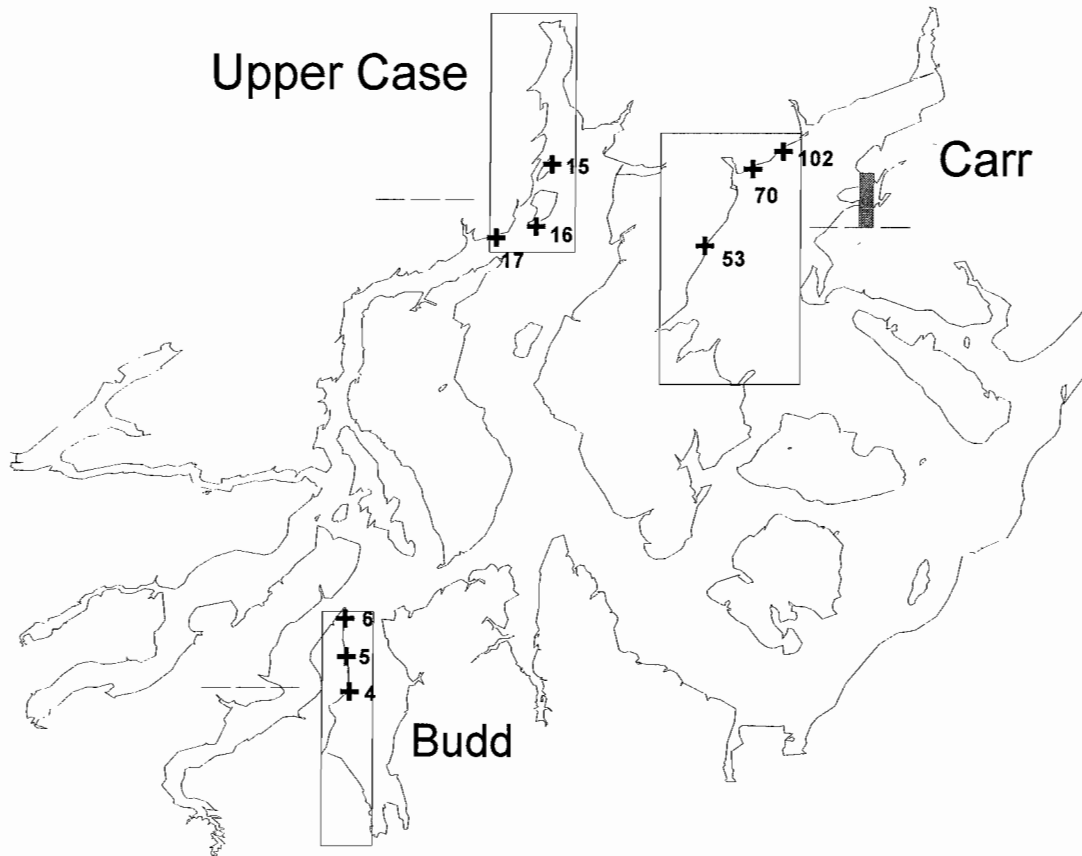


List of Appendices

- Appendix A (DIGITAL ONLY).** All biota found in 1997-1999 Puget Sound sampling, listing abundance data from all sites.
- Appendix B (PAPER: attached).** GIS maps of taxa showing differences between 1998 and 1999 samples
- Appendix C (DIGITAL ONLY).** Results of all t-tests comparing abundances of taxa in 1998 vs. 1999 samples (summarized in Appendix B).
- Appendix D (DIGITAL ONLY).** Results of spatial autocorrelation tests for each taxon sampled (summarized in Appendix E).
- Appendix E (PAPER: attached).** GIS maps of results of spatial autocorrelation tests for key taxa.
- Appendix F (DIGITAL ONLY).** Results of nested ANOVA tests for all taxa (summarized in Table 2).
- Appendix G (PAPER: attached).** Listing of all non-rare taxa found in Puget sound surveys, and comparison with historical samples (summarized in Tables 4 and 5).

APPENDIX B

**Appendix B2. Spatial distribution of *Allorchestes angusta*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: AME.SA.C
 All.an. with Year = 1 , and y: All.an. with Year = 2
 $t = -2.9845$, $df = 178$, $p\text{-value} = 0.0032$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.6091086 -0.1242247

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

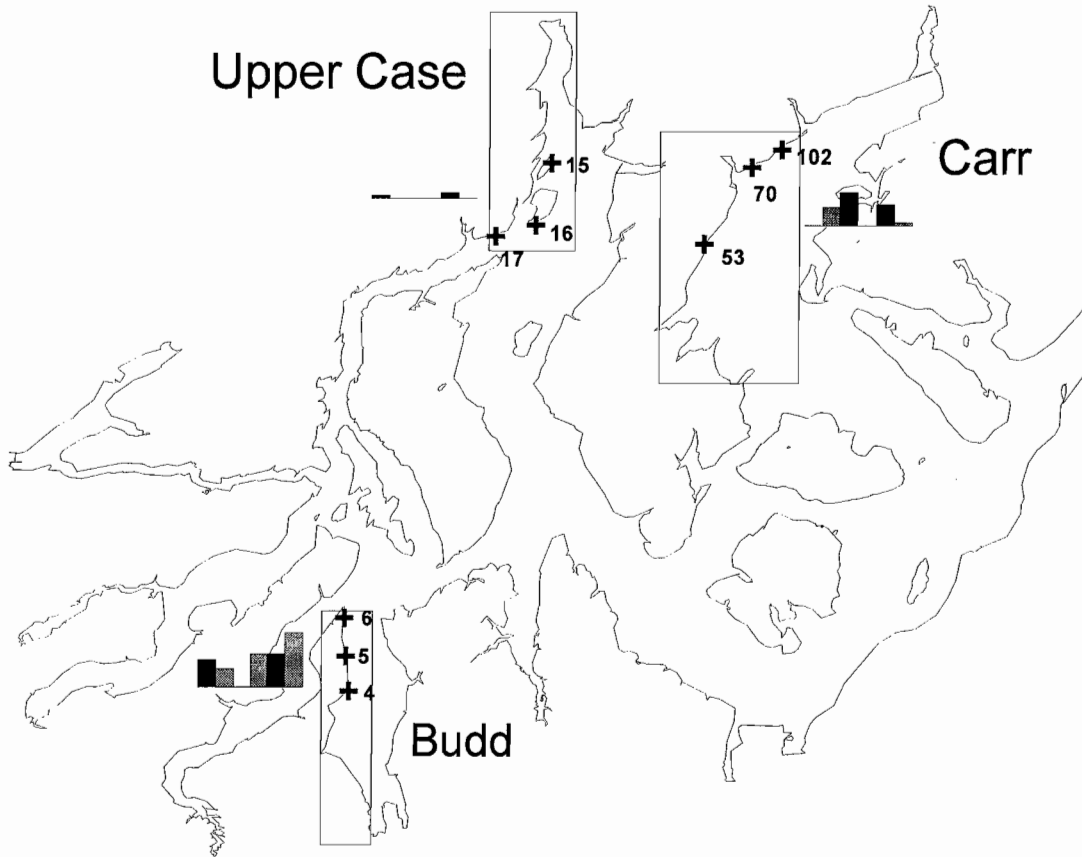
98 *Allorchestes angusta*:

0 0 0

99 *Allorchestes angusta*:

73 37 0

Appendix B1. Spatial distribution of *Alia gausapata* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: ALI.GA.Q
 Ali.ga.Q with Year = 1 , and y: Ali.ga.Q with Year = 2
 $t = -0.2522$, $df = 178$, $p\text{-value} = 0.8012$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -3.235732 2.502398

Indicator values are based on 10 samples
 from a 50 m horizontal transect at MLLW

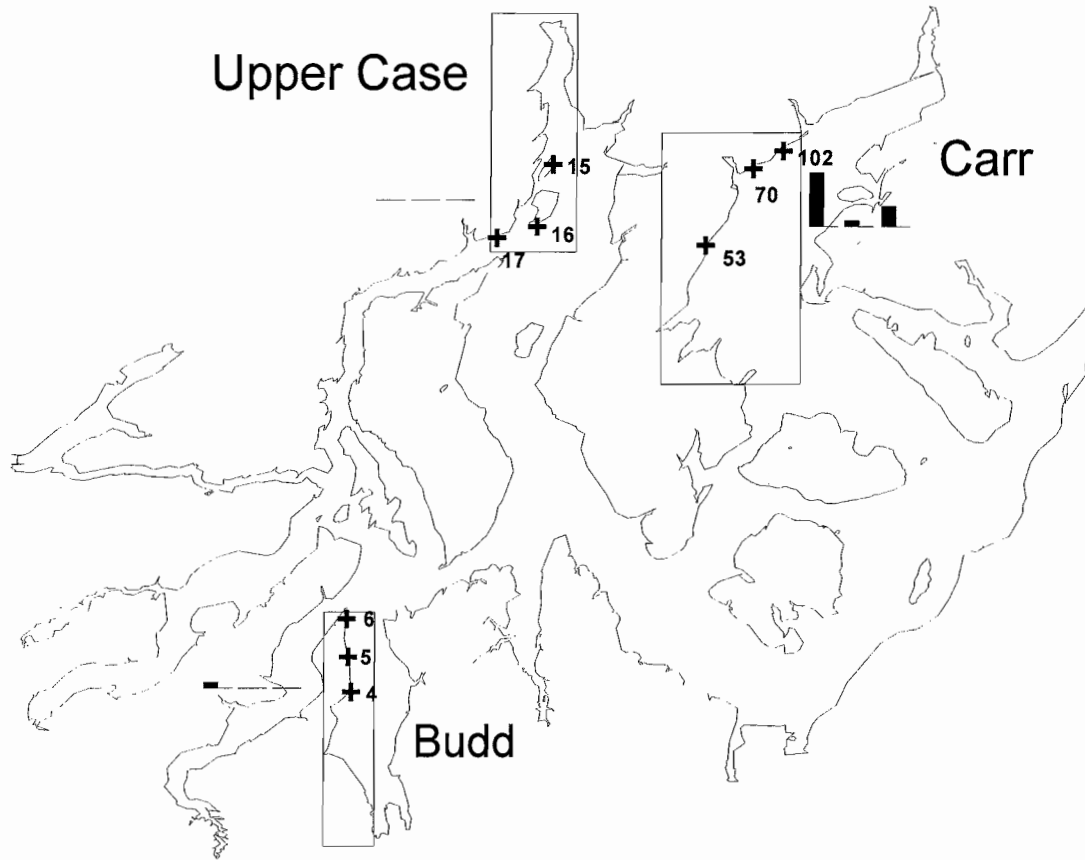
98 *Alia gausapata*:

■ ■ -
 11 6 0

99 *Alia gausapata*:

■ ■ -
 18 9 0

Appendix B3. Spatial distribution of *Armandia brevis* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: ARM.BR.C
 Arm.br.C with Year = 1 , and y: Arm.br.C with Year = 2
 $t = 3.2406$, $df = 178$, $p\text{-value} = 0.0014$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 0.1086214 0.4469342

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

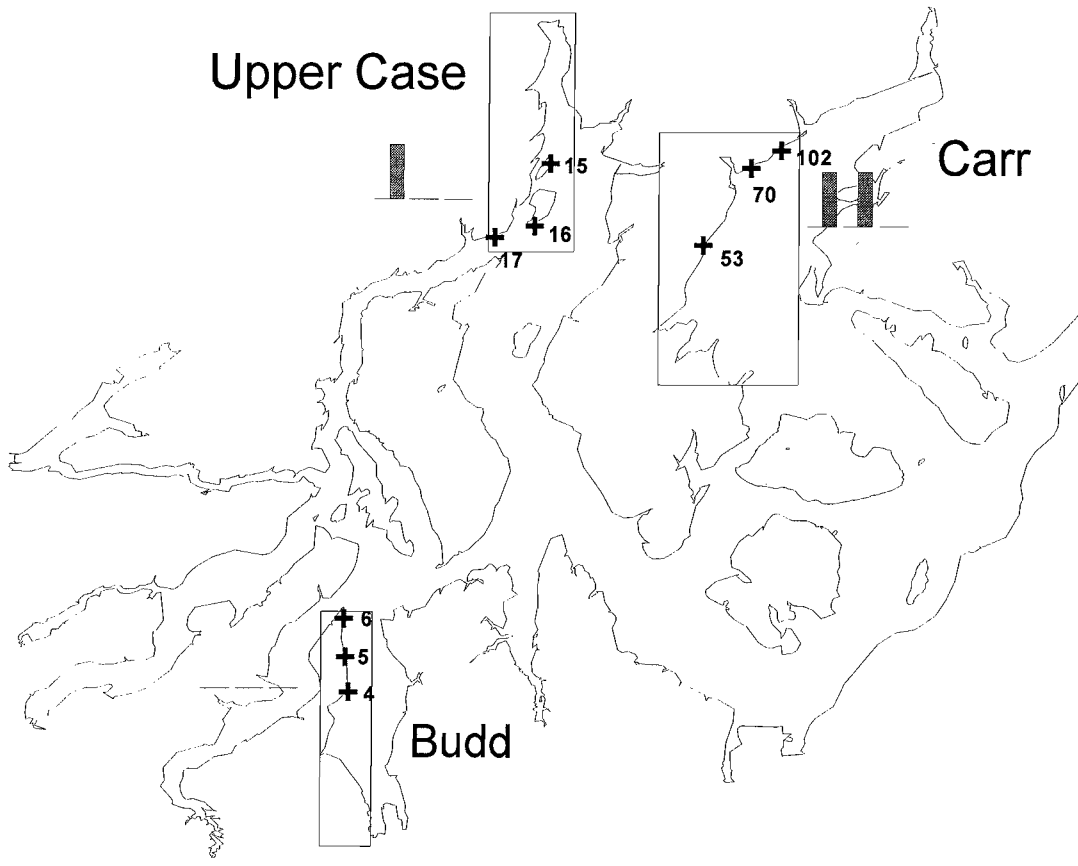
98 *Armandia brevis*:



99 *Armandia brevis*:



Appendix B4. Spatial distribution of *Axiiothella rubrocincta* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



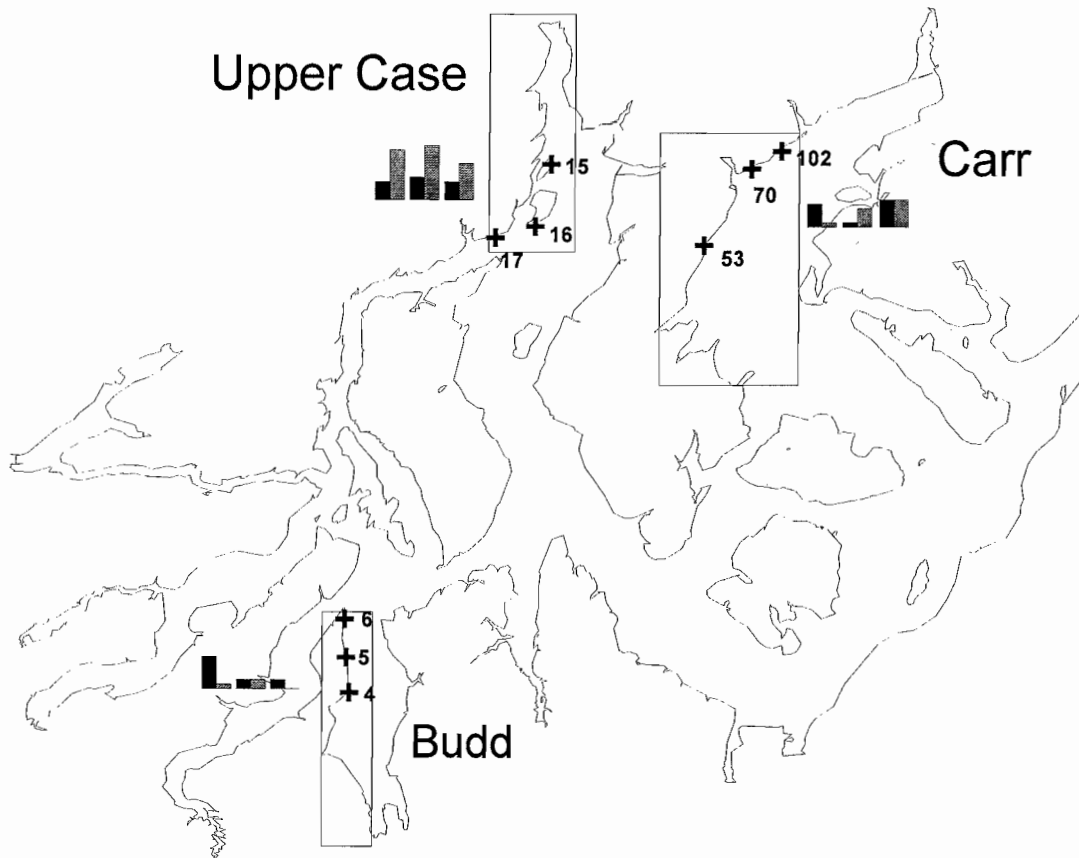
T-TEST: ARM.BR.C
 Axi.ru.C with Year = 1 , and y: Axi.ru.C with Year = 2
 $t = -1.7518$, $df = 178$, $p\text{-value} = 0.0815$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.070881926 0.004215259

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

98 *Axiiothella rubrocincta*:
 - - -
 0 0 0

99 *Axiiothella rubrocincta*:
 █ █ -
 3 2 0

Appendix B5. Spatial distribution of *Balanus glandula* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: BAL.GL.Q
Bal.gl.Q with Year = 1, and y: Bal.gl.Q with Year = 2
 $t = -1.6584$, $df = 178$, $p\text{-value} = 0.099$
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-10.8035841 0.9369174

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

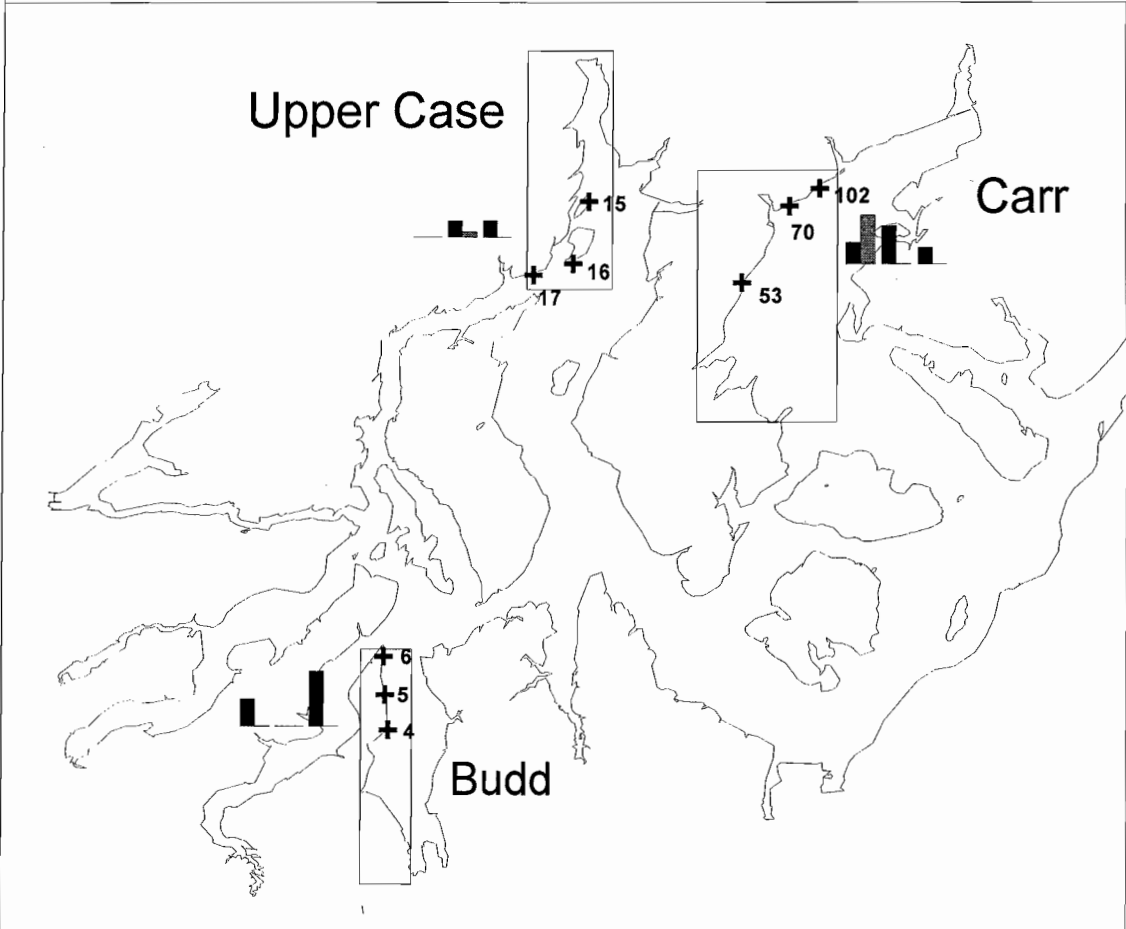
98 *Balanus glandula*:

■ ■ ■
8 5 2

99 *Balanus glandula*:

■ ■ ■
13 7 1

**Appendix B6. Spatial distribution of *Crepidula dorsata*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



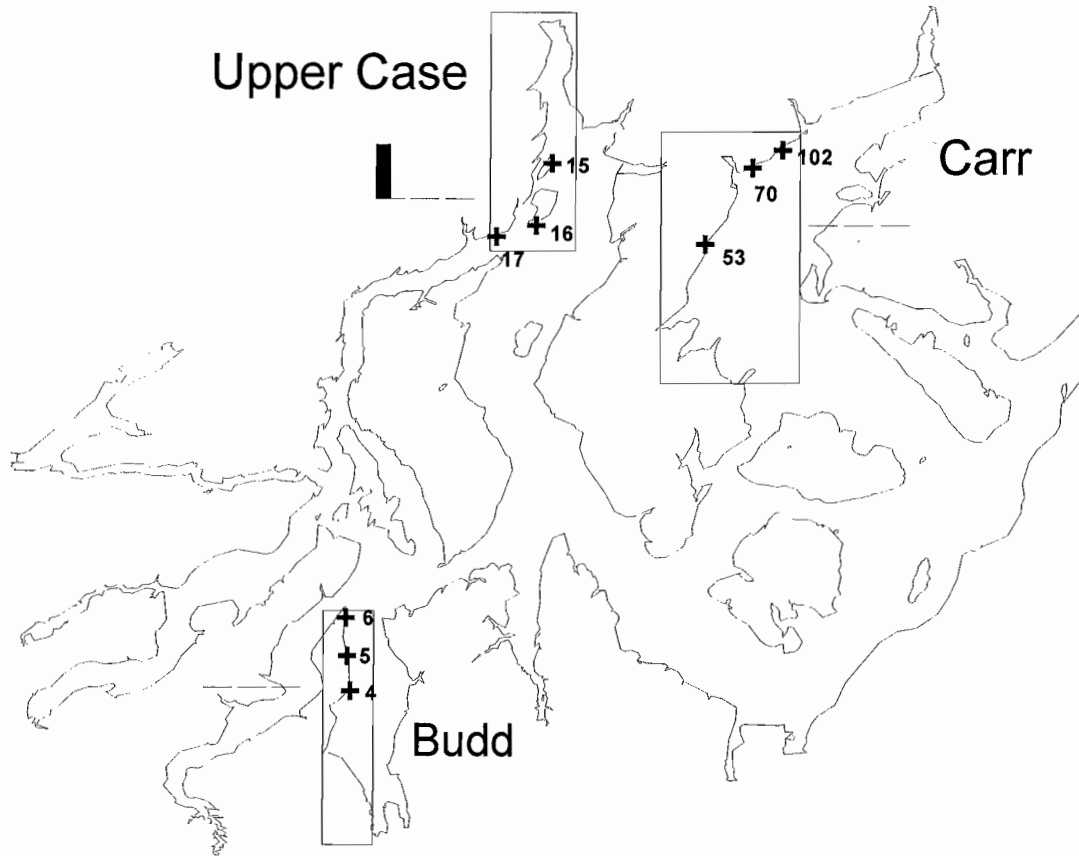
T-TEST: CRE.DO.Q
 Cre.do.Q with Year = 1 , and y: Cre.do.Q with Year = 2
 t = 2.91, df = 178, p-value = 0.0041
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 0.2861096 1.4916681

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

98 *Crepidula dorsata*:
 10 5 0

99 *Crepidula dorsata*:
 9 5 0

Appendix B7. Spatial distribution of *Diopatra ornata* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: DIO.OR.C
 Dio.or.C with Year = 1 , and y: Dio.or.C with Year = 2
 $t = 1$, $df = 178$, $p\text{-value} = 0.3187$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.01081534 0.03303757

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

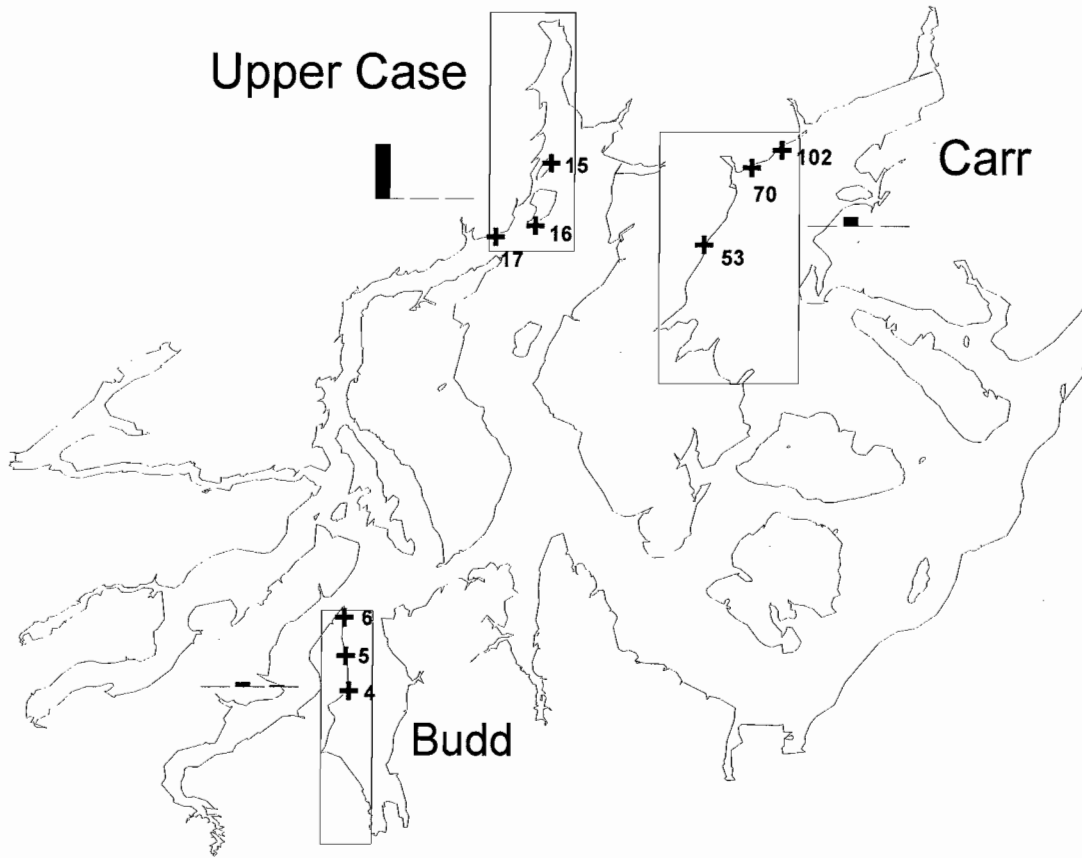
98 *Diopatra ornata*:



99 *Diopatra ornata*:



Appendix B8. Spatial distribution of Edwardsia A. Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: EDWARDSIA A.
 Edw.A.C with Year = 1 , and y: Edw.A.C with Year = 2
 $t = 3.2945$, $df = 178$, $p\text{-value} = 0.0012$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 0.06683425 0.26649908

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

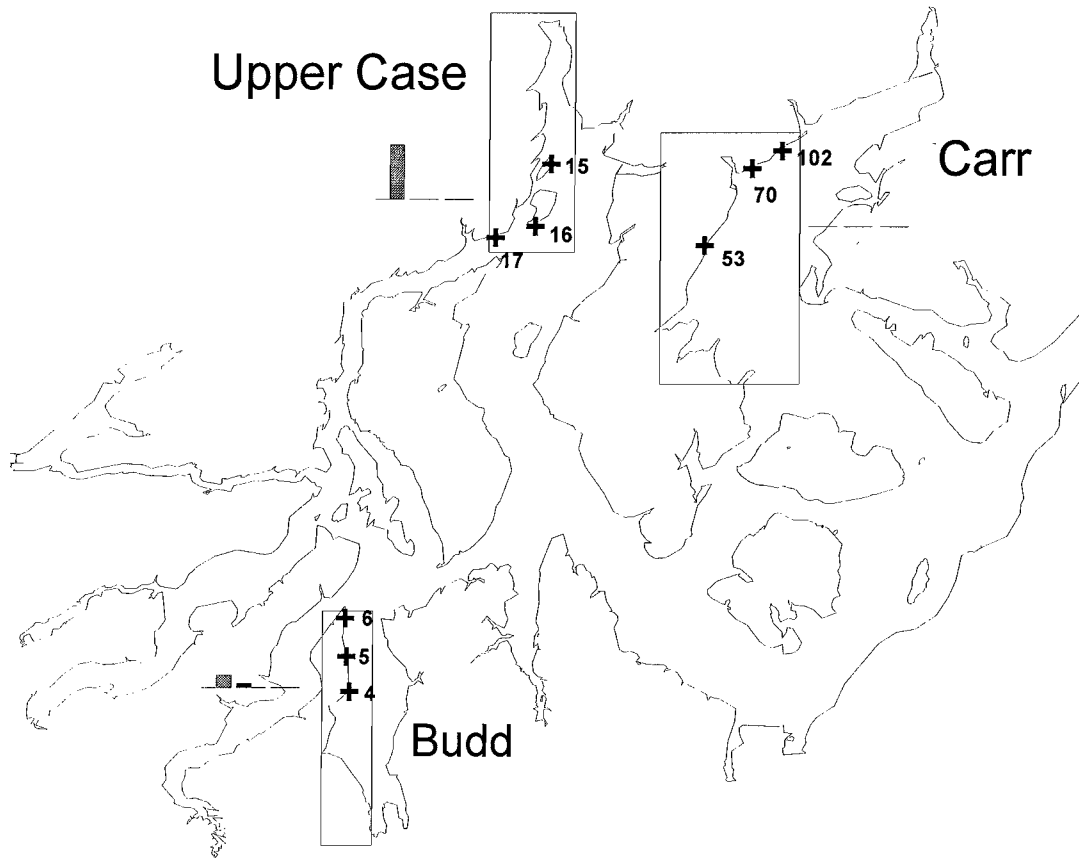
98 Edwardsia sp:



99 Edwardsia sp:



**Appendix B9. Spatial distribution of *Edwardsia sipunculoide*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: EDW.SI.C
Edw.si.C with Year = 1, and y: Edw.si.C with Year = 2
t = -1.2885, df = 178, p-value = 0.1993
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.16877285 0.03543952

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

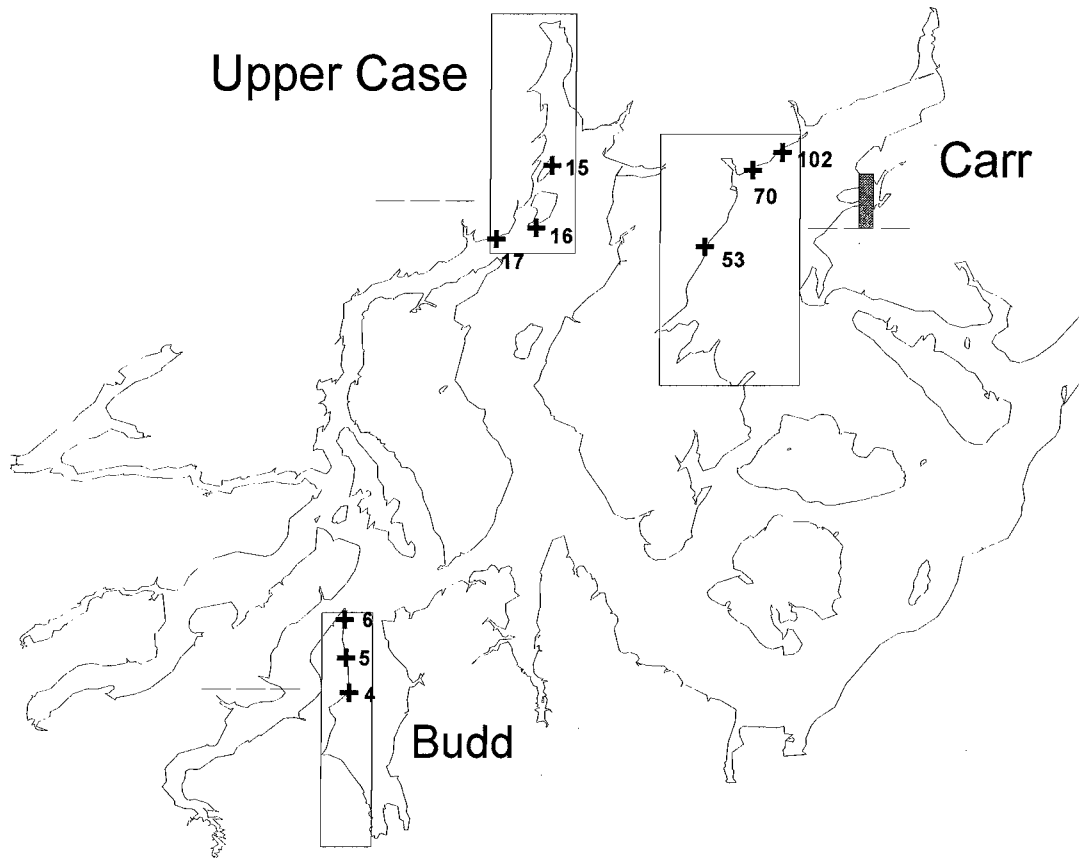
98 *Edwardsia sipunculoide*:

— — —
1 1 0

99 *Edwardsia sipunculoide*:

█ █ —
13 7 0

**Appendix B10. Spatial distribution of *Eogammarus oclairi*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



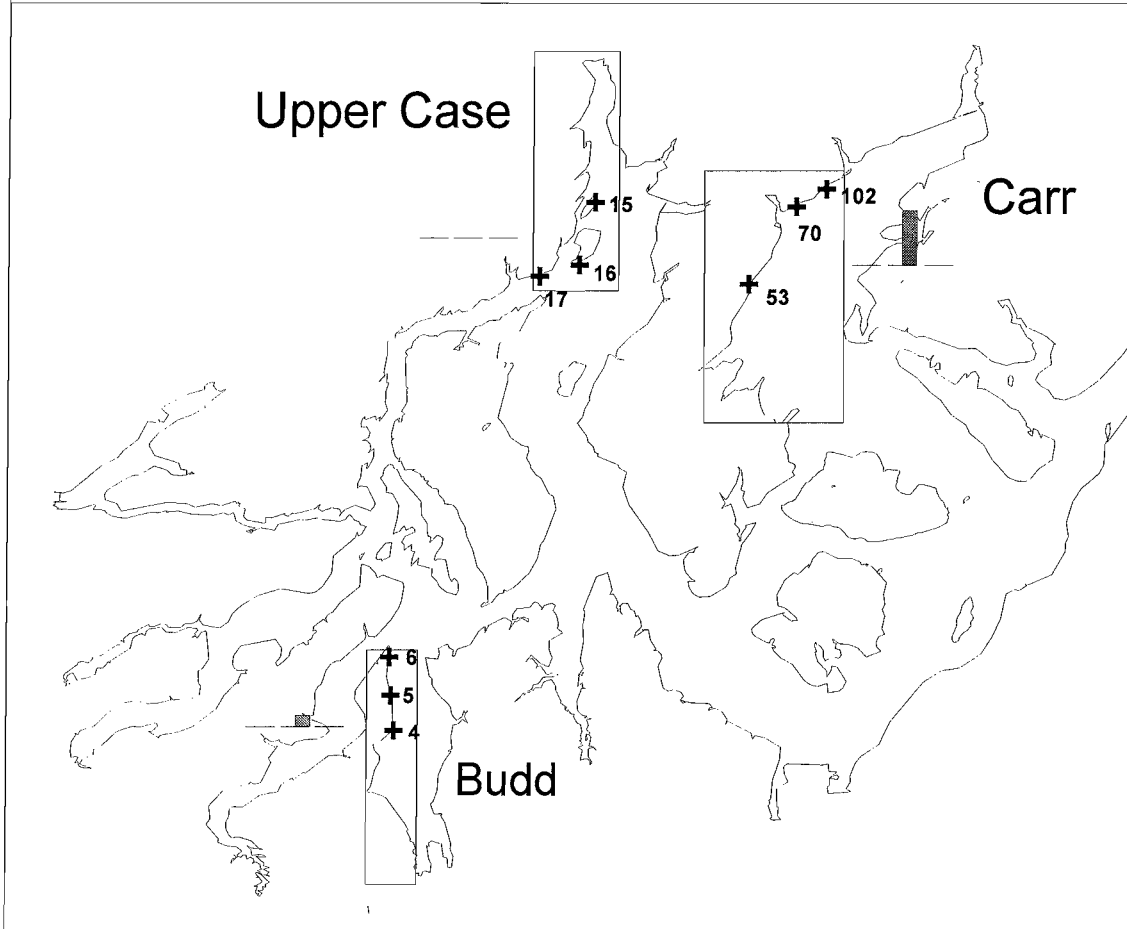
T-TEST: EOG.OC
 Eog.oc. with Year = 1 , and y: Eog.oc. with Year = 2
 t = -2.6998, df = 178, p-value = 0.0076
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.51927686 -0.08072314

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

98 *Eogammarus oclairi*:
 0 0 0

99 *Eogammarus oclairi*:
 80 40 0

**Appendix B11. Spatial distribution of *Harmothoe imbricata*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



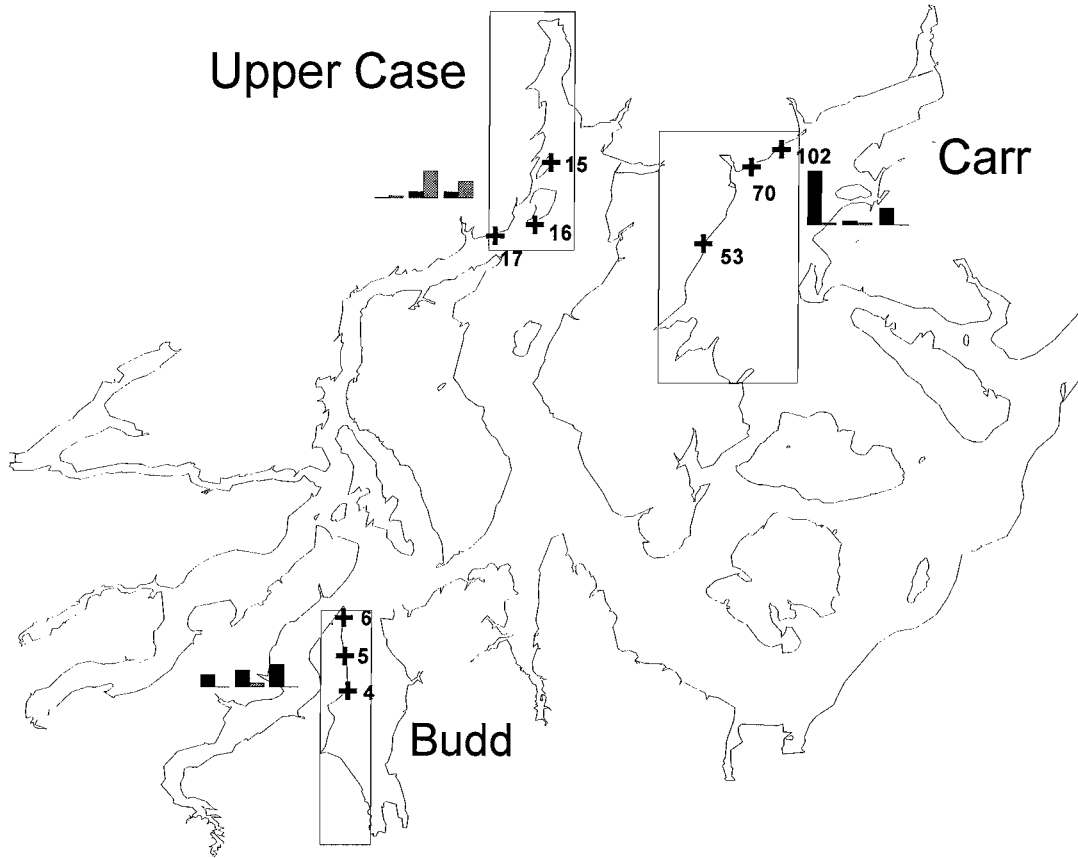
T-TEST: HAR.IM.C
 Har.im.C with Year = 1, and y: Har.im.C with Year = 2
 t = -1.6485, df = 178, p-value = 0.101
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.097647803 0.008758914

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

98 *Harmothoe imbricata*:
 - - -
 0 0 0

99 *Harmothoe imbricata*:
 █ █ -
 15 8 0

**Appendix B12. Spatial distribution of Hemigrapsus oregonensis
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: HEM.OR.Q
Hem.or.Q with Year = 1 , and y: Hem.or.Q with Year = 2
 $t = 4.6907$, $df = 178$, $p\text{-value} = 0$
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
2.639031 6.472080

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

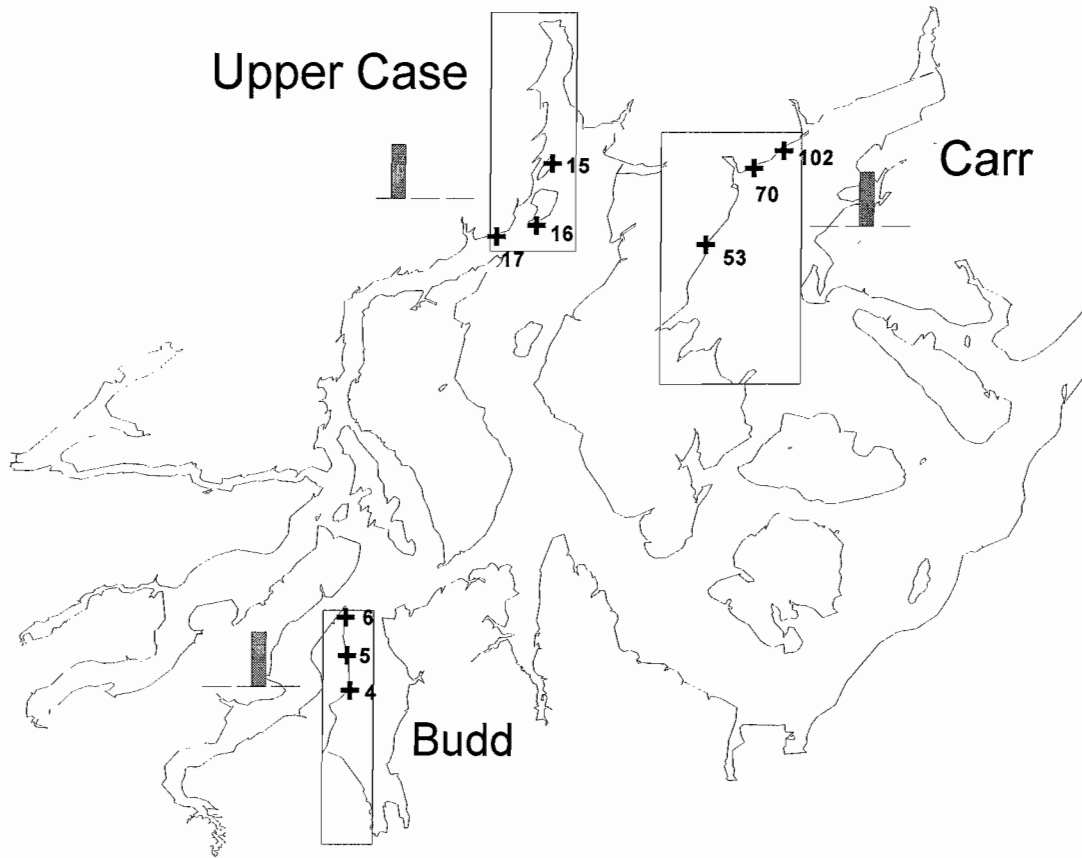
98 Hemigrapsus oregonensis:



99 Hemigrapsus oregonensis:



**Appendix B13. Spatial distribution of *Hermisenda crassicornis*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: HER.CR.Q
Her.cr.Q with Year = 1, and y: Her.cr.Q with Year = 2
t = -1.7518, df = 178, p-value = 0.0815
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.070881926 0.004215259

Indicator values are based on 10 samples from
a 50 m horizontal transect at MLLW

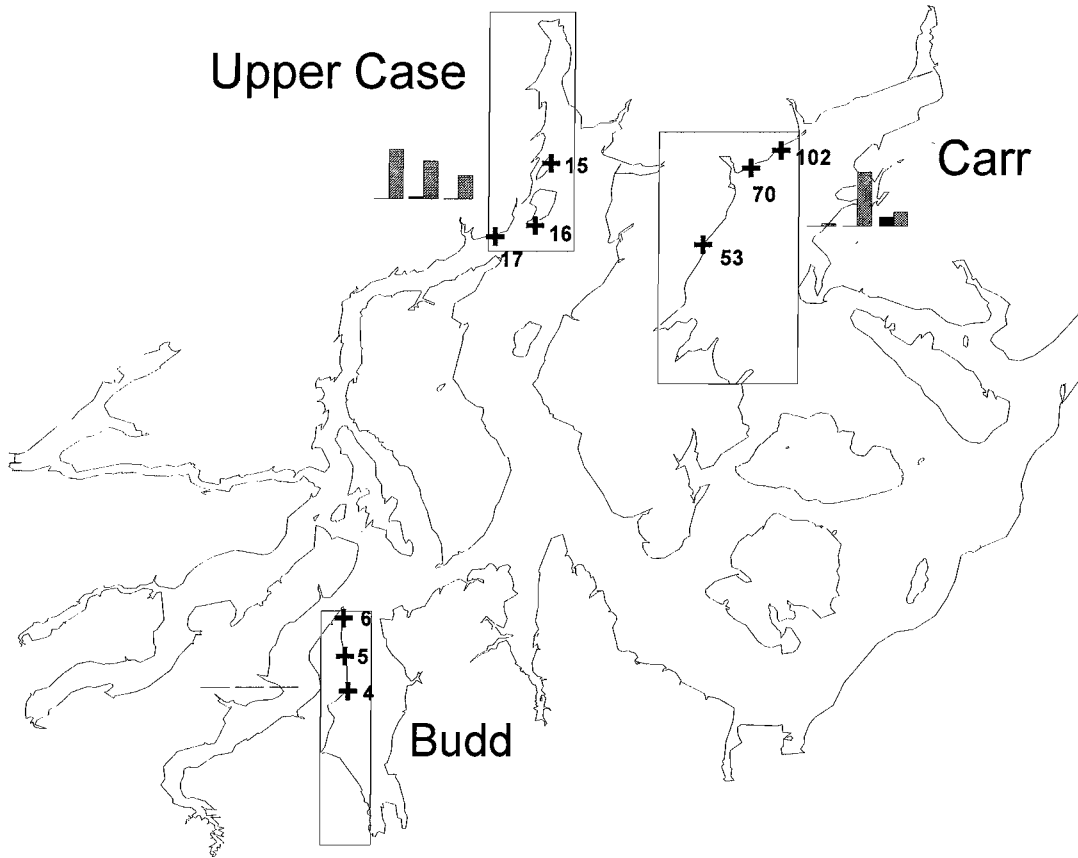
98 *Hermisenda crassicornis*:

0 0 0

99 *Hermisenda crassicornis*:

3 2 0

Appendix B14. Spatial distribution of clam siphon holes Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: HOLES.Q
 Holes.Q with Year = 1, and y: Holes.Q with Year = 2
 $t = -6.2828$, $df = 178$, $p\text{-value} = 0$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -1.6645191 -0.8688142

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

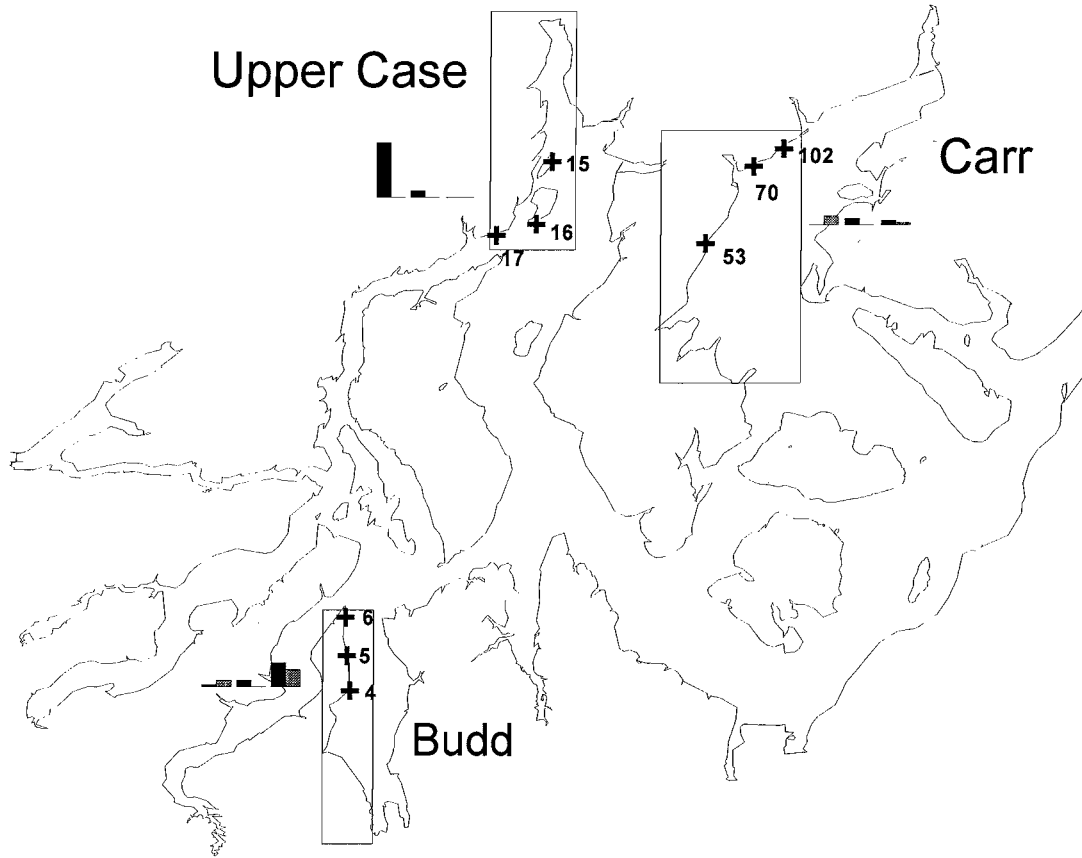
98 holes in sediment (unident.):

■	-	-
4	2	0

99 holes in sediment (unident.):

■	■	-
23	12	0

**Appendix B15. Spatial distribution of *Leptosynapta clarki*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: LEP.CLA.
Lep.cl. with Year = 1 , and y: Lep.cl. with Year = 2
 $t = 3.3799$, $df = 178$, $p\text{-value} = 0.0009$
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
0.4392569 1.6718542

Indicator values are based on 10 samples from
a 50 m horizontal transect at MLLW

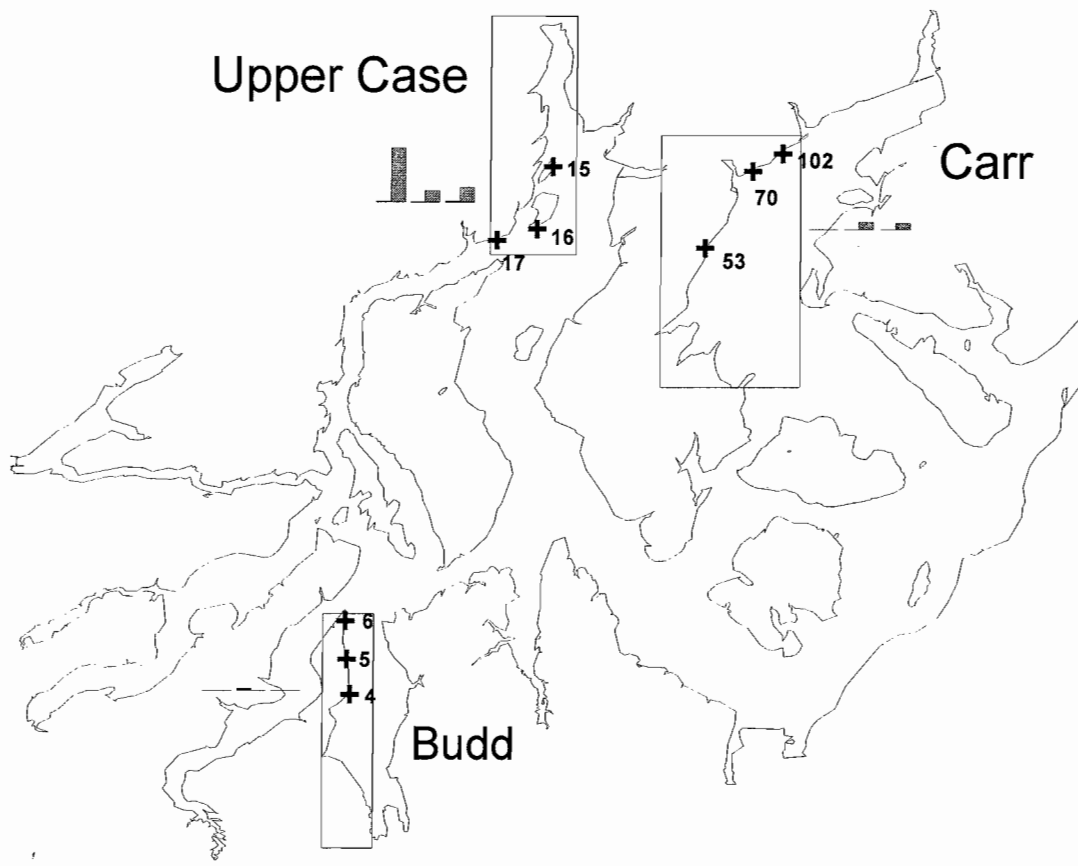
98 *Leptosynapta clarki*:



99 *Leptosynapta clarki*:



Appendix B16. Spatial distribution of *Littorina scutulata* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



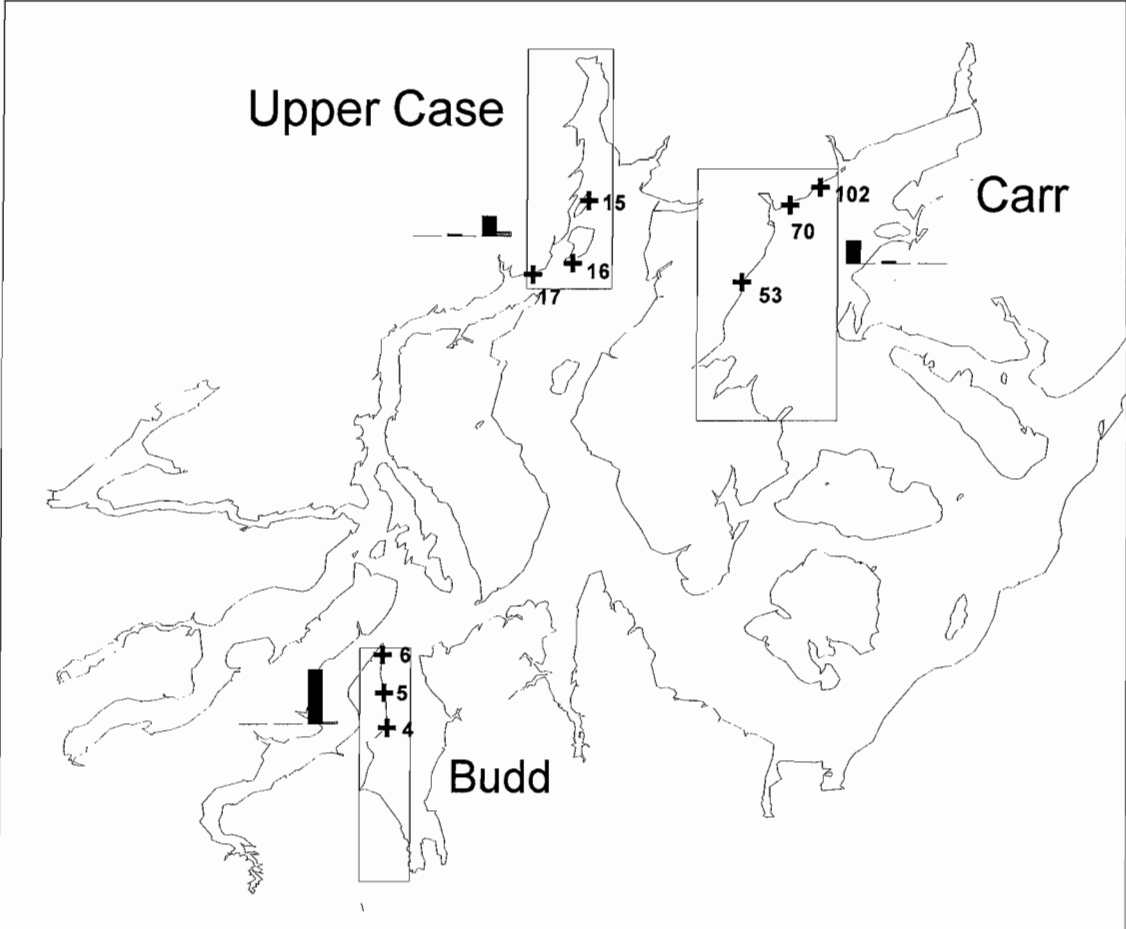
T-TEST: LIT.SC.Q
 Lit.sc.Q with Year = 1 , and y: Lit.sc.Q with Year = 2
 $t = -5.4474$, $df = 178$, $p\text{-value} = 0$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -83.91528 -39.28472

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

98 *Littorina scutulata*:
 - - -
 2 1 0

99 *Littorina scutulata*:
 █ █ -
 51 26 0

**Appendix B17. Spatial distribution of *Lophopanopeus bellus*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: LOP.BE.Q
Lop.be.Q with Year = 1 , and y: Lop.be.Q with Year = 2
t = 3.107, df = 178, p-value = 0.0022
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
0.1094582 0.4905418

Indicator values are based on 10 samples from
a 50 m horizontal transect at MLLW

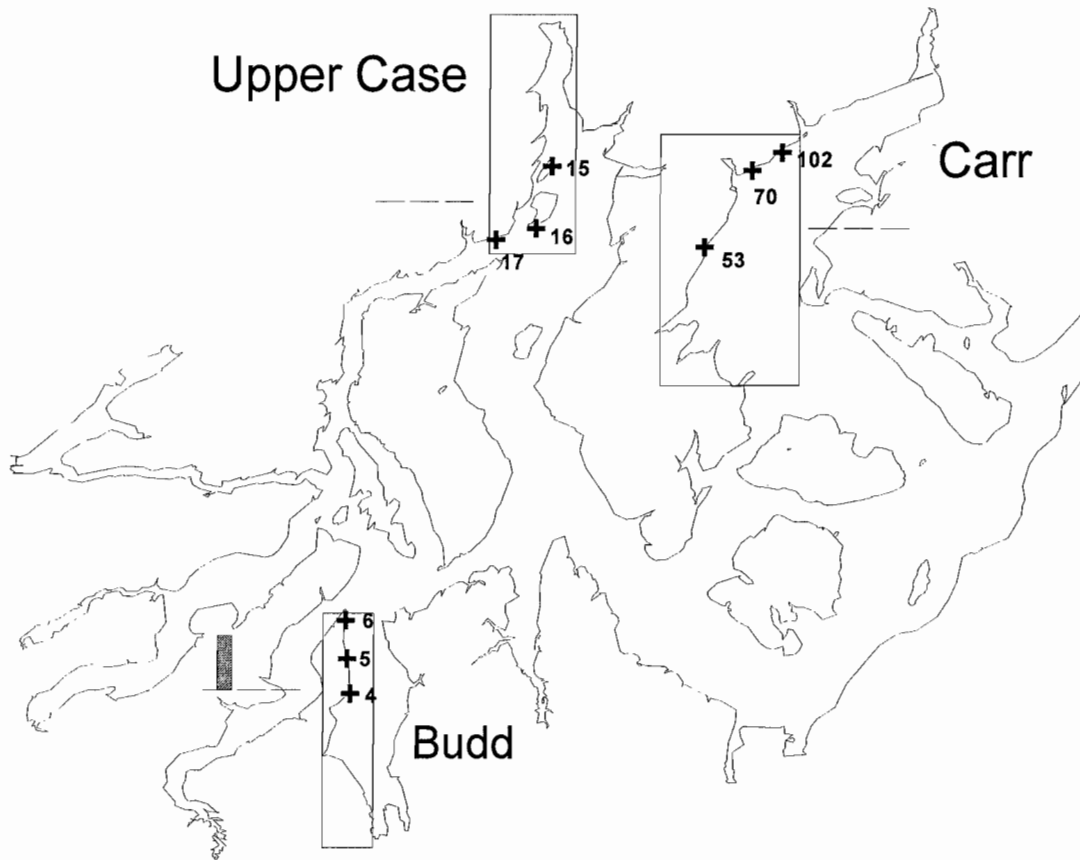
98 *Lophopanopeus bellus bellus*:

█	█	-
24	12	0

99 *Lophopanopeus bellus bellus*:

-	-	-
2	1	0

**Appendix B18. Spatial distribution of *Macoma nasuta* (juv)
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: MACOM.C
 Macom.C with Year = 1 , and y: Macom.C with Year = 2
 t = 4.2242, df = 178, p-value = 0
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 0.319705 0.880295

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

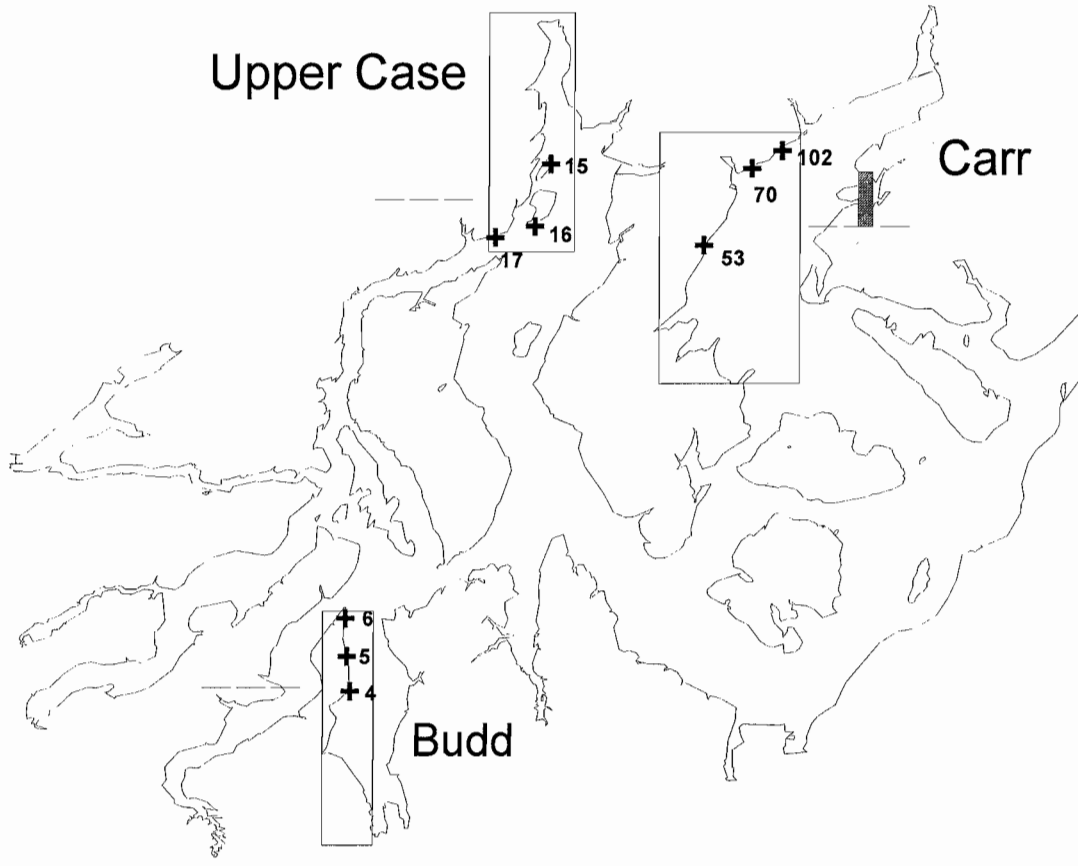
98 *Macoma nasuta*:

0 0 0

99 *Macoma nasuta*:

10 5 0

**Appendix B19. Spatial distribution of *Macoma secta* (juv)
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



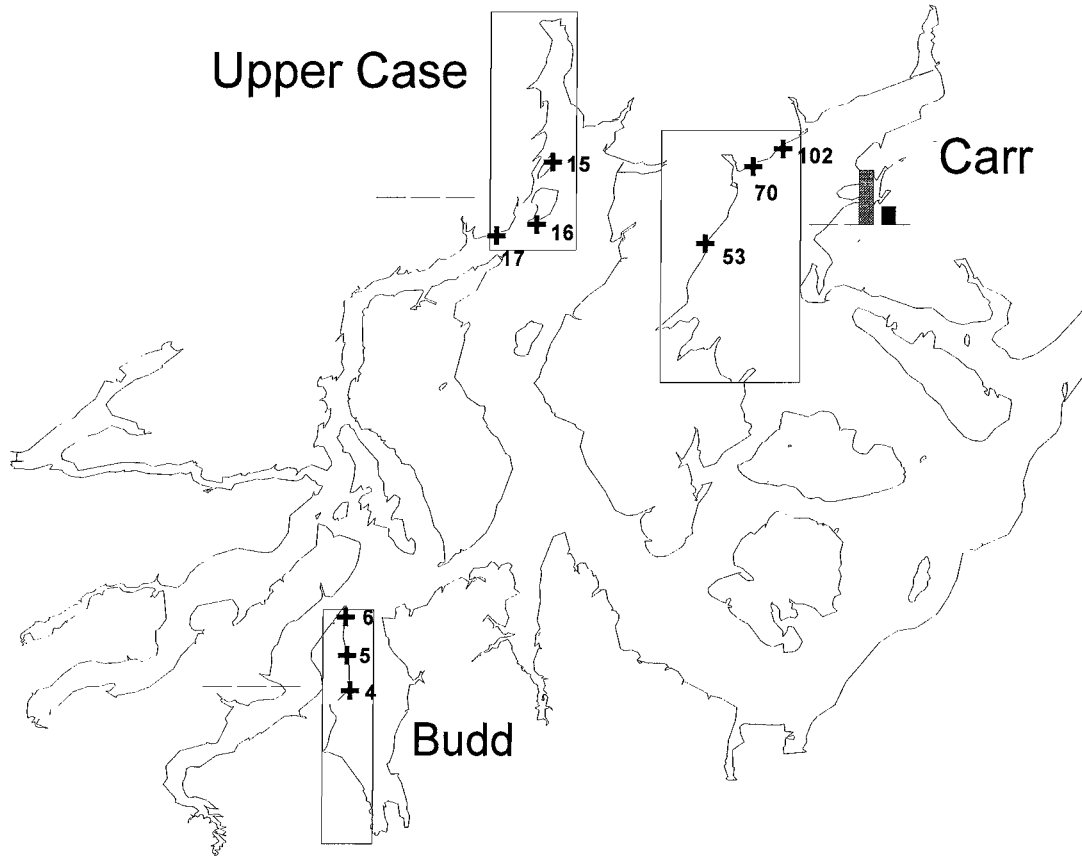
T-TEST: MAC.SE.C
 Mac.se.C with Year = 1 , and y: Mac.se.C with Year = 2
 t = -1, df = 178, p-value = 0.3187
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.03303757 0.01081534

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

98 *Macoma secta*:
 - - -
 0 0 0

99 *Macoma secta*:
 █ █ -
 10 5 0

**Appendix B20. Spatial distribution of *Macoma inquinata* (juv)
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: M.I.JU.C
M.i.ju.C with Year = 1 , and y: M.i.ju.C with Year = 2
t = -1.6485, df = 178, p-value = 0.101
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.097647803 0.008758914

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

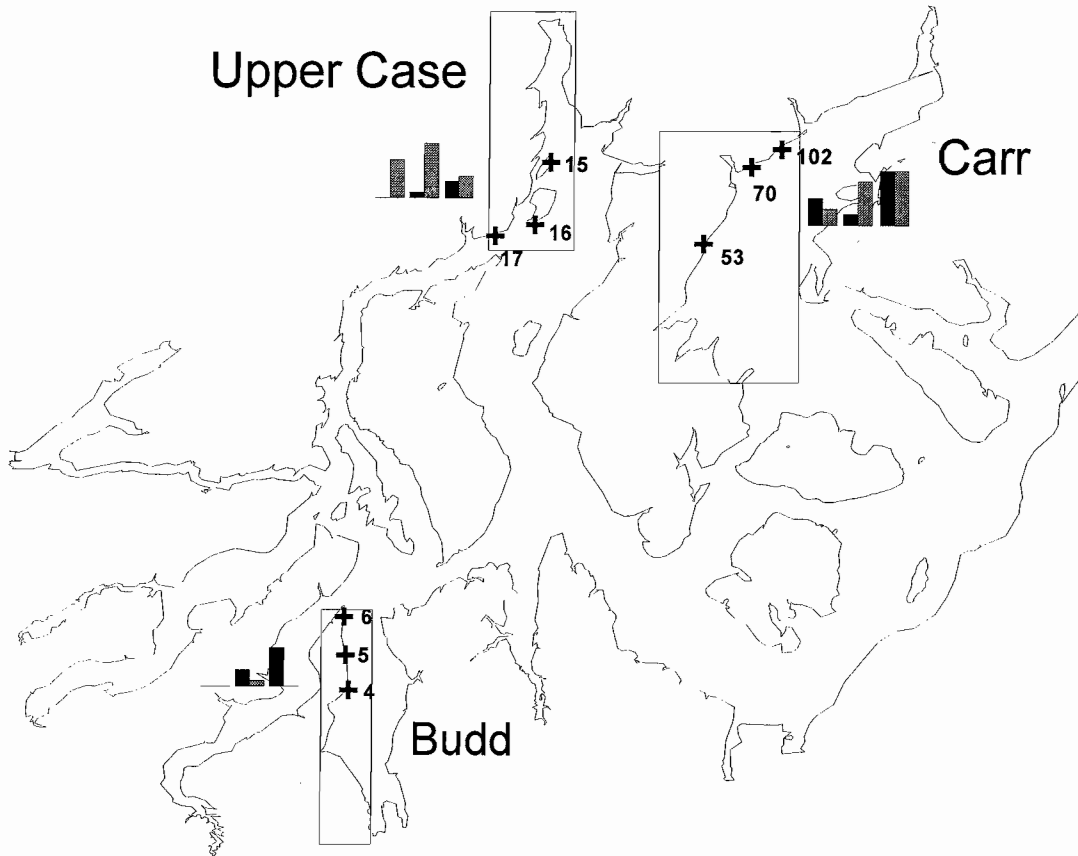
98 *Macoma inquinata*:



99 *Macoma inquinata*:



Appendix B21. Spatial distribution of *Mytilus trossulus* Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: MYT.TR.Q
 Myt.tr.Q with Year = 1 , and y: Myt.tr.Q with Year = 2
 t = -0.7805, df = 178, p-value = 0.4362
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.2352312 0.1018979

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

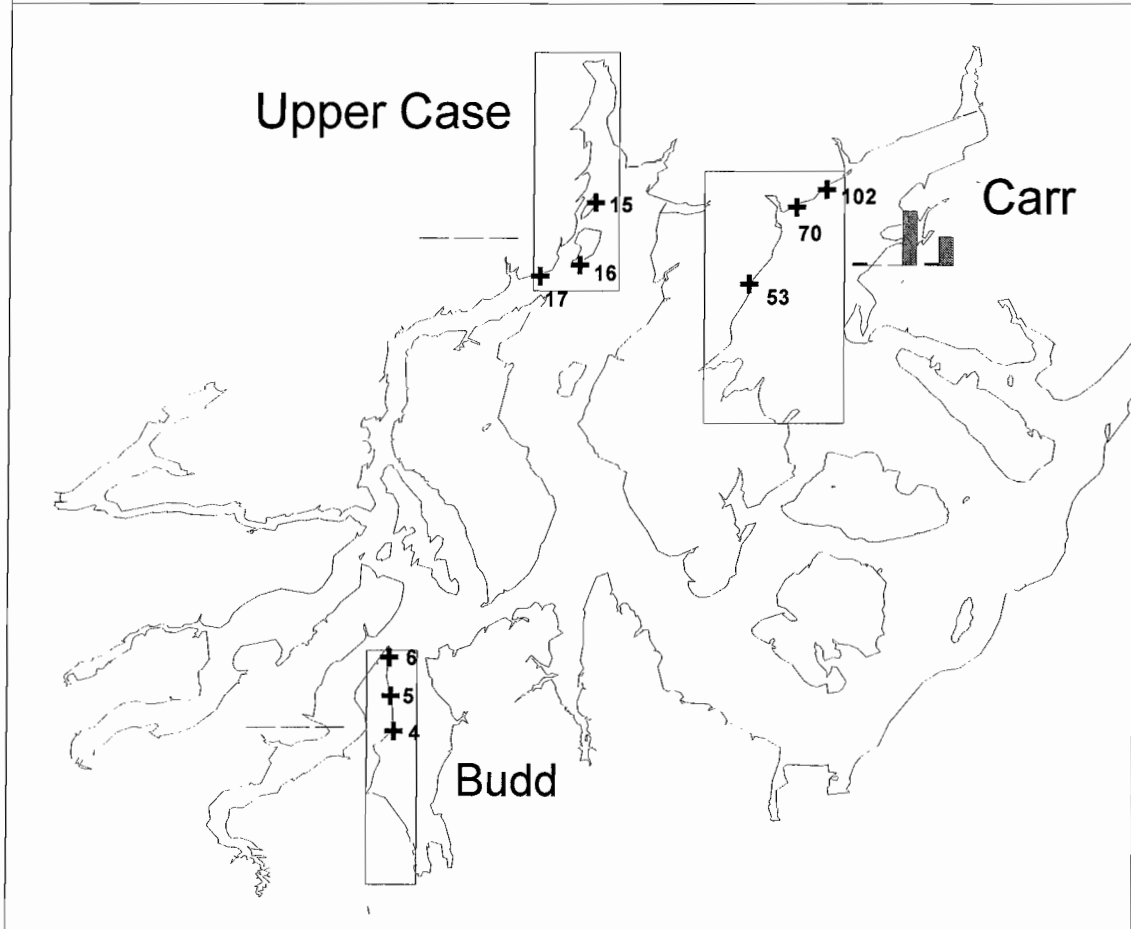
98 *Mytilus trossulus*:



99 *Mytilus trossulus*:



**Appendix B22. Spatial distribution of *Neotrypaea californiensis*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



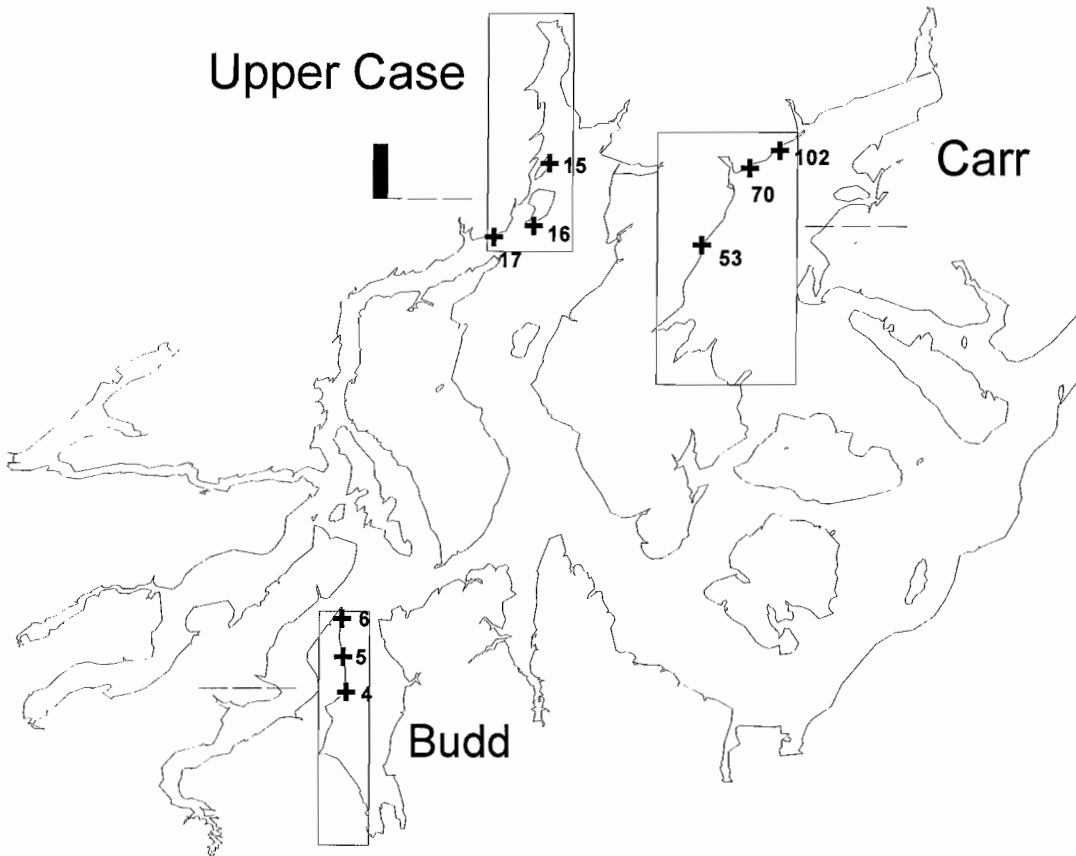
T-TEST: NEO.CA.C
 Neo.ca.C with Year = 1 , and y: Neo.ca.C with Year = 2
 t = -2.0289, df = 178, p-value = 0.044
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.219180140 -0.003042082

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

98 *Neotrypaea californiensis*:
 - - -
 1 1 0

99 *Neotrypaea californiensis*:
 █ █ -
 25 13 0

**Appendix B23. Spatial distribution of *Onuphis 'holobranchiata'*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: MYT.TR.Q
 Onu.ho.C with Year = 1 , and y: Onu.ho.C with Year = 2
 t = 1.4222, df = 178, p-value = 0.1567
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.008611769 0.053056213

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

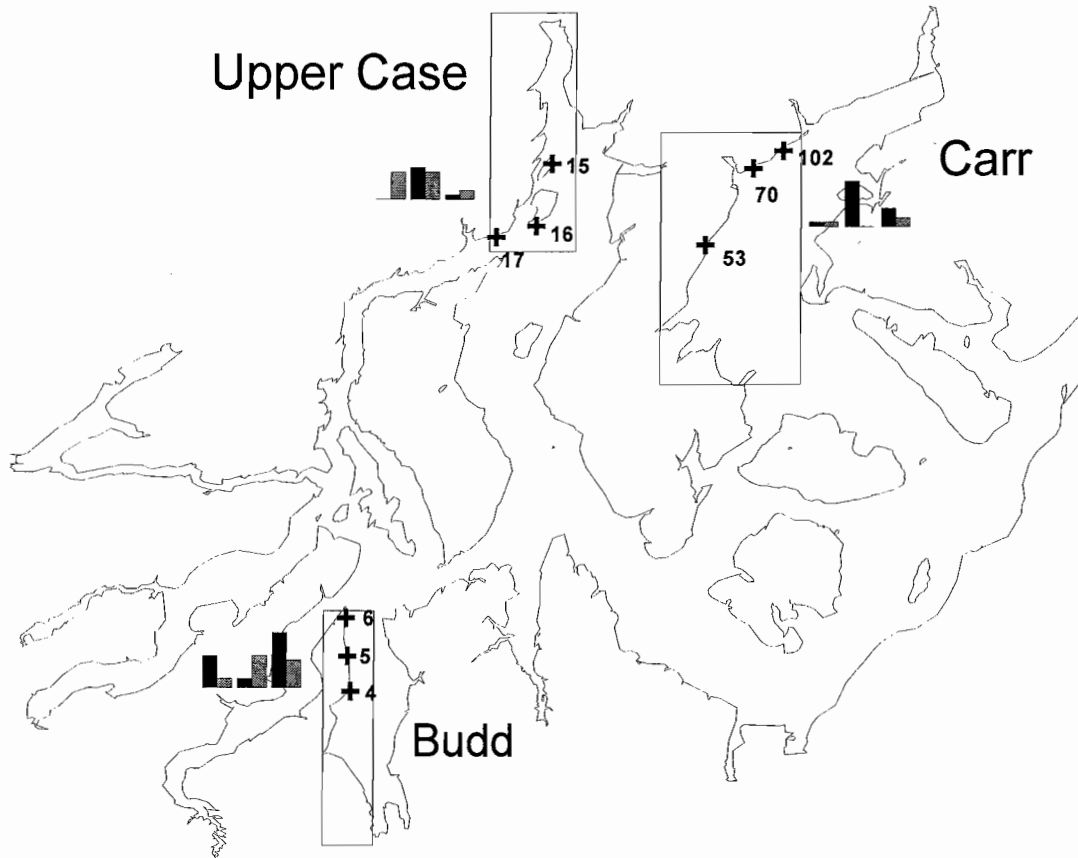
98 *Onuphis 'holobranchiata'*:



99 *Onuphis 'holobranchiata'*:



Appendix B24. Spatial distribution of Pagurus (all) Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: PAGUR.Q
 Pagur.Q with Year = 1 , and y: Pagur.Q with Year = 2
 $t = 1.5921$, $df = 178$, $p\text{-value} = 0.1131$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.2794207 2.6127540

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

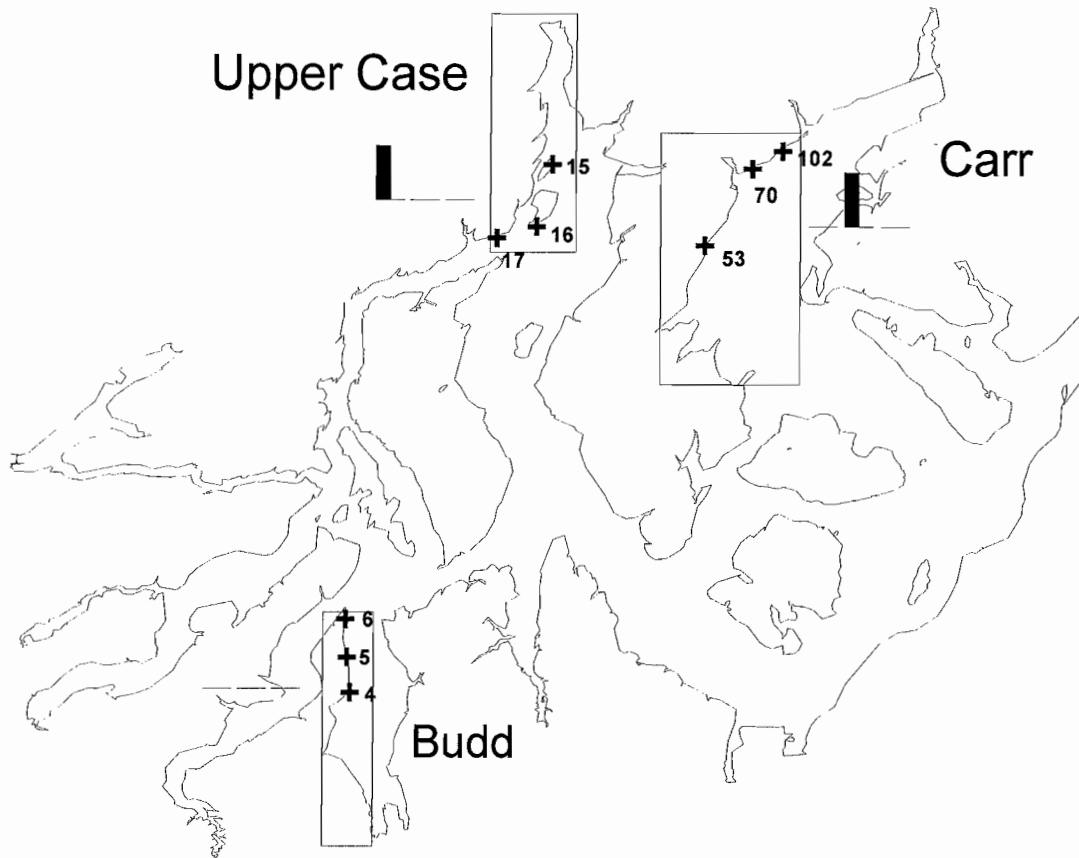
98 Pagurus spp. (beriganus and others):



99 Pagurus spp. (beriganus and others):



**Appendix B25. Spatial distribution of Polynoids (in core)
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: PAGUR.Q
 Polyno.C with Year = 1 , and y: Polyno.C with Year = 2
 t = 1.4222, df = 178, p-value = 0.1567
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.008611769 0.053056213

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

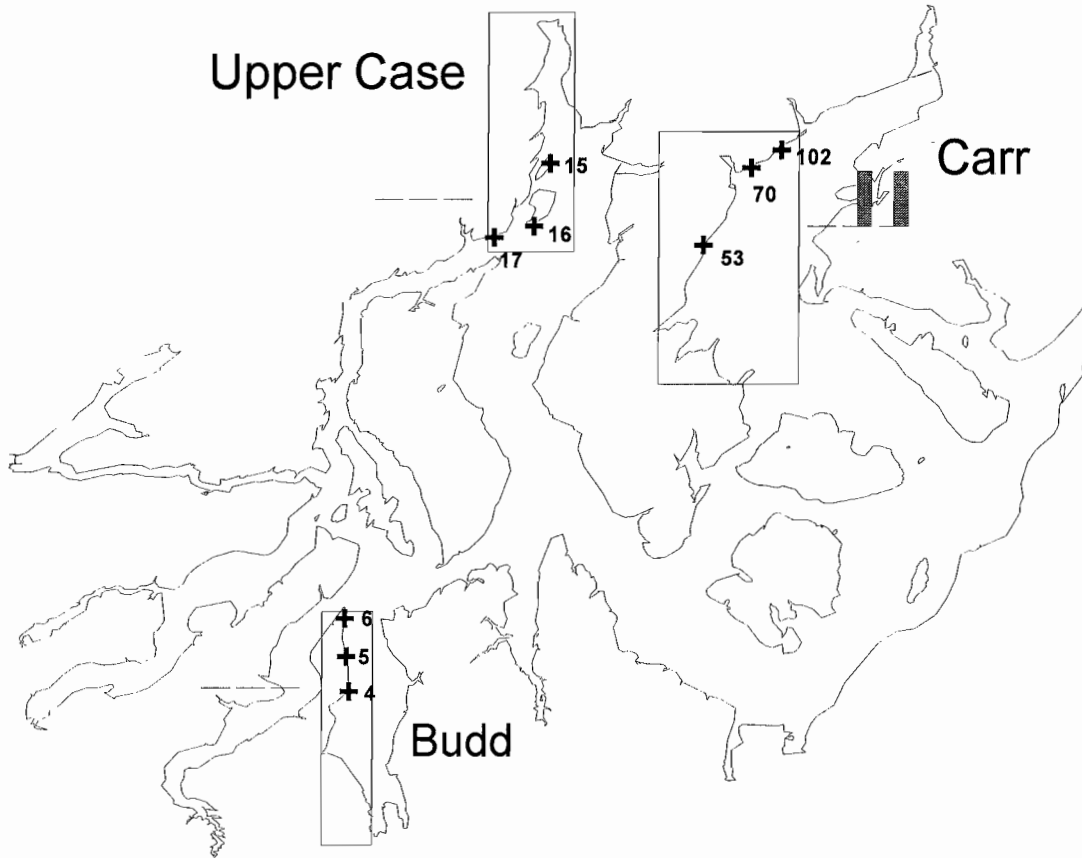
98 Polynoid (unident., in core):



99 Polynoid (unident., in core):



**Appendix B26. Spatial distribution of *Saxidomus giganteus* (juv)
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: SAX.GI.C
Sax.ju.C with Year = 1 , and y: Sax.ju.C with Year = 2
t = -1.4222, df = 178, p-value = 0.1567
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.053056213 0.008611769

Indicator values are based on 10 samples from
a 50 m horizontal transect at MLLW

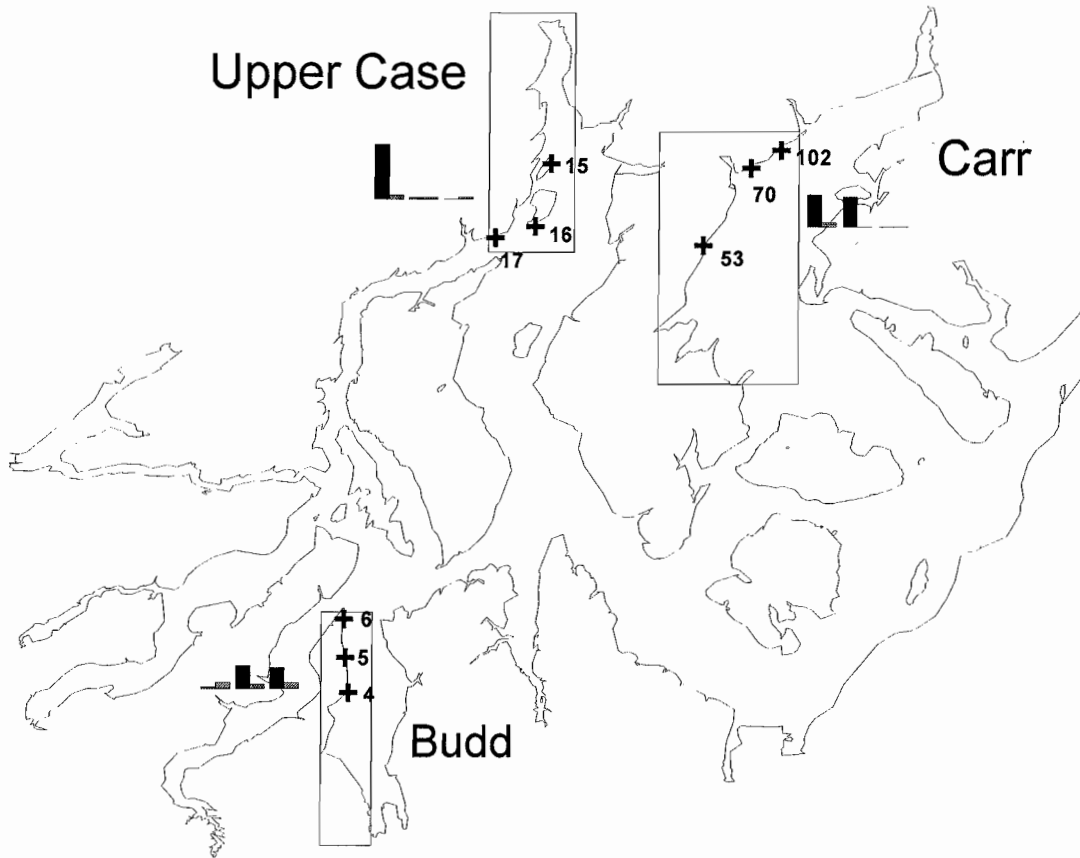
98 *Saxidomus giganteus* juv.:

0 0 0

99 *Saxidomus giganteus* juv.:

5 3 0

**Appendix B27. Spatial distribution of *Spiochaetopterus costarum*
Puget Sound 1999 vs 1998: South Basin
Low Zone Pebble Beach Taxa Distributions**



T-TEST: S.TUBE.Q
 Spi.co.C with Year = 1 , and y: Spi.co.C with Year = 2
 $t = 1.7518$, $df = 178$, $p\text{-value} = 0.0815$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 -0.004215259 0.070881926

Indicator values are based on 10 samples from
 a 50 m horizontal transect at MLLW

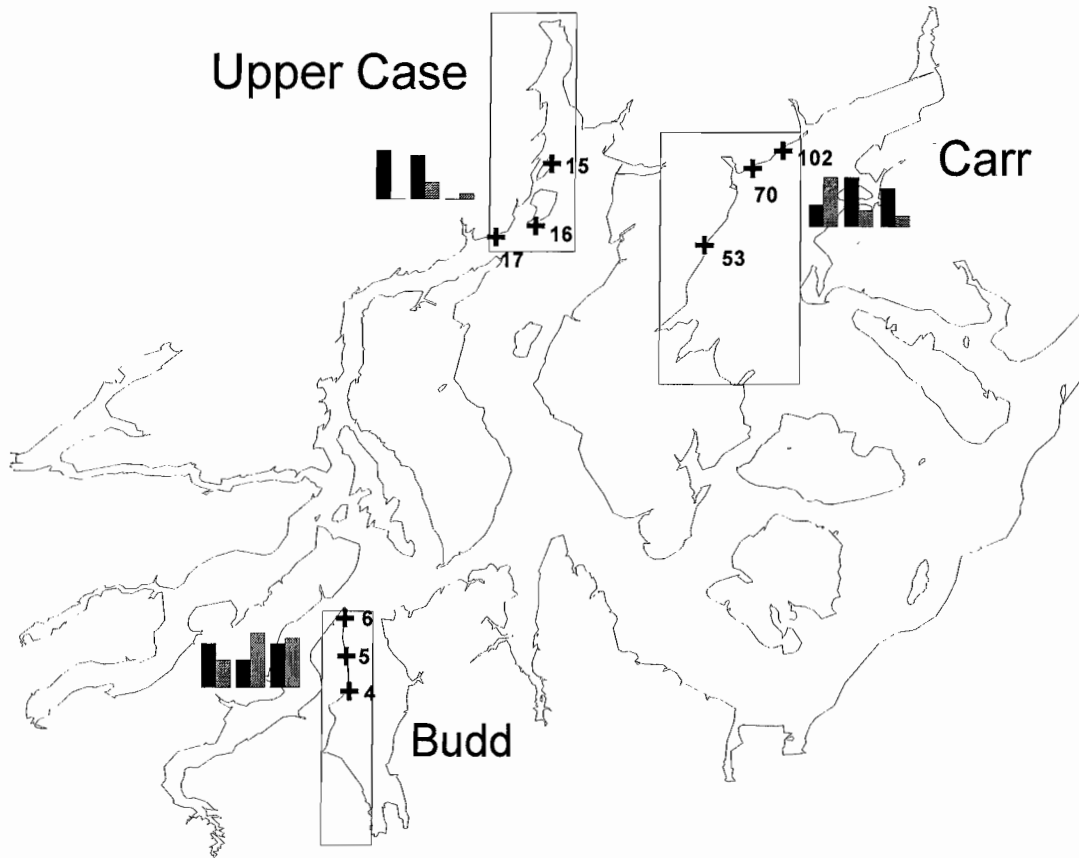
98 Spio tubes:



99 Spio tubes:



Appendix B28. Spatial distribution of ulvoids (all) Puget Sound 1999 vs 1998: South Basin Low Zone Pebble Beach Taxa Distributions



T-TEST: ULVOID.Q

Ulvoid.Q with Year = 1 , and y: Ulvoid.Q with Year = 2
 $t = 3.3396$, $df = 178$, $p\text{-value} = 0.001$
 alternative hypothesis: true difference in means is not equal to 0
 95 percent confidence interval:
 7.204703 28.017519

Indicator values are based on 10 samples from a 50 m horizontal transect at MLLW

98 Ulvoids (unident.):



99 Ulvoids (unident.):

