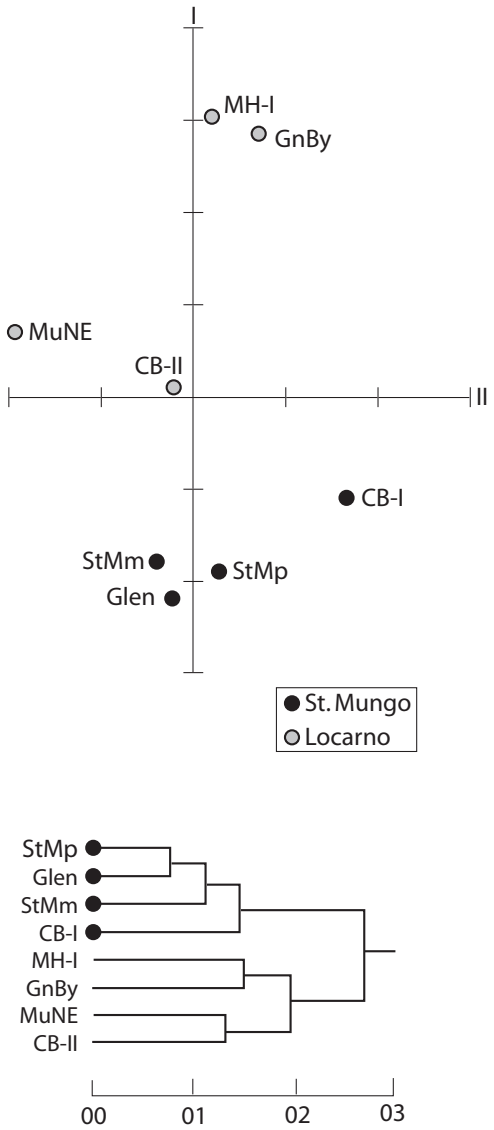

Figure XII-3. Top, Metric Multidimensional Scaling, dimensions 60 and 15% of Trace. Bottom, Furthest Neighbour cluster analysis of same data matrix, city block distance based on percents.

examples (all two) and the previous St. Mungo culture. This closeness is exactly what is expected if there is an evolutionary relationship between the two as demonstrated in other analyses. The large differences between mainland and island Locarno components was not expected, but we will see, is a repeating theme in these analyses. A reassuring note is the high similarity between the three St. Mungo components from Glenrose, and the two separate ones from St. Mungo itself. This shows that it is not necessary (at least in all cases) to classify the items in person, as Mackie's (1982) report was relied on for St. Mm. That Crescent Beach I appears some distance away, supports the impression that there are a number of differences between the two sets, and the very evident differences in the decorative items.

To this basal analysis I added Helen Point Ib and DgRv 9, on Valdes Island. The Helen Point site is located immediately across Active Pass from Georgeson Bay (Figure XII-1), and the Locarno component is reasonably well described by McMurdo (1974), although Helen Point Ib has no dates from this excavation. The results are seen in Figure XII-4. The first dimension represents 46% of the squared distance from the center, the second 16%. The third (not illustrated) dimension explained 21%. The pattern suggested by the first analysis is reproduced, with all three of the substantial Gulf Island components being presented at some

distance from mainland sites of any sort. Although one might expect the vertical dimension to be "time" Montague Harbour I has one of the oldest Locarno dates. Inspection shows that all of the components at the top share a number of characteristics. They are low in retouched flakes, high in chipped slate disks, high in microblades and low in choppers. They also have abundant unshaped abrasive stones and sea mussel tools. They are also low in antler wedges and bone chisels/wedges, as well as bird bone awls.

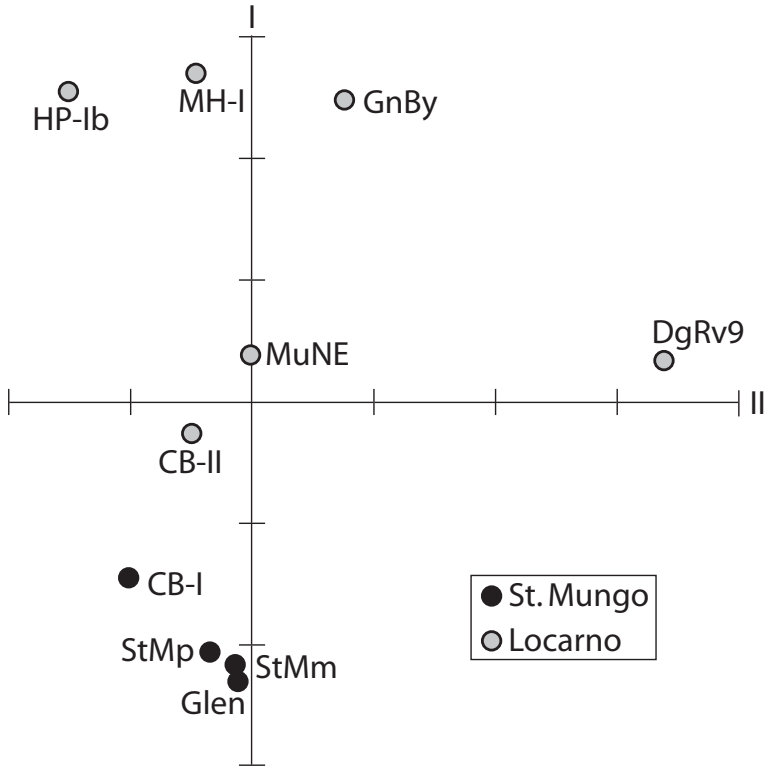

Figure XII-4. Metric MDS, Dimension I, 46%, II 21%; city-block distances from percents.

Georgeson Bay and Helen Point Ib can both be considered to be good members of the Locarno Beach culture, albeit of the "island" variety. With the addition of these two Gulf Island sites, it has become clear that the "mainland-island" dichotomy found for the Marpole is an important determinant of the variability among Locarno Beach components as well. The small Locarno component from DgRv 9 from Valdes Island (Apland 1981) closest neighbours are Musqueam NE (DhRt 4), Crescent Beach II, and Georgeson Bay at 0.0217 and 0.0219 distances. The next closest components are the St. Mungo assemblage analyzed by Pratt and Glenrose at 0.0227. As reported earlier, the assemblage of tools from DgRv 9 totaled only 35 even after adding the items from disturbed context. I justify this inclusion on the basis that only a single component was judged to be present and that the disturbed layers were treated during excavation in the same fashion as the others so that the relatively proportions ought to be good, provided the "one component" inference is correct. In this data set DgRv 9 joined at a very distant manner with the "St. Mungo" cluster in the cluster analysis (not illustrated), but was clearly a member of the Locarno culture in the scaling results, although by far, the most distant member, and according to the distances reported above. I conclude that DgRv 9 is a valid member of the Locarno Beach culture, but that further analysis would be unwarranted. Dimension two could be interpreted as the "aberrant" nature of DgRv 9.

Next I added four other likely Locarno components (after dropping DgRv 9), but ones that had a number of questions attached to them as per their suitability for an analysis like this. One is the older component at Willow Beach, at Oak Bay, Victoria, whose excavator was unsure was Marpole or Locarno

(Kenny 1974). Another is the older component at Marpole reported by Burley (1979) which is undated, mixed and which Burley considered a "Mayne" component. Burley (1979:531,532) lists artifact classes that he judged are likely intrusive from the Marpole component (II) at this site. I divided the numbers present in each of these classes to estimate how much "belonged" in the old component. Very close by Willow Beach is the Bowker Creek site (Mitchell 1979) with dates, that if corrected for the reservoir effects, as reviewed above, appear to be after Locarno, and with a modest collection with proportionately too much chipped stone, which in turn is dominated by numerous microblades (as is Willow Beach). A feasible Locarno component, as judged by Mitchell (1979) but likely a specialized one. Finally, the undated old component at Belcarra Park, with very few bone tools (Charlton 1980). Two of these would be expected to fit with the mainland components, and the other two, weakly with the Gulf Island ones.

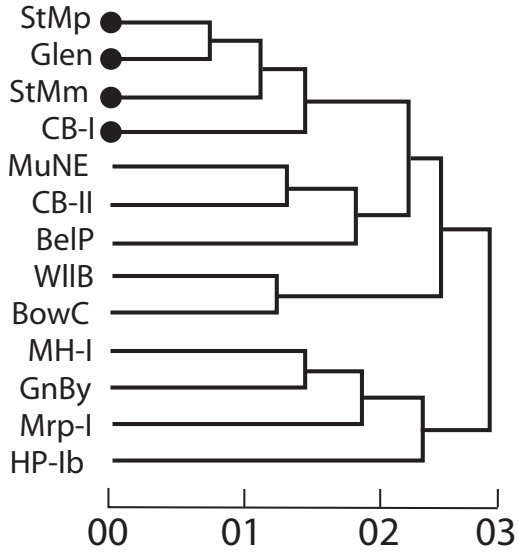

Figure XII-5 Furthest Neighbour Cluster analysis, city-block distance and percents of artifacts.

Figures XII-5 and -6 give the results of these analyses. Some of our expectations are met, others are not. Willows Beach links with Bowker Creek, as expected, but neither are very similar to anything else, either in the cluster analysis or the scaling. Belcarra Park links with Musqueam NE in the cluster analysis and is closest to MuNE and CB II on the first two dimensions of the scaling, but Marpole I links to the cluster of Montague Harbour I and Georgeson Bay in the cluster analysis and is close to both on the first two dimensions of the scaling results. This positioning certain confirms the essential "Locarno-ness" of this component. The cluster analysis confirms the differences between the "mainland" and "island" forms of the Locarno culture, albeit with the early component from Marpole joining with the "island" form.

The first dimension of the scaling results is correlated with amount of chipped stone tools, as before, but no longer has as strong a relationship with time. The "seriation" curve might be seen as a upside down "horseshoe" such as the plotted dashed line. It is typical with these techniques that seriations do result in "horseshoe" alignments, so this would not be unexpected. Obviously, Willows Beach is not an early site; its radiocarbon dates are indicative of terminal Locarno age, in spite of its abundant chipped stone assemblage and would be positioned at one end of the horseshoe. The question of its "Locarno-ness" must remain open at this time. It and Bowker Creek are very different from any other Locarno site. The distinctiveness of these components is likely the result of the high numbers of microblades present on both, a difference that may not really mean much. The first dimension is reduced in importance to only 37 percent of the scaled distance from the centroid.

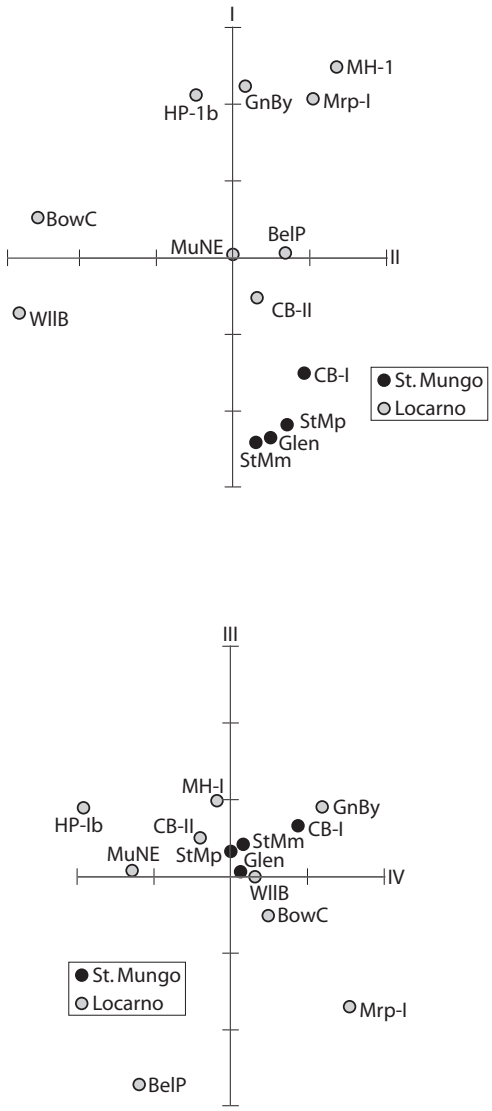

Figure XII-6. Data same as in XII-5, Metric MDS, dimension I, 37%, II, 18%, III, 13%, IV, 11%.

The second dimension (18%) appears to be correlated with microblades at the Willow Beach/Bowker Creek end, and with the abundance of contracting stem points, chipped slate disks, celts, mammal bone awls and bone chisels/wedges at the other. It can be interpreted as the difference of the Willow Beach/Bowker Creek pattern with the other assemblages. As presented earlier in this volume and in Matson (1992), Matson and Coupland (1995:152), the most likely economic developmental model appears to be that of the development of an unspecialized, foraging coastal adaptation in the St. Mungo, to a intensified specialization on stored salmon, as presented by Croes and Hackenberger (1988). In this transformation specialized "field stations" (Binford 1980; Lightfoot 1985) become part of the set seasonal round. The introduction of limited activity sites in Locarno times was one of the findings of Thompson's (1978) wide-ranging quantitative analysis. So the development of specialized sites, perhaps represented by Bowker Creek and Willows Beach (and most of the Locarno component at Crescent Beach) are only to be expected.

This interpretation, though, is offset by dating issues. As described above, if corrected for "reservoir effect", Bowker Creek would have the latest dates yet accepted for a Locarno component, but still greater than 2400 RCYBP at one sigma. Furthermore, the Willow Beach dates are on charcoal, and are consistent stratigraphically, with one from near the bottom of the old component (2630± 95 RCYBP GaK 5102) and

the other (2490+ 85 RCYBP GaK 5103) from the middle portion (Kenny 1974:310). If accepted, they would have this component beginning about 2700 RCYBP and lasting to about 2400 RCYBP, again extending the age of the Locarno culture. The matrix is discolored sand and I think is likely to have accumulated very rapidly, given that it did at the Locarno Beach site and Whalen Farm. So, accepting these dates as being very precise, would have this component at the end, but still within the accepted dating of the Locarno Beach phase. This issue must remain open at this point.

The third and fourth dimensions (Figure XII-6) add on 13 and 11 percent to the squared distance from the centroid. The third dimension may be interpreted as showing the distinctiveness of the Belcarra Park, Marpole I, and Bowker Creek assemblages. Although on the first two dimensions, and in the previous analysis, Belcarra Park and Marpole I appeared to be good members of the Locarno culture, on these two dimensions, they demonstrate their unusual aspects. In terms of artifacts, the three assemblages at the bottom have high amounts of contracting stem points, celts, and Ground Slate Knives, while the components at the top have high amounts of handstones and notched stones. On the fourth dimension, the assemblages to the left have more shaped abrasives, toggling harpoon valves, and wedges than the rest. The fifth dimension accounts for only 8% of the distance and given the relative lack of information in the fourth was judged not worth pursuing.

What can be said at this stage? Marpole I and Belcarra Park can be welcomed to the small group of assemblages sufficiently similar to the well described and dated Locarno Beach components to be judged clearly "Locarno" even without radiocarbon dates. Bowker Creek and Willows Beach have similarities to other Locarno assemblages but together appear to be substantially different and date to the end of the Locarno Phase, if not actually later. Whether these are specialized sites or a member of a related but different, later (Old Musqueam subphase?) or coeval culture is not evaluated at this time. These possibilities will be inspected in more detail below.

In addition to the above assemblages, all from the southern Gulf of Georgia, that have all been attributed to the Locarno Phase by someone and have been described in enough detail to be subjected to this sort of analysis, there are four other sites, Puddleduck, Buckley Bay, Tsable River Bridge, and Millard Creek) further north on the east coast of Vancouver Island that Mitchell (1988b) has described as Locarno. The Shoemaker Bay site at the head of the Alberni Inlet has a component dated to more than 2000 years old, and which has similarities to both early Marpole and Locarno Beach (McMillan and St. Claire 1982) rather than west coast of Vancouver Island sites. There are questions, though about applying the Gulf of Georgia sequence the far north. The "Marpole" component from Deep Bay, for instance, has been judged as being the northern most Marpole site, outside the sphere of the Marpole culture, or really more similar to Gulf of Georgia "Late" (Burley 1980:39). There is also the presence of the "Obsidian Culture" (Mitchell 1988a, 1990) in the Johnstone Straight region which has some similarities with Locarno and overlaps in time. Is there some definite dividing line between "Obsidian" and Locarno? Or a cline in between the two? Or some third culture with similarities with both lying in between? With these questions in mind it would seem to move cautiously in describing these definitely as Locarno on the basis of a few dates and some similarities in some artifact types. Mitchell (1988b:19), though, does briefly describe an analysis along the lines of the one carried out here that supports his judgement. Descriptions of the Puddleduck and Millard Creek sites (Mitchell 1988b; Capes 1977) at Courtenay are sufficiently detailed to include in this analysis. For Shoemaker Bay, upon the advice of Alan McMillan, I chose to use only the material from Zones C and D to compare with Locarno components (McMillan and St. Claire 1982:124). I also "adjusted" the amounts of microblades and Irregular Abrasive stones reported in this detailed report to correspond to my judgement of how these items were reported elsewhere.

Figures XII-7 and -8 show the results. In the cluster analysis Puddleduck links with Helen Point and

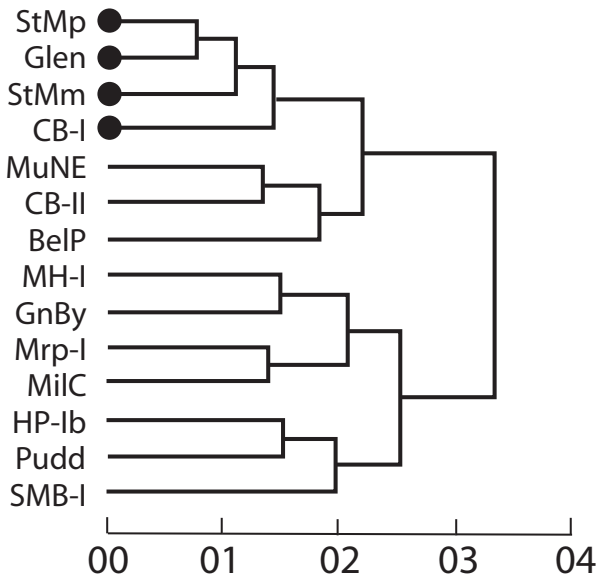

Figure XII-7. Furthest Neighbour cluster analysis, city-block distances, based on percents.

Millard Creek with Marpole I, to form a large cluster of "Island" components, compared with the cluster of three of the four mainland components, which in turn are linked to the St. Mungo assemblages (all of which are mainland as well). Shoemaker Bay I links, as the most distant of any site, to Helen Point and Puddleduck. In the first two dimensions of the scaling (42 and 16% of trace) both Puddleduck and Millard Creek are plotted as distant members of the "Island" form, with Shoemaker Bay I being the most distant member of this group. On the basis used before, Millard Creek and Puddleduck must be considered good members of the Locarno culture. Shoemaker Bay I, can not be so clearly classified, but certainly shows a high degree of similarity with other Locarno components, and in fact, is at a distance of 0.0163 with the Puddleduck site. Let us leave it at a tentative Locarno culture component. Shoemaker Bay, at the head of a very long inlet, is in a far different environment from any site yet discussed, and is connected by water (Alberni Inlet) to the Pacific Ocean, rather than the Gulf of Georgia. These factors would lead one to expect it to differ from other sites, even if the people living there were full participants in the Locarno anthropological culture.

In addition to the results of this analysis, on the basis of the briefly reported cluster analysis by Mitchell (1988b), where the Tsable River Bridge and the Buckley Bay sites are included, these are most likely good Locarno components as well. Mitchell (1988b) does not describe his cluster analysis in much detail, but does show that these three assemblages are closely related. As far as I know, the Tsable River material has not been described and Mitchell does not report his tabulation in his analysis (Mitchell 1988b). The Buckley Bay material has been briefly described (Mitchell 1974), but I did not think this small, relatively old, collection would reward further analysis in this style, using the 55 different artifact classes. The radiocarbon dates are discussed below. On the basis of Puddleduck being a good Locarno site, and Mitchell's analysis, I think we can accept both these two adjacent sites as having good Locarno components, although possibly with other components as well.

From Millard Creek, Capes (1977:82) reports three dates not contaminated by coal. One is near the top of the deposit (1780$\pm$ 145 RCYBP) and Capes reports suggestions of a later component present, so I think should not be accepted until more support of this sort is date is present. One of the others, is from the bottom of the same unit, and is 3520 $\pm$ 110 RCYBP (GaK 4857, 2C layer 3), one of the earliest dates from a a good Locarno component, but one that fits into the 3300-3500 transitional time argued earlier. The

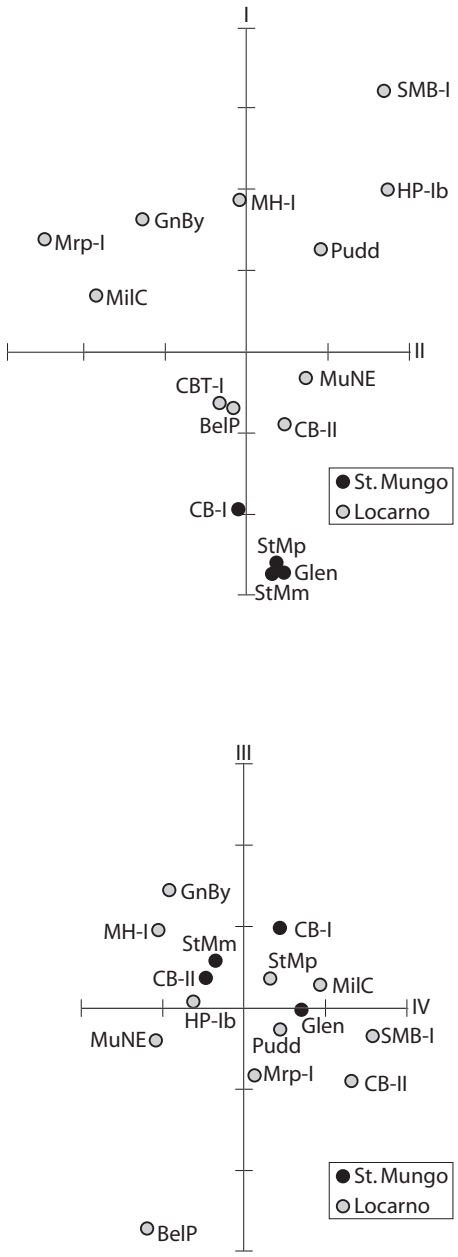

Figure XII-8. Metric MDS, same data as X-7. Dimension I, 40%, II, 15%, III, 11%, IV, 9%

final date accepted by Capes is from Unit 2D, is of essentially the same age, 3480 ± 195 (GaK 4858). From the Puddleduck site, two dates, one from the top and one from near the bottom are also available, and they are 2210± 80 RCYBP and 2780± 240 RCYBP Here the older is acceptable, but the younger is the youngest yet tabulated from a "good" Locarno component. It may well be, though, that the dating of Locarno in the Courtenay locality varies significantly from that in the southern Gulf of Georgia.

Only one of the three dates from the Shoemaker Bay component used here was accepted by the excavators and it is 2860± 90 RCYBP in the middle of the Locarno Period. This supports the Locarno-like nature of this component.

The question of a possible non-Locarno but Locarno-related culture present between the southern Gulf of Georgia Locarno area and the Obsidian culture in the Queen Charlotte strait region can now be answered negatively. Since the Courtenay sites fit so well with the southern Gulf of Georgia Locarno sites,

they must be considered to be good members of this culture. Given the relatively short distance (circa 150 km) between Courtenay and the known Obsidian culture sites in the Queen Charlotte Strait (Figure XII-1: O'Connor, Bear Cove, and Echo Bay) it is unlikely that a third culture lies between the two. Similarly, no obvious clinal variation shading into the Obsidian culture exists going up the east coast of Vancouver Island.

Given the support for Mitchell's (1988b) judgement for the classification of Millard Creek and Puddleduck as Locarno, one would expect that Tsable River Bridge site (Wigen 1980) and Buckley Bay (Mitchell 1974; Wigen 1980) would also be classified as Locarno. However, in the absence of the kind of available detailed description to carry out the kind of analysis with other sites, such a classification needs to be qualified. The four radiocarbon dates for the Locarno components (Wigen 1980) from these sites are all on shell. Uncorrected, the dates fit well within the expected 2400 to 3300 RCYBP period, but when corrected according to the procedure suggested by Robinson and Thompson (1981:53), they become 2230± 90 and 2360± 90 RCYBP for Buckley Bay and 2650± 110 and 2810± 140 RCYBP for Tsable River Bridge. Thus, Buckley Bay appears to date more recently than any other accepted Locarno component when corrected, and the Tsable River Bridge to the later portions of the usual Locarno period. Taylor (1987:126-132), however, shows that there can be a lot of variation in shell dates within very small areas, so that for individual samples the corrections can be too large or too small. With this in mind, the shell dates from these two components might be best thought of as indicating an approximate Locarno date for them and leaving it at that.

An additional Locarno component (CBTI) can also be seen in Figure XII-8, that of the Trench I excavations by Trace (1981) at Crescent Beach. Trace excavated two trenches at Crescent Beach. Trench 2 produced the layers of shellfish and hearths expected, but Trench 1 had most of its depth filled with a relatively homogeneous material that was suspected of being back fill from an drainage ditch. Three of the four dates, however, came from this trench. Furthermore, if the single date from Trench 2 was valid, most of its layers were post-Locarno. In addition, the assemblage from Trench 2 was smaller than Trench 1. For these reasons I chose to use the material from Trench 1. In a cluster analysis (not illustrated) it linked with Crescent Beach II at 0.0155 and on the first two dimensions of the scaling was immediately adjacent to Belcarra Park I, and very near to Crescent Beach II. These observations support Trace's (1981) assigning his material to the Locarno Beach phase, although the context of much the Trench I material may still be in doubt, i.e., whether it has been disturbed in recent historical activity, or still as laid down during the Locarno culture.

Despite the relatively long distance from the type site of Locarno Beach, these northern Gulf of Georgia sites are good members of this culture. We will see that the situation is somewhat different to the south. Given the relative homogeneity of Locarno Beach to the north, is it too much to suggest that these Locarno Beach makers spoke Salishan languages? Perishables, such as found at DhRt 4, would be more definitive than the patterns shown here.

In addition to the above sites, three more distant sites exist that appear to be related to Locarno. At Hoko River (Croes 1995; Croes and Blinman 1980) a component with Locarno dates and many similarities with the Locarno component is present, but the basketry is distinctly different from that found at MuNE (DhRt 4), indicative of a different ethnicity (Poulsen 2001). Croes and Hackenberger (1988) suggest that an economic adaptation exists at this time across a larger part of the Northwest Coast, which they term a plateau, and that different ethnic groups would participate within it. From this perspective, all the previously discussed Locarno Beach components would have been "Salish". It is unclear, though, that any other Locarno components belong to the Hoko ethnic group, although recently several candidates have appeared. First, is the results of a salvage project at Little Beach, near Ucluelet (Figure XII-1), on the west coast of Vancouver Island (Arcas 1991). Although an intact assemblage was not really recovered, a number

of likely dates, a labret, a leaf shaped point, a fragment of a facetted ground stone point, a possible ground slate knife fragment, and cairn burials were present, all items found in the Locarno culture and heretofore unknown in this area. Although it is hard to relate the dates (Table XII-2) with any particular cultural material, they clearly include the time of the Locarno culture. More recently, McMillan (1999, 2003) has reported a similar component at Ch'uumat'a (DfSi 4), in Barkley sound, just south of Ucluelet, the sound into which Alberni Inlet empties. The oldest material here has similarities with both Locarno and St. Mungo, perhaps pointing to the presence of both these cultures on the west coast of Vancouver Island. Thus, we have good evidence of a wide-spread Locarno-like culture present in Nuu-chah-nulth or Nootka territory, including to Hoko River, on the south side of the Strait of San Juan de Fuca. Further work, though, is necessary before we can determine the exact relationship of these new finds to the Locarno culture in the Gulf of Georgia region.

Croes (1987;1995) has argued on the basis of similarities in basketry with Ozette that Hoko River is probably Nootkan; that is ancestral to Makah. Poulsen (2001) points out that the similarities between Ozette and Hoko River are actually not very large, although the 2500 years between Ozette and Hoko River may explain that. She also agrees that the differences between Hoko River and DhRt 4, at only a few hundred years difference in age, are significant. Poulsen suggests on the basis of both linguistic and archaeological evidence (McMillan 1999; 2003) that the Nootkan speakers crossed the Strait of San Juan de Fuca only after Locarno times, and that the makers of the Hoko River were more apt to be Chimakuan speakers than Nootkan. Chimakuan is an isolated language family, represented by two languages, Chimakuan and Quileute, both on the Olympic peninsula (Thompson and Kinkade 1990). Kinkade (1991:151) indicates the language differences supports that, while now separated, they were once closer together, and have become separated by another language group. Foster (1996) reports a lexicostatistic estimate for the separation of 2100 years. Given, according to current information, if this separation was caused by Nootkan speakers, this event happened after Locarno Beach, Hoko River would probably be Chimakuan. Today, Clallam is along the northern coast of the Strait of San Juan de Fuca, making them another possibility for both splitting the Chimakuan languages and for being the makers of Hoko River perishables. Given the very significant differences between Hoko River basketry and DhRt 4, I doubt that the Hoko River was any kind of Salish, particularly in view of that most of the differences within the speakers of Salish languages is likely to have occurred since the beginning of the Locarno Beach culture.

Having turned to the north and west of the central Gulf of Georgia, we now turn to the south. the components of interest here are the Dry old component from Hoko River, the second from the West Point site (Larson and Lewarch 1995), Component II 45CA426 at Sequim (Morgan 1999), and sites 45SJ165 and 169 on Decatur Island. All five of these are well dated to Locarno times, and 45CA426, 45SJ169, and the second component at West Point have well described components of sufficient size to compare using the techniques used above. Unfortunately Sequim and Component II at West Point have very few bone and antler tools making this kind of comparison doubtful, even though their chipped stone components are quite large. The part of the Hoko River complex that has a traditional artifact complex, the Dry site area, has almost no bone or antler tools, and very large numbers of only a few categories and so this sort of analysis was not attempted. Croes (1995:226-227) reports on a presence-absence cluster analysis based on Matson (1974a) which shows that this component links to other Locarno Beach sites, with the closest match to Montague Harbour I. I reran his data set as metric multidimensional scaling using Jaccard's distance, and Hoko River is found in the middle of other Locarno Beach components in the plot based on the first and second dimensions (not shown), with Helen Point being the most distant Locarno site. These presence-absence analyses are probably about as definitive as classification that can be done with this apparently highly specialized component. These findings supports the conclusion of Croes (1995) and Mitchell (1982)

that this Hoko River component has it highest similarities to Locarno Beach.

On Decatur Island, site 45SJ165 does not have a large enough "Locarno" component to use these quantitative techniques, although the excavations of Walker (2003) and Bard et al. (2007) have recovered enough "diagnostics" that, along with the numerous radiocarbon dates, to make this very likely. Its final assignment ought to be based on 45SJ159, as if that is definite Locarno Beach, that would demonstrate Locarno Beach is present that far south in the Puget Sound and would make it clear that 45SJ165 is also a member of the Locarno Beach culture.

Figure XII-9 is the first two dimensions of a metric multidimensional scaling showing many of the sites previously established as good Locarno Beach, and the more recently reported sites of Sequim, West Point 2, and Decatur Island 45SJ169, Locarno Component, and five sites previous established as belonging to the Old Musqueam Marpole subphase. These latter are from Burley (1980:46-48) with the main exception that the first lithic category "Flake Edge Tool" does not include utilized flakes, unlike the definition provided by Burley (1980:49) as I have elsewhere limited this attribute to "Retouched Flakes". Unlike previous plots, based on Euclidean distances, this one is based on Chord distances (Overpeck et al. 1985; Hammer and Harper 2006; Hart and Matson 2009), a measure which is thought to be superior when the abundance information varies from small to large proportions, as is true in the present case. This plot thus includes St. Mungo and Old Musqueam Marpole components, other cultures these potential southern Locarno components might belong to. Note that the "Gulf Island" variant of Locarno Beach is represented only by

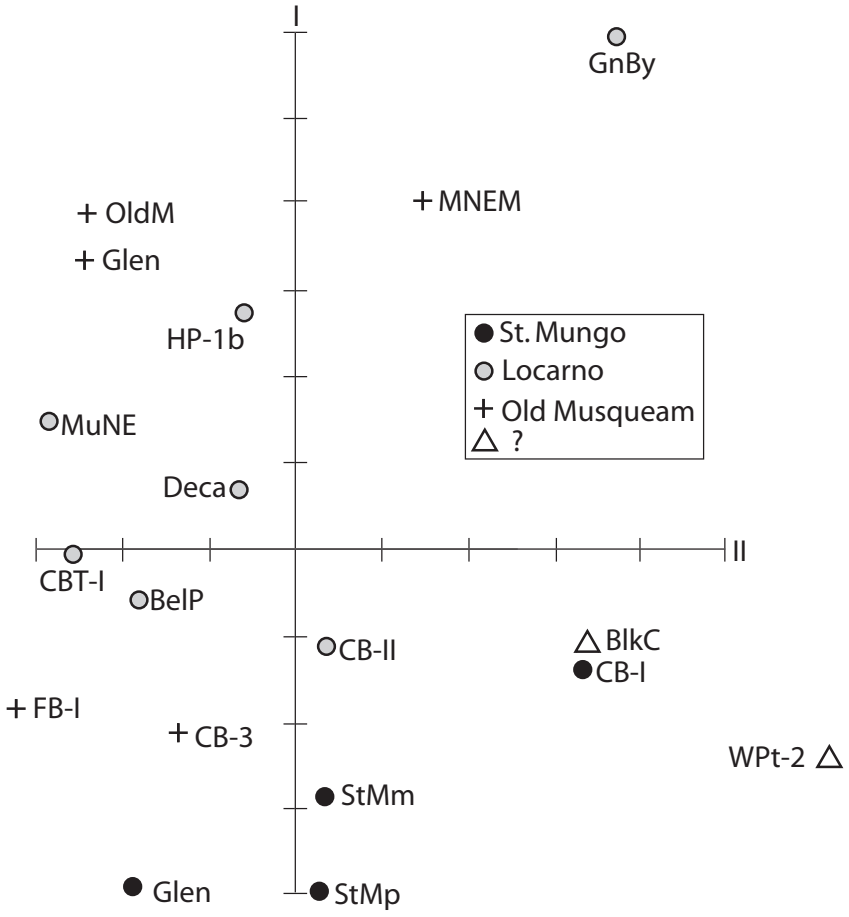

Figure XII-9. Metric MDS, Southern Locarno sites and Old Musqueam sites, Chord distances, based on artifact percentages. Dimension I, 24%, II, 23% of trace.

Garrison Bay (GnBy). These (mainly Montague Harbour I and Georgeson Bay) always turned out to be outliers in these analyses and more recently reported excavations did not seem to be very similar to them.

Since Decatur Island 45SJ169 is a good Locarno Component according to these results, we can remove any questions about 45SJ165 not also being one. If we add Sequim to Figure XII-9, it appears to be an outlier, but must be within the geographical range of Locarno Beach Culture, if we accept both Decatur Island and Hoko River as Locarno Beach. Given the presence of artifact types at Sequim often thought of as Locarno Beach diagnostics, contracting stem points, quartz crystal microblades, bar abraders, hand stones, composite toggling harpoon, bone chisel/wedge, and numerous (7) hexagonal cross-section ground stone points and the very clear radiocarbon dates, I don't think this assignment is in doubt. Given that this site is inland, although only 4 kilometers, and thus the usual shellmidden is absent, with the (resulting?) very small bone and antler assemblage, that it looks different from other Locarno Beach components shown in Figure XII-9 when it is included is not unexpected.

West Point component 2 is seen as even more aberrant as a Locarno Beach component in Figure XII-9. Even though this component is very well described and has a large set of faunal remains also very well described that clearly complement those of the Crescent Beach Locarno Beach Component, it is unclear that it can be assigned to the Locarno Beach culture. It is of the same age, it has the same adaptation, it is similar (including the presence of a labret), but given it is well beyond the geographical range of components definitely identified as Locarno Beach, it may well be a member of a heretofore unrecognized similar but distinct culture. Additional components of this age need to be excavated well south into Puget Sound before this question can be resolved. West Point 2 may also be just a Locarno Beach component with an unusual amount of chipped stone, including cobble tools. This ambiguous positioning is interesting, in that the earlier West Point component 1 was classed as a good member of the St. Mungo culture by a similar analysis carried out by the investigators (Larson and Lewarch 1995).

Turning to the Old Musqueam Components on Figure XII-9 (most codes are in Table XII-3), in general they are located on the opposite part of the plot from the St. Mungo components, with the Locarno Beach components distributed between the two, showing a temporal trend. Two of the five Old Musqueam components, though, appear to be located out of place, within the Locarno Beach components. Fossil Bay I (FB-I on Figure XII-9) is consistently located in such a position when scaled with a similar mixture of sites. Whether this undated component should be considered to be Locarno Beach or Marpole, or a mixture of the two, has always been an issue. This analysis indicates these questions should continue to remain. Crescent Beach 3 (CB-3) tends to move around more, but is located on Figure XII-9 more as an early Locarno Beach component rather than a Marpole component. I wondered if we just used the material recovered in 1989 and 1990 what the results would be, but this very small assemblage (only 23 items fit in the 55 artifact classes) also appeared to be too "old". Inspection shows that both sets of Crescent Beach "Marpole" components have very large numbers chipped stone assemblages and corresponding low numbers of bone and antler artifacts. The presence of a separate culture, the Old Musqueam subphase of Marpole is clearly indicated by this analysis, although doubts about the classification of Fossil Bay I should certainly continue and questions about the "Marpole" component at Crescent Beach are definitely raised.

It is interesting that acceptable radiocarbon dates exist for only the three clear members of the Old Musqueam subphase on Figure XII-9 (plus Whalen Farm). But it is these dates that give us the best termination dates for the Locarno Beach culture, since these three sites are clearly different from other mainland Locarno Beach components, and have slightly later dates, as given in Table XII-3. Three of the Glenrose Marpole dates are clearly in the Marpole component and range from 2030 to 2310 RCYBP. Between the Marpole component and the next one at Glenrose, the St. Mungo component is a layer of "tan silty clay-loam" which corresponds to the gap in radiocarbon dates of a thousand years and the lack of

Locarno Beach at Glenrose (Matson 1976:9-14). This material was not sterile, but had very little material compared with layers above and below it, varied from 15 to 40 cm in thickness and was interpreted as corresponding to a hiatus in occupation of about 1000 years (Matson 1976: 11). In our analyses we included this layer within the Marpole component, but clearly an argument can be made that it should be excluded, as being before Glenrose was re-occupied in Marpole times. The oldest date from the Glenrose Marpole component 2340 ± 115 RCYBP (S-790 [NMC-615]) is actually from the upper portion of the "tan silty clay-loam" so actually may be before the Marpole re-occupation took place. It is equally likely that it is from the beginning of the re-occupation that became incorporated in the top part of this intervening layer. The dates from DhRt 3, "Old Musqueam" are indistinguishable from those at Glenrose supporting this date range of 2300-2000 RCYBP for this Marpole subphase. Although we do not have a direct date on the Marpole component at DhRt 4, Musqueam Northeast, there is a date (Table XII-3) from the top portion of the Locarno component, indicating that the beginning of the Marpole component there is less than 2500 RCYBP, providing some additional support of this dating for the Old Musqueam subphase. In any event, just as the Block C dates confirm that Locarno Beach began by 3300-3400 RCYBP, depending on ones interpretation of this component, early Locarno Beach, or terminal St. Mungo becoming Locarno Beach, supporting inferences based on dates from clear Locarno Beach culture components, the Old Musqueam dates show that the Locarno Beach culture had been replaced by early Marpole by 2300 RCYBP.

Table XII-3 Old Musqueam Marpole Subphase Radiocarbon Dates.

Site	Date (RCYBP)	Lab No.	Code in Fig. XII-9	Reference
Glenrose Marpole	2310 + 105	Gak 4646	GLEN	Matson 1976:18
Component	2030 + 95	Gak 4647		Matson 1976:18
	2300 + 70	S-787(NMC-612)		Burley 1980, This Volume (here)
	2340 + 115	S-790(NMC-615)		Burley 1980, This Volume (here)
Musqueam NE (DhRt 4)	2550 + 85	I-7790	MNEM	Borden 1976
Top of Locarno Component (Layer A1)				
Old Musqueam (DhRt3)	2350 + 80	Gak 1283	MuNE	Wilmeth 1978:76
	1910 + 80	Gak 5137		Monks 1976:267
Whalen Farm	2110 ± 65	WSU 4340		This Volume
	2360 ± 120	Beta 14123		Hammon 1986:4
	2100 ± 70	Beta 14124		Hammon 1985:97, 1986
	2060 ± 110	Beta 14125		Hammon 1986:4

What can we say about the nature of the artifact assemblages found in Locarno Beach components as indicated in this long series of comparisons, including earlier and later cultures? On the mainland of British Columbia there is a clear evolutionary trajectory from the St. Mungo components found at Glenrose, St. Mungo, and Crescent Beach sites to Locarno and from Locarno to the Old Musqueam subphase. This gradual transition is illustrated by the faunal remains at Crescent Beach, and the Block C component at the St. Mungo site (Ham et al. 1986) which is very well dated and separate from the other St. Mungo components, and is clearly transitional between St. Mungo and Locarno, however it is classified. At the other end, the Old Musqueam component at Crescent Beach is difficult to separate from the Locarno Beach component, even though both Percy (1974) and our analyses of the 1989/1990 excavations believed there was a cultural change.

In contrast, the Gulf Island components appear to be very different from mainland Locarno components when analyzed in the same manner. The differences appear to be larger between mainland and island than between mainland Locarno components and St. Mungo or early Marpole components! The "Locarno-ness" of both sets of components is confirmed by the same set of distinctive, but usually uncommon artifact types, labrets, hexagonal ground slate points, Gulf Island Complex items, microblades and/or quartz crystal microliths, composite toggling harpoon valves and shaped/decorated abrasive stones. A sharp contrast between island and mainland variants of the same Gulf of Georgia culture was first identified by Burley (1979,1980) who demonstrated this in his ground-breaking analysis of Marpole culture. The re-analysis by Matson et al. (1980; Matson and Coupland 1995:211-225) confirmed this strong contrast. The current analysis shows this is equally true for the earlier Locarno Beach culture.

For the Locarno culture, though, questions exist about the reality of this separation. In many ways the differences between the island and mainland variants look like the differences between modern and the original Borden excavations, i.e., the much smaller numbers of lithics in the earlier excavations. And it is certainly true that the three Gulf Island Locarno components that are at the centre of this contrast, Montague Harbour I, Georgeson Bay, and the Helen Point component reported by McMurdo (1974) were all excavated in the 1960s, prior to the important wave of greater understanding of chipped stone material resulting from the contributions of Don Crabtree and Francois Bordes. So the contrast is likely at least partially the result of the age of the excavations. It is also true that there are generally less lithic resources available on the islands, so the setting results in a more conservative use of lithics. Do these two facts explain the Locarno mainland/island contrast? That remains to determined. What is clear, is that the best published description of a Locarno component, that of Mitchell's (1971) is a very misleading guide if applied to modern mainland excavations, or even to those on Decatur Island.

In the previous analysis I have referred to positions on dimensions and to some general statements about the amount of lithics, bone and antler tools, but have rarely referred to specific artifact types except when justifying components as Locarno when the scaling results are not conclusive. What are the specific differences between Locarno and St. Mungo? Locarno Mainland and Island? With Marpole? And specifically, with the Old Marpole subphase (Clark 2000)?

The results of such comparisons are dependent on which components are selected for the comparisons. Because of the lack of non-mainland St. Mungo components or their equivalent, our first comparison is limited between Mainland components. So, it is the sites of Glenrose, St. Mungo and Crescent Beach, for St. Mungo, and Crescent Beach, Marpole 1, Belcarra Park, and DhRt 4 (Musqueam NE) that are used. Given the irregularity of reportage, I am using the median value (in this case the average of the 2 nd and 3 rd values when ranked) for each sample of four. For chipped stone, the retouched flake tools have a median of 32 % in St. Mungo compared to 23.5 % in these Locarno components, although there is overlap in frequencies. The chipped slate disks are found only in the Locarno components (3 of the 4) although the medians are 0% and 2 %. The presences of Pieces Esquilles are more common in St. Mungo components with a median of 7%, and present in only one of the four Locarno components (median of 0%). The final chipped stone category of this 55 attribute list is that of formed bifaces, which are not found in these St. Mungo components, although they are found in all four Locarno components, with a modest median occurrence of 2%. That more lithics are present in St. Mungo is expected, and that the chipped slate disks, sometimes thought to be ground slate knife preforms, would be more common in Locarno, is also expected. The other two categories were a surprise to me. One would expect that microblades would also be in this list, but only Marpole I among these Locarno sites had "formal" microblades, although we have argued that the quartz microliths found in other Locarno components had the same function. A few quartz microliths are found in some St. Mungo components, but not in similar frequencies as in Locarno components.

Turning to ground stone categories, no stemmed points were present in St. Mungo, but they were in these Locarno components, albeit at a median occurrence of 0.5%. Facetted ground stone points, long a hall mark of Locarno, are not found in these St. Mungo components (or in any component of this age that I am aware of), but occur, sometimes in numbers up to 14%, in the Locarno, although again with a median frequency of only 0.5 %. Ground Stone celts would be expected to occur only in Locarno, and such is the case, although again with a low median frequency of only 1%. Labrets, again would be expected only in Locarno, and such is the case, but with a median occurrence of 0.0%, and occurring in only two of the four components. As far as I know, labrets have not been found in good context in St. Mungo-aged contexts. The best case for a St. Mungo labret is in West Point 1, where one was found in a shell sample later analyzed (Larson and Lewarch 1995:11-10). The dates for West Point 1 range from 3700 $\pm$ 70 (Beta 58026) to 3390 $\pm$ 60 (Beta 58032) RCYBP (Larson and Lewarch 1995:6-5), so this may be no older than the one located in Component C at St. Mungo, the transitional/early Locarno component. Shaped abrasive stones are more common in Locarno with a median occurrence of 3% compared to 0%. Irregular abrasive stones show a similar distribution of 2.5% in St. Mungo, compared to 10.5% in Locarno. Ground Stone Knife fragments are much more common in Locarno components than in St. Mungo, with none present in St. Mungo, and found in three of the four Locarno components, at a median occurrence of 5%. It is not a surprise that all the differences in ground stone are in the order of higher frequencies in the Locarno culture.

As an aside, Cybulski (1991) reports on labret wear on a mandible from the Pender Canal site, that is dated to 5100 RCYBP. This date is on the same human remains, but is not corrected for the marine reservoir effects which means that the correct date to compare with other radiocarbon dates (as discussed below) is some hundred of years less than 5100 RCYBP, but still much older than any known dated labret. The nature of labrets at this very early age is unclear, or even if something else was producing wear identical to that produced by labrets. The next earliest good dated labret wear is from the Tswwassen site, report by J. Curtin (1991:81-83, 1999a:55), burial D-48, 3500 $\pm$ 60 RCYBP, from human bone (Beta 39228), said to be St. Mungo on the basis of this date. Again, this date apparently is not corrected for the Marine reservoir effects and thus dates later than this. This problem can be very serious in dating human remains, although, like most of my colleagues, I was ignorant of this problem until very recently. I turn to making an estimate of the corrected date.

The Marine reservoir effect has two main components, the average difference between carbon in the ocean and in the air, and local effects. Immediately prebomb, both components are each about 400 years (Taylor 1987, Deo et al. 2004, Robinson and Thompson 1981) for the Puget Sound, Gulf of Georgia region. Thus a date on marine material in the last few hundred years would be approximately 800 years too old. The average component is known to change over time, going from about 400 years now to about 200 years, 3000 years ago (Stuiver and Braziunas 1993). Deo et al. (2004) argue that their data indicates that the regional component remains about 400 years between 1200 and 3000 calendar years ago, although Southon et al. (1990) present evidence that it is probably more like 500 or 600 years 3000-4000 years ago. On the face of this it appears that dates based on marine material that is 3000 years old would produce dates 600-800 years too old. However, the dates are on human collagen, where the carbon is derived from a mixture of both marine and terrestrial sources.

Fortunately, Brian Chisholm (1986, 2008) has made estimates of the marine contribution for many coastal human remains, including this one (Chisholm 1999:287). That we have an estimate on this individual is actually not too important, as Chisholm's results show relatively little variation over the last 4000 years for Northwest Coast burials. The actual measurement on D-48 is -12.2 δ which indicates 100% of the protein comes from a marine source. The estimated precision is 10% on this measurement (Chisholm 1999:282). So, according to this estimate, between 600 and 800 years should be subtracted from this date, let

us call this 700 years for a date of 2800 (3500-700) RCYBP with a precision of the square root of (60^2 + 70^2) or ±92 years (Taylor 1982:54), a middle Locarno date.

Another poorly preserved burial, D-16, has a single tooth (of the total of five teeth recovered) with a labret wear "facet" (Curtin 1991:219, 1999a:55) and an even older date, 3800 ± 60 RCYBP (Beta 39354). This burial also had thousands of ground stone and shell beads. Chisholm also has a measurement of the 13C ratio for this burial of -13.8 δ, which indicates about 85% of the protein is from marine sources. In this case we would multiple 0.85 by our reservoir estimate of 700 years giving a correction factor of 595 (.85 x 700). This results in a reservoir corrected date of 3205 ± 85 RCYBP, using the same procedure (square root of [60^2 + 59.5^2]) as above, but with different numbers, still well within other dates attributed to the Locarno phase.

One can actually use this procedure without the individual remains having isotope analyses made by Chisholm. One could use 85% marine protein (Chisholm 1999:284) which is the average for coastal, but not island, burials, as Chisholm (1986, 2008) has shown almost all coastal burials within the last 4000 years do not vary far from this figure (and this is apparently was Cybulski used in his redating in Chapter XI). This would result in a subtraction of 595 (.85 x 700) years for a date of 2905 ± 84 RCYBP for D-48, and the identical results for D-16. One is left with the impression, though, that the true uncertainties are somewhat higher than indicated by these figures.

An additional, complicating factor, is that these Tswwassen dates were not isotopically corrected. Thanks to R. Brolly who dug up the original Beta dating reports, the absence of isotopic correction on these dates is very certain. Isotopic corrections adds about 16 years for every mil less than -25 δ (Taylor 1987: 122). Since this step was not taken, about 200 years need to be added to the D-48 estimate, making it 3000 ± 92 RCYBP, still clearly within the Locarno time period, and 176 years to the D-16 estimate, making it 3381 ± 85 RCYBP, right at the beginning of accepted Locarno dates.

In any event, projects, such as the Tswwassen and the Pender Canal investigations, that relied heavily on dates from bones need to have their dates re-examined as the "true" dates are likely some hundreds of years later than indicated. From my inspection, I do not think that many basic discoveries will be overturned, but some aspects such as this apparently surprising early labret wear at Tswwassen will need to be rethought. The differences between the "Marine Reservoir Corrected" dates given here and those by Cybulski in Chapter XI demonstrate that this procedure can give different results. I now return back to the artifact analysis.

One of the four artifact types I added to Burley's list, is incised schist or slate, often thought to be in the ground stone category, although grinding is not really a conspicuous part of technology. This is a artifact type thought to be diagnostic of St. Mungo components, and is present at a median of 1% in these four components, and not found in any of the four Locarno components. Among the pecked stone, hammerstones do appear to be more common in Locarno Beach, with a median occurrence of 6% compared to only 2.5% in St. Mungo.

Turning to bone and antler artifacts, although many of these are very distinctive, they typically occurred in only small numbers and so fewer showed up in this tabulation than one might expect, and several of those that do, are forms not limited to a single culture. Mammal bone awls are actually more common in St. Mungo, at a median occurrence of 11.5% compared to 2.4% in Locarno, although overlap in abundance is present. Bone chisel/wedges, a categories reviewed in some depth in Pratt (1992) as well as in Chapter V, are also more frequent in St. Mungo, with a median of 9.5% compared to 2 percent in Locarno. Ulna awls show a weak trend the other way, with a Locarno median occurrence of 0.5% compared to a St. Mungo of 0.0%. Both incisor tools (typically beaver incisors) and ground tooth pendants have a median occurrence of 0.5% in St. Mungo, compared to 0.0% in these four Locarno components. Perforated bone

pendants are a diagnostic type for St. Mungo and occur at a median rate of 1% and are absent in these Locarno components. Antler wedges appear to be more common in St. Mungo (7%) than in Locarno (2%). Composite toggle harpoons and valves are a diagnostic of Locarno and Late periods, and occur at a median rate of 0.5% in Locarno and are absent in the St. Mungo components. Finally bilaterally barbed harpoons are thought to be diagnostic of St. Mungo (or Charles) times, yet occur in too low quantities to show up in this procedure. They are present in all four St. Mungo components and a single example is also found in Marpole I.

The easy assumption that there would be more chipped stone in St. Mungo, and more ground stone, antler and bone artifacts in Locarno Beach is both true and covers up a number of trends going the other way. The actual developments are complicated, and at this time, little understood. Looking at Block C of St. Mungo (Ham et al. 1986) in terms of the trends noted above, shows that it is in most ways transitional, as might be expected of a Locarno component whose end date is about 3300 RCYBP. It has a lower amount of retouched flakes than any St. Mungo component, more formed bifaces than any, a ground stone celt (absent in St. Mungo), a labret, shaped abrasive stones, mammal bone awls and chisels/wedges in intermediate amounts, an ulna awl, and a single perforated bone pendant. The last is the only item that is distinctive St. Mungo, compared to the labret, celt, and ulna awls. These characteristics support the earlier placement of this component as Locarno, rather than St. Mungo, although it is clearly distinctive. The absence of toggling harpoon valves, facetted ground stone points, and ground slate knives in this component (and their absence in a number of other Locarno components which do not have the very precise dating present for Block C) suggests that these items were not present at the beginning of the Locarno culture, but instead begin to occur after about 3000 RCYBP.

Turning to the Mainland/Island contrast, I made two alternative arrangements, treating the contrast literally, with DhRt 4, Crescent Beach, and Belcarra Park representing the mainland Locarno sites, and with Montague Harbour, Helen Point, and Garrison Bay, the Islands – this was the source of the original contrast – and adding Decatur Island to the "mainland" and Marpole I to the "islands" as that is how these two sites grouped in later analyses. There were only a few differences when the alternative was used; I will refer to those I thought might be significant below. Remembering that the initial understanding of the difference was in the greater chipped stone items on the mainland sites, this is confirmed as by far the most important contrast with the mainland having a median of 23.5% of retouched flakes compared to only 8% of the islands with the minimum of the mainland 23% and the maximum of the four island components 9%. The other large contrast is the abundance of chipped slate disks on the islands, with a median of 14%, compared to one of 1 or 2% depending on which version of the Mainland sample one used.

Four other contrasts were also noted, but very faint when compared to the retouched flakes and chipped slate disks. First microblades are more abundant on the islands at 3 or 4% compared to 0% for Mainland sites. Again, with microliths being likely functional equivalents of microblades, this difference is probably not very important, but it is interesting that Decatur Island has 10% microblades. Gulf Island Complex items are also more common on the Islands with a median abundance of 4.5 or 6% depending on how one calculates it, compared to 1 or 2% for Mainland sites. Of all the components, Decatur Island had the highest frequency, 13%, suggesting that this is also something limited to the Islands. Hammerstones have a median Mainland occurrence of 6% compared to 1 or 1.5% for the Islands, an occurrence suggestive that it is related to the more abundant chipped stone. The final items is bone chisels/wedges, which have a median occurrence of 2 to 3.5 % on the Mainland compared to 0.5 or 1% on the Islands. In conclusion, the chipped stone is the largest contrast, with the questions raised about its reality continuing, but the chipped slate disks also being important. Microblades, Gulf Island Complex items, as well as microblades are more common on the Islands, while bone chisels/wedges and hammerstones more common on the Mainland.

Another "Island vs Mainland" contrast would be to contrast the northern Vancouver island Locarno components with the four mainland ones. Since the northern Gulf of Georgia sites were both investigated and reported more recently, some of the questions raised above may be reduced. Here I used Millard Creek and the Puddleduck Locarno components to represent the northern Gulf of Georgia material. The two largest contrasts remained the same, the retouched flakes being more abundant on the Mainland, and chipped slate disks on the Island, but not of the same order. Although the percentages did not overlap for the retouched flakes, the medians were barely different, at 23.5% and 19.5%. In contrast, the chipped slate disks difference remained large, with the highest occurrence in the Mainland at 2%, compared with 6 and 31% at the Island sites, and with medians of 1% and 18.5%. Microblades continue to be more common on the Island, with a median of 0%, the highest occurrence of 10% (on Decatur Island) and 6 and 14 % in the northern Gulf of Georgia. Five other artifact classes appear to differ, with Hammerstones (6% -1%) Bone Chisel/Wedges (3.5%-0.0%), Toggle Harpoons (1%-0.0%), Antler Wedges (2%-0.0%) and Ground Slate Knives (2% -0.0%) all having higher median occurrences in the Mainland group than in this Island pair. These repeat those items in the previous paragraph with the addition of the Antler Wedges, and the absence of Gulf Island Complex items.

The last comparison is with the Old Musqueam subphase of the Marpole culture. The previous analysis has cast doubt on two of the members of this group, Fossil Bay I, which has always been the most questionable member, and surprisingly, Crescent Beach III, no matter how defined. This leaves the three best dated members, Old Musqueam, and the Marpole components at DhRt 4 (MuNE) and Glenrose that were used in the above analyses and the components from Whalen Farm (Chapter X and Hammon 1985,1986). I chose to use the four "mainland" components discussed above to compare with them, as all three of these Old Musqueam members are also mainland. Since Clark (2000) has suggested that this subphase should be linked with Willow Beach and Bowker Creek and all considered a Locarno variant, rather than a Marpole variant, close attention will be paid to attributes considered to be typical of Marpole.

As expected, the retouched flake category is higher among the Locarno components. Although there is no overlap in this category, the medians are only slightly difference, 21% and 23.5%. Pieces Esquilles are surprisingly more common in the Old Musqueam components, by a median of 5% to 0.0%. More predictably, chopping tools are more common in the Locarno components (3% to 0.0%). Expanding stem points, a Marpole marker, have a median occurrence of 1% in the Old Musqueam, compared to a total absence in the Locarno sites. Formed Bifaces, on the other hand, continue their unexpected trait of being a Locarno maker, with a median of 2% compared to 0.0%. Stemless ground stone points, on the other hand, have a median frequency of 1% in the Old Musqueam components compared to 0.0 % in these four Locarno assemblages. Although I can find no statement that these are typical Marpole artifacts, they appear to be so on the basis of Burley's tabulation (1980:47) where he reports a total of 52. Celts are present at a median of 3% in the Old Musqueam, compared to 0.0% in the Locarno, an expected trend. Shaped abrasives, a Locarno trait, are more abundant in the Locarno components at 1%, compared to 0.0% in the Marpole variant. Hammerstones are also more common in the Locarno at 6%, compared to only 2%. Mammal bone awls are listed by Mitchell (1990) as a Marpole characteristic and are found at 3% in these Marpole sites, compared to 1% in the Locarno. Needles, listed by Mitchell (1971) and Borden (1970) as Marpole traits, occur at a rate of 1%, compared to 0.0% in the Locarno sites. Ulna awls have the opposite trend with 2% in the Locarno components versus 0.0% in the Marpole. So this artifact type appears to be more common in Locarno than in earlier or later cultures. One of the best known markers of Locarno are toggling harpoons, including composite forms, and in this set of Locarno components they occurred at a 1% rate, and are absent in the three Old Musqueam components. The final character that is clearly different are the Ground Slate Knives, occurring at a 17% rate, almost all of these of the thin variety, while only found

at a median of 2% among the Locarno components. Abundant Ground Slate Knives is a definite Marpole trait.

The three Old Musqueam components have a number of traits typical of Marpole components, all being more abundant than in the Locarno comparison group. There are some differences that do not fit into this category, including the abundance of Pieces Esquilles, Formed Bifaces, and Ulna Awls. The first is surprisingly more abundant in the Old Musqueam components, while the other two can now be considered to heretofore unrecognized Locarno markers. The dates for these three components (Table XII-3) are later than the latest good Locarno dates, and even the corrected shell dates from Bowker Creek (if combined together) and the charcoal ones from Willow Beach. The last two sites are anomalous, but a better fit as Locarno, rather than grouping with the later, and clearly Marpole-like Old Musqueam components.

When I first recognized the Old Musqueam components I discussed with Donald Mitchell and Roy Carlson whether they might be considered a late Locarno variant instead. The advice I remember getting that they were better as Marpole components. In part this advice (and my decision) was surely based that four of the five I identified at that time had already a long history already in the literature as Marpole components, various ones cited by Matson (1974a), Borden (1970), Burley (1980), Matson (1976), Percy (1974) and elsewhere as Marpole components, to which I would add Matson and Coupland (1995) among more recent citations. One wants to have convincing reasons to go against the long line of citations and decisions. This recent examination does call into question the membership of Crescent Beach III, and even more Fossil Bay I, but ends up supporting the original treatment and dating of the presence of the Old Musqueam subphase of the Marpole culture. Thus we can conclude that Locarno Beach ends about 2400 RCYBP and is replaced by the Old Musqueam subphase of the Marpole culture over most of this area.

To summarize all these analyses, one finds a number of trends that can be interpreted in a number of ways. First, the presence of a distinct culture, the Locarno Beach, lying between the St. Mungo and the Old Musqueam subphase of the Marpole culture and dating from at least 3300 RCYBP and 2400 RCYBP has been abundantly verified. If one accepts the Block C component at St. Mungo as Locarno Beach, the beginning date must be very close to 3500 RCYBP, as is suggested by the investigations at Crescent Beach, and is the position taken here. If one looks at the mainland components, the transitions from St. Mungo to Locarno Beach, and to the Old Musqueam subphase are consistent with an in situ evolutionary progression. There appears to be little evidence for a population dislocation, although the type of evidence examined is not the most sensitive for this question. The existence of persistent differences between Island and Mainland assemblages, though, could lead one to a very different position. The Island forms are less similar to St. Mungo than the Mainland forms, and one can argue that this is consistent with the Island form being the origin of the Locarno Beach, and representing a different population. The Mainland forms would thus be developing out of St. Mungo influenced by the Island variety. This position is consistent with a model put forward by R. Carlson (1970) where the pre-Locarno culture is the "Mayne Phase" distinct from the St. Mungo in having labrets, microblades, and Ground Slate Knives. This question can not be settled until well described and dated "Mayne Phase" components, or other immediately pre-Locarno Island components are reported. At this point, I question whether they exist, as the original Helen Point Mayne Phase component, is now understood as a mixture of Locarno Beach and Mayne material (Carlson 1975), as originally a Locarno component was thought to be absent (Carlson 1970). The current Island dating is not abundant or secure enough to indicate that Locarno Beach there is either younger or older than Mainland forms.

The large differences in undiagnostic retouched flakes between Island and Mainland forms is probably the result changes in excavation and description as well as the result of a location with less lithic sources. The same much reduced lithics are also what we found in our re-analysis of the early excavations of Whalen

Farm and Locarno Beach and have been found before in this sorts of analysis (Matson 1974a). The slightly more recently investigated northern Gulf of Georgia Locarno assemblages have about the same frequency of these types as recent Mainland excavations. There remains the consistent differences of more chipped slate disks, and microblades, and lower numbers of bone wedges/chisels, hammerstones, and ground slate knives on Island components. I do not regard these as very significant, and believe we can group these Locarno sites together and consider both to be very likely made by speakers of Salish languages. The analyses reported above do not seem to allow for a culture between Locarno Beach and the Obsidian Culture, so Locarno Beach appears to extend from the northern tip of the Gulf of Georgia, down to the northern Puget sound, to Decatur Island at least, and possibly to Seattle. And all this I would see as Salish during this time.

The Hoko River material has already been discussed as likely non-Salish Chimakuan, and I don't think we have enough information to hazard a guess about the linguistic affiliation of the Locarno-like material on the west coast of Vancouver Island. Similarly, Component 2 at West Point, might well be either another culture or/and produced by another linguistic group. It is obvious that I am treating the Locarno Beach, much in the way suggested by Dale Croes and S. Hackenberger (1988), as more of an economic adaptation, than as a unit analogous with an ethnographic group.

Locarno Beach Subsistence

Turning to the Crescent Beach faunal remains, the main contrast is that the earlier St. Mungo material is much more diverse, indicative of a "broadscale" rather than a specialized economy. In St. Mungo times flatfish–starry flounder– were very important, before salmon became dominant. This change sounds very much like the pattern predicted by Croes and Hackenberger (1988). The possibility suggested by Croes and Matson that quartz crystal microliths were used to cut the tough skin of the starry flounders, also known as "grinders" and "emery wheels" is rejected. Instead, the microliths appear when salmon become dominant and when salmon head parts are no longer found in quantity. This is good evidence of salmon storage developing circa 3300-3500 RCYBP, perhaps our most important finding, which is perhaps best supported by the more recent investigations at West Point (Larson and Lewarch (1995) and Decatur Island (Walker 2003).

Given all that has been presented on the origins of salmon storage here, how does one take statements to the contrary, such as Carlson (1991) and Cannon and Yang (2006)? First, there has to be little doubt about the general widespread use of salmon storage in the Pacific Northwest by circa 3000 RCYBP (Chatters and Prentiss 2005). The large jump in number of Gulf of Georgia sites immediately after the St. Mungo times pointed out by Mitchell (1990) and the rapid spread of the interior Plateau Pithouse Tradition (Richards and Rousseau 1987), with the association of the dominance of salmon with the Locarno Culture (most fully reported here) leaves no other feasible explanation. As pointed out to me by G. Coupland (Per. Comm.) just the switch from flatfish and salmon to a very high dominance of salmon at a place like Crescent Beach, without any outstanding local access to salmon, can hardly have a likely alternative explanation, leaving aside the arguments about cranial remains as superfluous redundancy. The argument is not about stored salmon being widespread (just how widespread, is another issue) at this time, that appears to be accepted, but whether it was present well before then. In order to see exactly what the disagreement is, one needs to review these discussions in some detail.

Carlson (1991:118) states that "By 4,000 years ago the cultures of both the coast and interior Plateaux begin to look a lot like those of the ethnographic period." which on the next page is summarized "(1) a subsistence dominated by the procurement of marine animals with salmon as the most important single species....". These statements could be taken as indicating that the stored salmon economy was fully

developed shortly after 4000 RCYBP, which would be very close to evidence and interpretation presented in this research. In any event, it is not far off. Further on Carlson goes on to present what he sees as good evidence of "organization of society around the procurement, preservation, and storage of salmon" (1991:119). After some discussion of "early, abundant use of salmon" at Dalles, Namu, Kettle Falls, and Milliken (to which I would add Glenrose), prior to 5000 RCYBP, salmon use apparently without storage, Carlson (1991:119) turns to the Gore Creek individual, near Kamloops, as evidence of early interior salmon use, citing (Chisholm 1986). This individual is dated to 8250 RCYBP has a delta carbon 13 measurement of -19.4 mils (Chisholm 1986:87). This would lead to a reconstructed diet of -23.9 (Chisholm and Blake 2006) well within many B.C. terrestrial mammals measured by Chisholm (1986). This is the only statement in this section of Carlson's discussion that I would definitely disagree with.

The next section is the one where Carlson (1991:120-121) actually makes a claim for early (pre-3500 RCYBP) existence of the stored salmon economy and this is where the disagreement occurs. He cites two cases, Namu and burials from near Clinton as evidence on the basis of stable carbon measurements, which I turn to first. Two burials from EjRm 7 were dated at 4950 $\pm$ 170 RCYBP and had carbon 13 measurements of -17.2 and -17.1 mils (Chisholm 1986:87). These measurements are clear evidence of the use of marine protein in the diet, but not of the stored salmon economy. A quick review of Chisholm's other interior B.C. measurements shows that the total of 77 human results runs from -13.2 to an outlier of -23.9, with the central half (first quartile to third quartile) of the population being in a relatively narrow band of -15.7 to -16.6. Only 12 of the 77 measurements are more negative than the two from Clinton, and some of those are from areas without significant salmon resources, and some others must be people who spent their most of their lives in such areas. I agree that these two measurements cited by Carlson are clear evidence of the use of marine protein, anadromous fish, but far from typical of the Plateau Pithouse Tradition, and not evidence of an economy based on stored salmon, while a measurement of less negative than -16 certainly would be. If such measurements were the case, and not an unusual exception, the Plateau Pithouse Tradition would undoubtedly show a widespread extent well prior to 4000 RCYBP, rather than circa 3300 RCYBP.

In short the serious case (and disagreement) is the case for Namu, as presented in Carlson (1991), Cannon (1991) and Cannon and Yang (2006). Carlson's (1991:120) treatment in full is:

> The earliest assemblage with any bones is that dated between 6,500 and 5,000 years ago. Salmon bones are present at this time, but with less relative frequency than in later deposits. In the deposits dated between 5,000 and 4,200 years ago salmon outnumber all other species combined and reach their highest relative frequency, which persists throughout the later deposits at the site until at least 2,000 years ago when deposition ceased in that part of the deposit being analyzed. These data can be taken as evidence of the development of a salmon-based subsistence system at Namu by 4,200 years ago, and what was true at Namu should also be true up and down the coast.

Note that supporting evidence (cranial bones, seasonality, settlement pattern information) for this statement is not given. I now turn to comment on the implications of Carlson's statement.

First, such a pattern is not found by 4,200 RCYBP at the Fraser Delta, nor at Seattle (West Point site) where the stored salmon economy is later. That is not to say that this pattern is evidence that the stored salmon economy did not occur at Namu at this time, just as Clark (2000) has made a case for it occurring only in the last 1500 years on the southern Vancouver Island, a pattern predicted by Matson (1983) and Croes and Hackenberger (1988). In both of the these treatments it is postulated that the salmon economy

would spread to all such places it is possible with a set technology, and temporarily stop, and then move again as new technologies develop. Croes and Hackenberger (1988) treat Hoko River as a case in point, where until salmon trolling in the Strait of San Juan de Fuca developed that salmon would not be locally very important there. Be that as it may, I certainly did not expect Clark's (2000) results for Vancouver Island. The "spread of the salmon-based subsistence system" at 4,200 years ago up and down the coast did not take place. For the actual evidence at Namu, as opposed to the interpretative statement above, I turn to Cannon and Yang (2006).

Here the position is somewhat different than Carlson as Cannon believes that Namu was "fundamentally unchanged" from ca. 5000 cal. B.C., and was always "dependent on a storage-based economy focussed on the mass harvest of salmon" (Cannon and Yang 2006:126). Thus, unlike Carlson, Cannon believes this stage exists from ca. 6500 RCYBP, some 2000 plus years earlier than Carlson. The evidence for the stored salmon economy is 1) the presence of large amounts of salmon and herring and 2) the seasonality evidence which consists salmon, herring, and neonatal harbour seal (Cannon and Yang 2005:126-7). Cannon and Yang (2006:127) go so far as to state "If winter subsistence was also supported by reliance on stores of dried or smoked salmon, then clearly Namu was a major winter village, typical of those described ethnographically, from the date of the earliest faunal remains ca. 5000 cal. B.C." given that the seasonality indicators show some residence at the site "throughout much of the year." The last factor is supported by neonatal harbour seal remains indicating mid-June; salmon, summer/early autumn; and herring late winter/early spring. There is no discussion of any changes in distribution of the herring or neonatal harbour seal in this article although Cannon (1991:59; 100) earlier reported quite large changes.

Cannon and Yang (2006) differs from Cannon's (1991) treatment of identification of salmon in that previously Cannon had relied on radiographic of growth lines of salmon vertebrae, a dubious method in my opinion, an opinion now supported by the substantial different results from DNA analysis in Cannon and Yang (2006) and in material from Keatley Creek (Speller, Yang and Hayden 2005). Earlier, chum was thought to be almost exclusively the only salmon at Namu, but the DNA analysis shows that Pinks were dominant, with Chum and Sockeye in approximately equal numbers at about half the occurrence (Cannon and Yang 2006). Seeming unnoticed by Cannon and Yang (2006:131) in the deposits older than 4000 RCYBP fully two-thirds are pink, in contrast to the general pattern of half being pink and in contrast to their statement about the "consistency of the species profile over the past 7000 years" (Cannon and Yang 2006:135).

Cannon and Yang (2006:136) also argue in their discussion section that the "evidence is also sufficient to support de-coupling the advent of permanent multiseasonal settlements and storage-based economies from population growth and greater social differentiation" and that there is not at Namu or elsewhere evidence for a rapid expansion of population immediately following ca. 5000 B.C. So the development of the stored-salmon economy was, at least initially, a non-event in terms of population or social differentiation in their view. The amazing inconsistency of this statement with the ones cited above on p. 126 and 127, about the salmon storage economy always being present and the "If winter.." statement is not discussed. There, the full developed Northwest Coast pattern must be present if storage and a long duration occupation was present. If there is no population growth, as in this new position, none of the 'coupled implications' (my term) are true so a population of circa 30 people at Namu exists, with no rank, no specialization, nor much else of the ethnographic Northwest Coast. The absence of evidence of houses, limited activity sites, etc., but the presence of the stored salmon economy by 7000 years ago can all be explained by simultaneously taking both positions.

In needs to be stressed that there is a "lack of evidence for substantial structures at Namu" (Cannon 2002:316) so that the presence of a "winter village" is an inference based on seasonality indicators among the

faunal remains and the abundance of salmon (Cannon 2002). I would expect that most Northcoast archaeologists would define a Northwest coast "winter village" as including two or more multifamily plank structures regularly occupied for four or more months each winter. I doubt if Cannon has such a restrictive definition, but it is unclear what his definition would include.

Salmon have been used on the Northwest Coast for a long time. Undoubtedly some salmon have been processed for storage at very early times as well. It is when the economy based on stored salmon occurs that we see changes occurring in rapid progression. At Crescent Beach this subsistence change occurs 3500-3000 RCYBP and I have reviewed the abundant supporting evidence that this occurs elsewhere at about this time. Working at a salmon procurement location may be more difficult than elsewhere to discover when this occurred, as one would have salmon all through the record. At a place like Crescent Beach where that isn't the case, the shift to a way of life based on stored salmon may be all that more visible, as it is the change that is important. The pattern evident at Crescent Beach is not that was expected; I expected salmon storage later at the beginning of the Marpole culture (as per Cannon and Yang (2006) were not cultural complexity and salmon storage closely coupled?); when we first recognized we had a structure, I thought it was St. Mungo, when we found the articulated salmon vertebrae in Unit Isw, I thought we had a salmon processing location. Archaeology progresses by evaluating one's ideas with empirical evidence, not building cloud castles.

In Chapter VI I reviewed the evidence that the stored-salmon economy first occurred in Locarno-aged sites, including Crescent Beach. This is not the same as saying that all Locarno components were based on the stored-salmon economy, the question I turn to now. Most Locarno components do not have evidence to investigate this issue, and the ones reviewed earlier, that did, showed evidence of the stored salmon economy. There is one, the Pender Canal site, that appears to not show evidence of stored-salmon (Hanson 1990). Although Carlson and Hobler (1993) appear to indicate otherwise Hanson (1990) indicates that there is not a concentration of salmon remains of any sort in the Locarno components of either DeRt 1 and 2, the two adjacent sites that make up the Pender Canal site. Since Hanson's (1991) detailed analysis of the later components at DeRt 1, also showed a low amount of salmon there, it is unlikely that her inferences about earlier components are incorrect. This area (the Gulf Islands) is not one with abundant, easily available salmon remains; it is generally agreed that salmon obtained locally would only become an important part of the diet after the development of the reef net fishery , which may have occurred only within the last 1000 years (Easton 1990). Even though a significant portion of the later deposits analyzed by Hanson (1991) dated to the last 1000 years and there is an ethnographic reef net location on Pender Island, the expected numbers of salmon remains never appeared, although those present, were almost exclusively vertebrae elements (Hanson 1991:171).

There are at least two competing explanations for the absence of salmon remains at Pender Canal; that salmon was not important in the diet there, or that the Locarno Component there has a limited seasonality that did not include seasons in which salmons were important. Since most of the Locarno material is from DeRt 2, which Hanson (1990:195) calls a "cemetery site", from which more than 100 burials were removed, the identification of it as a specialized site with limited seasonality is plausible. Carlson and Hobler (1993:45), instead, see most of this deposit as being the remains of a "major winter village type of settlement" based mainly on the artifact types. Since most of the dates of DeRt 2 (26 of 29, 1993:32-33) are bone that have not been corrected for the marine reservoir effect, the discussion of dating needs to be read with that in mind; i.e., they are "too old" by several hundred years and can not be directly compared with the charcoal dates without correction. Additionally Hanson (1991) finds that the later components appear to be late springtime, and thus the low numbers of salmon may be the result of seasonality. So, in sum, both explanations appear to be possible.

As Clark's (2000) investigation has pointed out, while the salmon storage economy may have kicked in prior to Marpole times in the Fraser Delta, that does not mean that this had occurred on the southeast coast of Vancouver Island where the "Marpole winter village" appears to be absent. So "Marpole" there appears not to have the large houses, stratified society, etc. The presence of small, one family winter "pit houses" at Sequim (Morgan 1999) in early Marpole times supports such a position, which was predicted by Croes and Hackenberger (1988) and Matson (1983). One would expect this to occur in the Locarno Phase as well, particularly when so many components (Montague Harbour, Georgeson Bay, Helen Point, Pender Canal, DgRv 9, Decatur Island) are located on islands without abundant, easily available salmon resources. Is Pender Canal the first member to be identified of this almost-certain to exist group? It appears that the raw information was obtained during the investigation to answer this, but the appropriate analysis has yet to be carried out.

Turning back to Crescent Beach, the shellfish analysis, supports the trends seen elsewhere of bay mussel being dominate in the St. Mungo and even into Locarno Beach, with clams becoming most important in the Marpole layers. In fact, we have only a single layer clearly within the early Locarno Beach or St. Mungo layers that is clearly dominated by clams; i.e., C-T at the bottom of the Locarno component. Most of the later layers appear to be springtime or early summer layers, as shown by the absence of herring and salmon head parts. The mammal and bird evidence reviewed earlier, is in accord with this view, as is the limited clam shell sectioning.

Conclusion

The Crescent Beach site has been excavated a number of time, but continues to yield important new information about the past. It has also served as a laboratory where new methods to obtain archaeological data have been developed. C.E. Borden's favorite toast – Here's to the future of the past – has never been more appropriate than in connection to this large, unique site. The vast majority of the site volume has been destroyed, and our own work was confined to a narrow area of "intact" midden – if "intact" is a word that can be used when 185 cm of disturbed deposits must be removed before intact material is found – a strip which was less than three metres wide. This is the strip of midden that exists between the total destruction of the midden caused by the two sewers along Bayview St. and the limit imposed by the railroad for fear of damage to their roadbed. How many questions will be asked in the future that will not be answered either because of the destruction of the site, or because of limits placed on damaging the remnants? In this regard it is very disappointing to see how much of the site has been destroyed in the last few years as development continues in the Crescent Beach area.