Chapter IV

STRATIGRAPHY AND CHRONOLOGY

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Given the previous description of the 1989 and 1990 excavations what can we say about the age and environmental settings of the deposits? These subjects can be divided into three sub-topics, the general age of the deposits, the specific age of the layers within this sequence, and the general environmental setting. I begin with the general dating of the deposits excavated.

Since Percy (1974) had excavated in the same general area of the Crescent Beach site and reported dates up to 4270±80 RCYBP (Gak 4925), we expected that by excavating close to his trenches we would obtain material of the equal antiquity. As to the top of the deposit, previous analyses had placed Percy's Marpole component well within the Old Musqueam subphase, which is well dated to between 2000 and 2500 radiocarbon years ago (Matson 1989; Matson et al. 1980; Matson and Coupland 1995:211-218). The topmost deposits we recovered from the South Trench also appear to fit this culture; certainly it does not date to the later Marpole subphases. So, in general, we expected radiocarbon dates between 2000 and 4500 years. It turns out that the dates obtained support the dating of the older deposits better than the recent ones.

After the first field season, we examined our carbon samples obtained from the field, cleaned them, and weighed them, we found that no samples collected *in situ* wasof sufficient size to be dated through standard techniques. We thus chose to use samples picked out of water screens and submitted to the Simon Fraser University Radiocarbon Laboratory six samples, with two from the South Trench and four from the North Trench. The results of these initial samples are presented in Table IV-1. Note that all radiocarbon dates are "uncalibrated", as other sources of "calendric" dates are not available and "calibrating" the dates in such situations usually just introduces another layer of complication.

Table IV-1. Radiocarbon Samples From 1989 Excavation

SFU #	SUBMITTER SAMPLE	PROVENIENCE	AGE R.C.Y. B.P.
725	6	Inw CN-3 45-60 cm	1080 ± 80
726	9	Inw CN-4 52-60 cm	1810 ± 70
727	15	Fnw BC-G1 200-210 cm	3060 ± 80
793	18	Fnw BC-G1 210-220 cm	3910 ± 90
794	28	Fnw BC-G1 230-240 cm	3780 ± 80
795	29	Fnw BC-G3 240-250 cm	4440 ± 80

The two samples from the South Trench (SFU 725 and 726) are inconsistent with each other in that we expected no more than a hundred years between the CN-3 and CN-4 layers(Figure III-6). Further, with our judgement that both layers are within the Old Musqueam culture, these dates should be between 2000 and 2400 RCYBP. Given the composite nature of the samples from the screen SFU 726 (1810 ±70 RCYBP) is very close to what is expected, but SFU 725 is at least 1000 years too young. Our conclusion is that recent charcoal must be intermixed with charcoal that was deposited with Layer CN-3.

There is some inconsistency from the North Trench dates as well, but these are larger samples than those from the South Trench. SFU 795, at the bottom of the 1x1m unit confirms Percy's earlier date of the mid-

fifth millennium before present for the deepest part of the deposit (Figure III-8). There is a slight reversal for the next two dates, but given these are from the same natural layer and from the screen, they support the dating of a mid-St. Mungo/Mayne phase age for these deposits, which agreed with our field evaluations about their nature. SFU 727 (3060 ±80 RCYBP) gives a mid Locarno Beach date, for what we initially thought were St. Mungo deposits. Given the situation with SFU 725, we assumed in 1990 that this was another situation of a composite date from the screen giving misleading, too recent dates. Knowing that the unit Fnw, was the archtypical "telephone booth," with not only a burial but two other features at the bottom, the dates from this unit were as good as could be expected.

In summary ,the dates from the first season gave us ball park figures for both trenches and supported our initial judgments about the deposits while we were excavating them in the field. But, as is often the case, there were some holes left in the dates. We also were dissatisfied with the use of dates based on samples from the water-screens, as we saw up to 3 of the six being misleading (SFU 725, 726, and 727). With further dates and thinking, as I report below, now only SFU 725 appears to be misleading, so dates from water screened material do not appear be counter-indicated, just dates from water screens that are close to the surface.

After our second field season we sent our carbon samples to the radiocarbon lab at Washington State University. We received the results of the assays during April 1991. Table IV-2 shows the results of this samples, all collected *in situ* except for WSU 4243.

Table IV-2. Radiocarbon Samples From 1990 Excavations

WSU #	SAMPLE #	PROVENIENCE	AGE R.C.Y.B.P.
4248	55	Mne C-N4 60-70 cm	MODERN
4243	112	Mne C-N5 60-67 cm	3080±100
4247	67	Inw C-S 76-91 cm (Feature 10)	3210 ±110
4245	98	Lne C-V1 100-110 cm	3590 ± 85
4246	97	Enw BC-HB 210-220 cm (Feature 9)	3010 ± 85
4244	108	Fsw BC-IS 220-230 cm	3710 ±80

The dates from the South Trench for 1990 were very different from the previous years results. Most noticeably, there is a thousand years difference between the two sets of dates in the C-N5 layer, and in fact, the four dates from the adjacent layers C-N4 and N5, range from modern to 3080 RCYBP, and not one of the three fall within the expected 2000 and 2500 RCYBP. What is somewhat surprising about these dates is the indication that the lower third of the deposit in the South Trench is Charles culture in age rather than Locarno Beach, which we were not certain about in the field. Exactly where the boundary between St. Mungo and Locarno lies is a little hazy from these dates, but clearly between C-S and C-V1, i.e., C-T or C-U (Figure III-6), given the 3300 to 3500 RCYBP dates reported by others for the division (Matson 1976; Mitchell 1971, 1990; Matson and Coupland 1995:154, see Chapter XI). The boundary between the Marpole deposits and Locarno is even harder to find because there is so much discrepancy in the four dates for C-N4 and N5.

The 3000 year old date for Feature 9, the possible house feature is actually consistent with the SFU 727 (3060+-80 RCYBP) date we got for the top of the North Trench deposits in 1989 (Figure III-4). The uppermost levels in the North Trench are Locarno Beach in age, with the St. Mungo material beginning

tentatively at 220 cm, but with a nearly 1000 year gap in dates between the two cultures.

So, what can be said about the general dating of the deposits? First, from the North Trench we have four dates of 3700 or more RCYBP, indicating a St. Mungo age for the deepest deposits excavated. Three of these dates were obtained from Fnw, excavated in 1989, and were from samples collected from water screening. These three dates are supported by a sample collected from the neighboring unit Fsw at 220-230cm (WSU 4244 (3710 ± 80 RCYBP). These dates support a general age of 4000 RCYBP or greater for the bottom of the deposit in North Trench, and for a St. Mungo age of most of the intact deposits from there.

St. Mungo deposits are also found in the South Trench, as indicated by the date from best preserved layer C-V1 at a depth of 100-110cm (WSU 3590 ±85 RCYBP). Layer C-V1 is approximately 50 cm and two layers above the deepest excavated material from South Trench indicating that the lowest layers in the South Trench are between 3700 and 4000 RCBP.

Turning to more specifics, let us begin with the South Trench. This areas appears consist of relatively continuously deposited layers to the depths that we excavated. If one accepts the date of 2000 RCYBP, as suggested above for the surface layers, this extends from at least 3700 RCYBP but probably not more than 4000 RCYBP. The transition between St. Mungo and Locarno Beach appears to lie between Layer C-S (WSU 4247, 3210 ± 110 RCYBP) and C-V1 (WSU 4245, 3590 ± 85 RCYBP), at approximately 100 cm below the surface (Figure III-8). WSU 4247 is probably our best sample, found in a hearth, protected by hearth rocks from disturbance and being a good sized sample of charcoal (Figure IV-1). WSU 4247 is just above the first labrets and two possible Gulf Complex items, which are usually thought of being first found in the Locarno Beach Culture (Mitchell 1971:57, 1990; Matson and Coupland 1995:115-116). WSU 4245 (3590 ± 85 RCYBP), on the other hand, is found beneath any possible Locarno Beach culture markers. Trace (1981:18) reports four radiocarbon dates for the Locarno Beach deposits in his excavations, ranging from 3260 ± 80 RCYBP (WSU 1701) to 2980 ± 80 RCYBP (WSU 1702) from Trench 1, and 2570 ± 90 RCYBP (WSU 1948) in the later Trench 2. The middle and lower ports of the South Trench deposits, then, are well dated by radiocarbon assays and the patterning agrees with the few "diagnostics" artifacts present, and with Trace's dates.

Figure IV-1. Feature 10, Layer C-S, Unit Inw, and source of 3210 ±110 RCYBP date (WSU 4247).

The situation for the upper third of the South Trench, though, is not so good. We have submitted four dates that we thought would date the transition between Marpole and Locarno. Our one *in situ* collected sample came back "modern" and the other three samples collected from screens ranged from 1000 to 3080 ±100 RCYBP! If we average the three non-modern dates we come up with 2300 RCYBP, which I think is about correct. Clearly the radiocarbon dates do not help with the dating of the upper third of the deposit and that issue must be dealt with analysis of the cultural assemblages, as it is later in this volume. Although my preferred interpretation is as above with the top of the midden being about 2000 RCYBP, the analysis in Chapter XI can be used to infer that the 3080 RCYBP date for Layer CN-5 is correct and the top is about 2500 RCYBP.

In contrast with the South Trench, the North Trench clearly does not have continuous deposition. Although it clearly has pre-Locarno deposits, the dating of the top layers of the undisturbed portion is unclear. We have interpreted the disturbed material as being the remnants of an old drainage ditch that was filled in when the main sewer was put in in 1972. Layers BC-E and higher (Figure III-9) are the results of that filling in. Layer BC-F the clay layer we interpreted as the "natural" fill at the bottom of the drainage ditch. Various historic items found in Layer BC-F such as liquor bottles, were thought to be things thrown in the ditch that sunk to the bottom. The intact deposits began at around 185cm below datum, and this dark midden was called BC-I. BC-I ended at between 190 and 200 cm below datum (Figures III-8 and -9). In most of the North Trench, the fill of Feature 9, denoted BC-H and BC-Hb, came next. It is the dating of this material, the BC-I above 210 cm and the fill of Feature 9, that is in question.

We have a single in situ radiocarbon assay of 3010 ±85 RCYBP (WSU 4246) of the fill in Feature 9 from Layer BC-Hb from 210-220 cm (Unit Enw). There appears to be a big jump in age after that, as we also have a radiocarbon date of 3710 ±80 (WSU 4144) from the neighboring unit, Fsw, at 220-230 cm. Both of these dates are confirmed by dates from Fnw, with SFU 727 (3060 ±80) at 200-210 confirming the dating of BC-Hb, and SFU 793 (3910 ± 90 RCYBP), at 210-220 cm the gap in dating for the material below. There is a relatively clear stratigraphic break at this point (Figure III-9) and our judgment is that above it we have 3000 year old Locarno layers, and below it, layers 3700 or more years old, of St. Mungo deposits. This hiatus could be the result of a break in occupation at this part of the site (note, not found in the South Trench), or the the result of the construction activities associated with Feature 9 which removed some deposits at about 3000 years ago. My preference is for the construction activity, as I would expect a 700 year hiatus to result in some stratigraphic evidence (see, for instance Matson 1976:11,19-20), plus we have no hiatus in the South Trench.

In summary, the South Trench surface layers probably date to about 2000 years, and the lowest layers excavated, at 140 cm below datum, between 3700 and 4000 years ago, with relatively continuous deposition indicated between the two. Although the artifactual material support this interpretation, only the oldest two-thirds of the deposit are well buttressed by radiocarbon dates. In contrast with the continuous sequence, from the surface on down, found in the South Trench, the North Trench lacks intact deposits until 185 cm below surface was reached, and even after this, has a substantial hiatus. Feature 9, a probable domestic structure, and equivalent surrounding layers (circa 185-210 cm) date to about 3000 years, as indicated by two radiocarbon dates, begin the intact deposit. These layers, (BC-H and BC-I) are roughly equivalent to the South Trench layers CQ and CR. Immediately below this horizon in the North Trench is material dated at 3700 years or older, indicating a hiatus of approximately 700 years. Thus, the equivalent of South Trench layers CS to CW or CX is missing in the North Trench. At 240-250 cm in the North Trench, a single date of 4400 radiocarbon years appears to date the first significant occupation of the site (and the beginning of the St. Mungo phase).

This dating corresponds neatly with the inferred stratigraphic events that made up this part of the

Crescent Beach site. In general terms, this history is relatively clear, that we have a build up of a low lying spit from east to west, so that the oldest archaeological deposits are found against the highland in the Bayview Street area, and more recent material to the west and south. Archaeologically, this build up is seen most clearly by Percy's profiles (1974:24b) where most trenches show a clear west to east slope in the lower layers. Our Figures III- 6 and -7 shows a slight tendency for the same trend in the lower half of the north walls of Units Mne and Inw. Once the spit has built up, one would expect the layers to become more horizontal in the Bayview Street area, and both Percy's and our profiles show this as well.

There are also some consistent changes in stratigraphy that may correlate with this proposed sequence. At the lowest levels in the North Trench, we have deposits which appeared to be very similar to reworked beach layers, which are superceded by more cultural layers with abundant bay mussel (*Mytilus trossulus*). Best seen in the lowest layers of the South Trench, is a concentrated bay mussel shell midden. This grades into a deposit with more sand and clams and less mussel in the upper layers of the South Trench.

In the South Trench, two other features of the natural layers were notable; that the upper layers in Units Knw, Isw, Inw, Lne, Mse, and Mne sloped from south down to north, and that various upper layers had abundant amounts of finely smoothed and flattened pebbles (Figures III-6 and IV-2). Units Ksw and Lsw, on the other hand, lacked the pebbles, and many of the layers found in the other units failed to extend into them. By inspecting the beach at Blackie Spit at the end of Crescent Beach, a simple analogy could be made – that we had a similar situation. At Blackie Spit small beach pebbles are found in the middle and upper intertidal zone, in slowly sloping layers with undifferentiated sandy deposits at the top of the beach.

Figure IV-2. Unit Mse, Layer CL, showing transition to more pebbles and beach deposits through time.

The upper layers in the South Trench appear to reproduce this pattern with Units Ksw and Lsw representing the top of the beach. It will be recalled that Trace (1981) reported layers that he interpreted in a similar fashion on the other side of the railroad tracks, albeit that his layers were in the lower cultural deposits, but within the Locarno Beach phase.

Let us explore this idea further. Obviously, if pebbles were being deposited, people were not living there at the time. On the other hand, the presence of cultural deposits indicates that this was not the The regular intertidal zone. The presence of pebble layers, then, must represent unusual winter storms at high tides, rather than the regular range of tides. Such a location might be suitable for a seasonal site, but would not be appropriate for winter time use. In my summary of subsistence information (Chapter VI), I review the relatively extensive information supports a spring to early summer use of the site in the upper layers, in accord with this interpretation. Inspection of the more open beach on the south side of Crescent Beach shows that the pebbles found there are much larger than found on the more protected Blackie Spit – and the excavated layers – indicative of the greater forces present on that more open beach. Thus the archaeological "beach", like Blackie Spit, was facing the Nicomekl River, a more protected environment. The slope of these layers are towards the Nicomekl River, supporting this idea. The slope also explains why the older layers are closer to the surface in the South Trench than in the North Trench.

A potential problem with this interpretation is that the lower levels do not have the pebbles or show the same slopes. If the higher levels are probable beach, were earlier people living under water? Clearly, this must not be the case. If we turn to the North Trench we find clear evidence of being near the beach at 250 cm below datum in Unit Fnw. Here we find not only pebbles but coarse, angular sand, only slightly reworked from that glacial material found in the adjacent highlands areas. This is the material called Zone X by Percy (1974) who found it beginning at around 200 cm below surface in most of his trenches. Since our North Trench is further from the headland than Percy's trenches, we would expect this transition to be deeper, and it is. The Crescent Beach site consists of cultural deposits bounded by sterile beach deposits at the bottom and intermixed cultural and beach layers at the top.

It is clear, then, that the spit developmental model must be modified somewhat. If what was present was a simple, linear development of the spit, beach deposits would not exist in the top layers. The missing factor is that of relative sea level. Fortunately the dissertation reviewed in Chapter II by Williams (1988) summarizes sea-level changes in the Fraser delta area. Williams (1988:188-89) states that about 4500 years ago the relative sea level was about 2.2 m below present levels. This explains why we can have occupation layers in the North Trench 1.5 metres below the apparent beach layers in the South Trench. The reason is that the sea level was also lower at that time.

According to Williams (1988:189) the sea level slowly rose 2 metres between 4500 and 2250 radiocarbon years ago, at which point it had reached the present level. This explains the presence of the pebbles in the upper layers, the sea rose faster than the cultural layers were laid down. Once the sea-level stabilized, the spit built up rapidly, extending out north and west, and placing the excavated area some distance from any active beach. If areas close to the beach were the preferred occupation areas, as the spit built up, the area we excavated would no longer be extensively used.

The rate of the development of the Crescent Beach spit can now be seen as the result of two factors, the building up of the spit and the rising sea level. If the sea level rises faster than the spit develops (including cultural material), the spit shrinks back towards the headland. During times of sea-level stability, such as in the last 2250 years, the spit builds up rapidly.

This model is in agreement with the information recovered from our excavations and with that recovered by Trace (1981) on the other side of the railroad tracks, that the occupation was on a small spit, close to the headland on the east side of Bayview Street. If the interpretation of the pebbled layers is correct,

the nearby beach faced Nicomekl River rather than Boundary Bay. Fresh water would probably been obtained through "Anthropology Creek" which now runs to the south of the site, some 300 metres from our excavation (Figure II-2).

The initial occupation, circa 4500 years ago, then, was on a headland, near a source of freshwater, next to a river (Nicomekl). This setting is very similar to Glenrose, at the time of initial occupation (Matson 1976, 1996b), where a very small creek ran immediately adjacent to the excavated area. This sort of setting, then, may have been preferred locations in St. Mungo and Old Cordilleran times. Even the initial deposits, slightly reworked angular glacial sands, are similar at both sites.

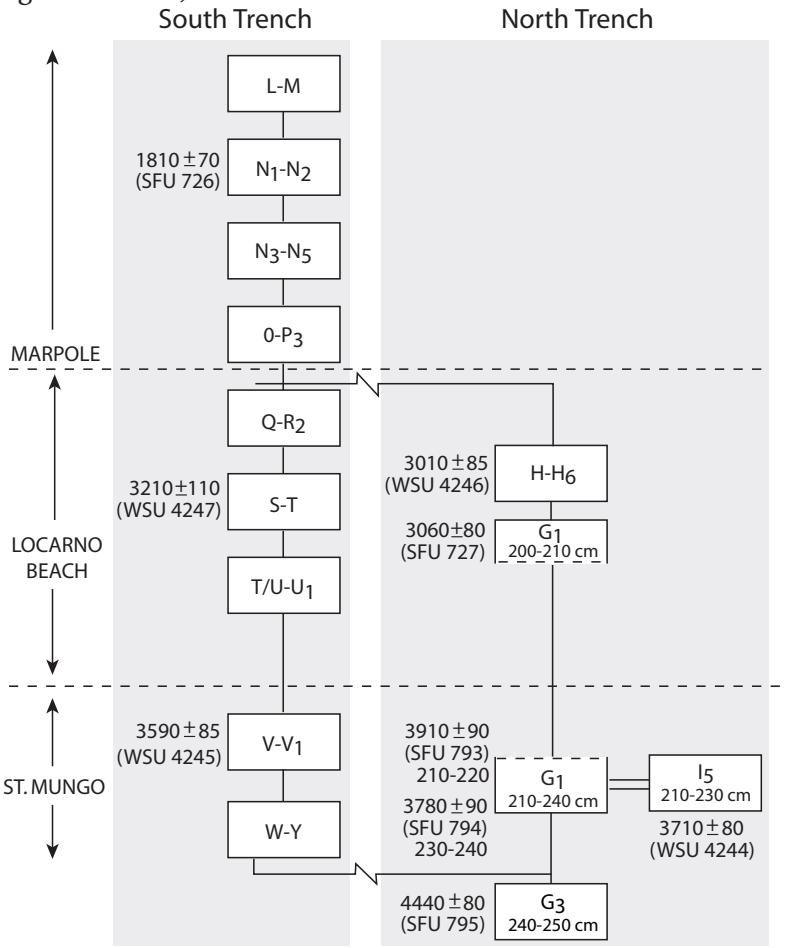

Figure IV-3. Harris matrix of Crescent Beach excavations. Dashed lines show beginning and end of discontinuity in North Trench. (After Thom, 1991).

The excavated area of Crescent Beach has an inferred history that can be summarized as follows. Some 4500 years ago use began of a beach of relatively unmodified angular gracial till. This is attested to in the North Trench, but sterile was not reached in the South Trench (Figure IV-3). We thus have layers representing continuous deposition up to about 2000 years ago, when this part of the site was no longer used extensively but the continuous sequence is not completely present in either trench. In the South Trench, continuous deposition occurred from at least 3700 years ago, Layer Y, up to the surface layers, about 2000 years ago. In the North Trench the continuous layers begin about 4500 years ago but stop at 3700 years ago. It is likely that later layers were originally deposited there, but were removed by an occupation dated at 3000 years ago (Feature 9 and equivalent parts of Layer BC-Il, Figure IV-3). The higher

layers in the South Trench are found with small, flat pebbles, interpreted as action of winter storms, indicating a relatively high sea-level (Figure IV-1). In the North Trench, a historic drainage ditch stripped off the top 180 cm, truncating the deposits so that the top intact cultural layers date to about 3000 years ago. In 1972, the drainage ditch was filled in while the large sewer main was being placed adjacent to it. So between the two trenches our 1989 and 1990 excavations recovered a continuous cultural record dating from 4500 to about 2000 years ago.