# BIOLOGICAL AND WATER QUALITY MONITORING IN THE RUSSIAN RIVER ESTUARY, 1997

## SECOND ANNUAL REPORT

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Submitted by

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# *I. SUMMARY*

This report summarizes the results for the second year of a field study to evaluate the impact of sandbar breaching at the mouth of the Russian River. The study included water quality sampling, fish and invertebrate sampling, and observations of pinniped numbers and behavior before and after breaching. The 1996 study design was modified for 1997 by including studies made on three dates for each event: a prebreaching survey, a draining survey, and a tidal survey. This resulted in an improved characterization of the effect of each breaching event on the estuary.

In 1997 the Russian River estuary mouth first closed March 30, and the sandbar was breached twelve times between March and early November. The MSC field team studied seven breaching events (comprising all breachings following closures of 7 days or more). This is in contrast to 1996 when the river mouth did not close until July and was breached only seven times.

Water quality profiles made at deep channel sites showed stratification (saline water overlain by brackish or fresh water). Near-bottom dissolved oxygen at these sites typically is reduced or absent during bar-closed conditions and renewed by tidal action following breaching. The length of time required to oxygenate the saline layers is shorter at shallow stations and those nearest the river mouth.

A finding of a 1992-1993 study (Heckel, 1994) was a wedge of saline, anoxic water killing mysids and fish as it drained from Willow Creek following a breaching event. This did not occur during either the 1996 or 1997 studies.

The estuary contains a diverse assemblage of marine, estuarine, and freshwater fish and invertebrate species. The estuary alternates between a tidal estuary (bar-open) and a coastal lagoon (bar-closed). The 1996 report concluded that the bar-open state is, in general, beneficial to the biota. This conclusion is further supported by the 1997 findings. Among the benefits of an open bar are the following:

- Tidal exchange helps keep the saline water layers oxygenated, and re-supplies marine plankton used as food by some of the organisms in the estuary.

- Food-rich mud flats and beaches exposed at low tides are available to wading birds and foraging mammals.

- Migrating salmonids and other fishes can enter or leave the estuary at any time. Steelhead smolts were found in the estuary throughout the study period in 1996, and both steelhead and coho salmon smolts were found in the estuary in 1997.

- Harbor seals use their preferred haulout sites at the mouth and at the snag area between Willow Creek and Sheephouse Creek.

The present management plan of breaching the sandbar when the river rises to 7 to 9 feet at Jenner appears appropriate in light of the findings of the 1992-1993 and both 1996 and 1997 studies. This plan limits bar-closed episodes to 7 to 10 days duration, and avoids flooding of riverside properties. Other conclusions derived from the 1997 study are that the estuary biota exhibits high variability from year to year, and that crowds of curious onlookers have a bigger impact on pinniped behavior than does the breaching operation itself.

The two-year study has shown that the breaching activity may have a beneficial impact on fish and seals. If continued monitoring is necessary for regulatory requirements, we recommend that a greater emphasis be placed on sampling salmonid smolts, and that tissue samples be provided for DNA analysis by an existing research program. Crowd control efforts at the breaching site should be continued throughout the breaching day, even after the SCWA breaching crew has left the site.

# II. INTRODUCTION

## BACKGROUND

A study of the hydrological, biological, and social impacts of artificially breaching the mouth of the Russian River was conducted in 1992-1993 for Sonoma County and the California State Coastal Conservancy under the direction of the Russian River Interagency Task Force. The final report of that study (Heckel, 1994) included selection of a preferred estuary management program which was used as the basis for the Russian River Estuary Management Plan subsequently adopted by the Board of Supervisors. The Management Plan includes biological and water quality monitoring to be conducted during artificial breaching events to support the adopted management approach or provide the basis for modification, as appropriate. Merritt Smith Consulting (MSC) was selected by the Sonoma County Water Agency (SCWA) to implement the monitoring element of the Management Plan during artificial breaching events in 1996 and 1997.

The results of the 1996 study program were presented in a previous report (MSC 1997), which included some recommended modifications to the study protocols for use in the 1997 program. This report presents the results of the 1997 study program.

## STUDY PROGRAM

The study program conducted during 1996 included the following elements:

- Pre- and post-breaching water quality profiles (depth, temperature, salinity, conductivity, and dissolved oxygen) at four stations, and continuous recording of temperature, salinity, and dissolved oxygen near the river bottom at three stations during breaching events.

- Pre- and post-breaching sampling of fish and epi-benthic invertebrates at four stations, by means of otter trawl and beach seine, and of planktonic invertebrates at two stations, by means of plankton trawl net.

- Observations of pinniped behavior near the river mouth before, during, and after breaching events

In 1996 the study design was to conduct the pre-breaching surveys on the day before breaching events, and the post-breaching surveys the day following breaching events. Unanticipated events (mainly unauthorized premature breachings and failed attempts at authorized breachings) limited the team's success in adhering to the planned schedule. Additionally, water quality sampling during the 1996 study revealed that more than one day and one or two tidal cycles following breaching was necessary before the estuary flushed and water quality returned to conditions typical of bar-open periods. Therefore, the study program was modified for 1997 in the following ways:

- Pre-breaching surveys were conducted after the river mouth had been closed at least seven days, but not necessarily on the day before breaching.

- "Draining" surveys were conducted on the day following successful breaching, while the system was still in the process of being flushed.

- "Tidal" surveys were conducted three to five days after breaching, so that the data collected would be representative of typical bar-open, tidal circulation in the estuary.

- Recording temperature/salinity/dissolved oxygen sensors were deployed at three estuary locations throughout the study period, not just during breaching events, as was the case in the 1996 study.

- Pinniped observations were made on the same schedule as in 1996, i.e., before, during, and after three breaching events.

The station locations are shown in Figure 2-1, and are the same sites used in 1996. Stations 2, 3, and 4 are at the same locations as the corresponding stations used for biological and water quality sampling in the previous study (Heckel, 1994).

At Station 1, otter trawls and water quality measurements were taken near the jetty in water 8-11 meters (m) deep, but the beach seining for Station 1 was conducted at the western tip of Penny Island, about 300 m from the pier pilings. Beach seining was, by necessity, conducted at gently sloping beaches located as closely as possible to the designated station locations used for otter trawling and water quality sampling.

At Station 2, beach seining was conducted on the north shore opposite the station location shown in Figure 2-1 (otter trawls and water quality profiles were taken in the 6-8 m deep channel adjacent to the south shore).

At Station 3, beach seining was conducted on the beach in front of the Ranger's residence just upstream of the mouth of Willow Creek, whereas, water quality sampling was conducted in the deep (4 m) channel adjacent to the east river bank 200 m downstream from the Willow Creek mouth. Otter trawling was conducted in shallow (2 m) water near the deep channel (the deep channel was filled with submerged trees and large rock outcrops). On each prebreaching survey, and on other surveys whenever the creek was navigable, water quality profiles were also taken inside Willow Creek at a location about 0.5 km upstream from the bridge where the water was about 2 m deep at high water. This

Figure 2-1

site is shown as Station 3A in Figure 2-1. Station 3 plankton trawls were conducted in the shallow (1 m) channel leading southward from the Willow Creek mouth, as well as at a control site located about 300 m upstream of the creek mouth, north of the Ranger's residence.

At Station 4, otter trawling and water quality sampling were conducted in the deep (14 m.) channel adjacent to the rocky cliff on the northwest bank just below the mouth of Sheephouse Creek, while beach seining was done on the southeast bank opposite the mouth of Sheephouse Creek.

## *METHODS*

### *Water Quality Monitoring*

Water quality vertical profiles (observations at 1 m vertical intervals) were conducted at each station each time biological sampling was conducted. Portable YSI salinity and dissolved oxygen meters were used to obtain *in situ* data on temperature, salinity, conductivity, and dissolved oxygen. The profiles were performed in the deepest part of the channel at each station, to determine whether or not salinity stratification was present. Additionally, submerged, continuous-recording meters (Hydrolab Datasonde III) were installed in the deep channels at Stations 1, 3, and 4 on 9 May and deployed continuously until 7 November 1997. These instruments were used to record temperature, salinity, and dissolved oxygen a few cm above the river bottom. Typically the datasondes were retrieved on the day of the prebreaching surveys and returned to the laboratory where data files were downloaded and the instruments were cleaned, serviced, and recalibrated. They were deployed the following morning. In some cases, one or more parameters were not measured due to a malfunctioning Datasonde. Repair would have required shipment to the Hydrolab factory for repair and no data would have been collected. In such situations, the MSC team opted for reduced functionality rather than no data.

### *Biological Monitoring: Fish and Macro-Invertebrates*

Otter trawls are nets which are dragged along the bottom. Otter trawl sampling was conducted in the deep channel at each station to collect slow-moving, benthic fishes and macro-invertebrates (e.g., crabs, shrimp, and mysids). The trawl is eight feet wide at the mouth, with 1/8 in. (square) mesh throughout. Single tows of four-minute duration were conducted at each station. The trawl was towed at 3-5 mph. behind a 16 ft. aluminum skiff powered by a 25 hp. outboard motor. After each successful trawl was completed, the contents of the net were brought aboard and emptied into a large plastic tray filled with water for sorting, counting, and species identification. Nearly all specimens were released alive and unharmed. A small number of invertebrates and non-salmonid juvenile or larval fish were preserved for closer examination in the laboratory. Fish were identified to the species level. Most invertebrates were identified to species; in a few cases identifications were only to the genus or family level.

Beach seines collect fishes throughout the water column near shore. Beach seine sampling was used to capture more agile fishes (especially salmonids) which cannot be caught by otter trawl, as well as mid-water fishes. The beach seine used in this study is 100 ft. long, 8 ft. deep, with an 8 by 8 by 8 ft. bag in the center, and is composed of 3/8 in. mesh knotless nylon netting. The seine was deployed by using the boat to pull one end offshore, and then around in a half-circle while the other end was held onshore by another person. Both team members then pulled the net ashore by hand. Captured fish and invertebrates were placed in a water-filled tray for sorting, identifying, and counting prior to release. Captured coho and steelhead smolts were also measured and examined closely for general condition and wild vs. hatchery origin prior to release.

A 100 ft. long, 14 ft. deep purse seine was tested at beach seine sites in May 1997. It was thought that a purse seine might be more effective than the beach seine during deep-water, pre-breaching conditions (when the water level at the Jenner Visitor's Center exceeds about 6 ft, it becomes increasingly difficult to effectively deploy and retrieve the beach seine at three of the four stations, as the water floods into terrestrial vegetation and steep banks). After numerous parallel trials with the beach seine, it was concluded that the purse seine was less effective at capturing salmonids than the beach seine (no salmonids were ever caught in the purse seine), although it seemed more effective at capturing schooling fishes such as Pacific herring and Sacramento sucker. In addition to sampling a smaller area than a beach seine of the same length, the purse seine is much bulkier and more difficult to deploy and retrieve (a purse seine any longer than 100 ft. would require a bigger boat and more personnel to handle it). Since sampling salmonids was the primary goal of the seining, use of the purse seine was abandoned after the trials.

***Biological Monitoring: Plankton***

Plankton trawls were made in conjunction with prebreaching and with draining surveys conducted at Station 3, at the mouth of Willow Creek, and at another site in the river a short distance upstream of the mouth of Willow Creek (Figure 2-1). The net used is a standard egg and larval net (conical, mouth 0.5 m diameter, 505 µm mesh). The plankton net was towed slowly behind the boat, just above the river bottom in shallow (ca. 1 m) water for two minutes. A General Oceanics flowmeter was attached to the mouth of the net to estimate the volume of water sampled.

***Biological Monitoring: Pinnipeds***

Observations of pinniped (mostly harbor seals) behavior near the traditional haulout site at the river mouth were made before, during, and after breaching events, following the method used by Hanson's team in the previous study (Heckel, 1994). An observer (pinniped behavior specialist Joseph Mortenson) stationed on the bluffs along Highway 1 made a continuous record of human/pinniped interactions. The day prior to breaching was used to provide a baseline for considering the effects of breaching *per se*. During the day of breaching, seal numbers and behavior were observed before, during, and after breaching. Observations made on the day following breaching were used to indicate the extent of recovery toward prebreaching use of the area.

# *III. RESULTS*

## *BREACHING EVENTS IN 1997*

The study plan for 1997 was to conduct surveys in conjunction with up to 7 breaching events, to be spread out over the months between the first closure and the last. Table 3-1 summarizes the 1997 berm closures and breachings. A more detailed account of events surrounding each breaching can be found in Appendix D-1.

**Table 3-1. Summary of 1997 Berm Closures and Breachings.**

| Date Closed | Days Closed | Date Breached | Days open | Study Event # |
|---|---|---|---|---|
| 30 March | 1 | 31 March | 18 | not studied |
| 18 April | 5 | 23 April (N)[1] | 12 | not studied |
| 2 May | 1 | 3 May (N)[1] | 12 | not studied |
| 15 May | 7 | 22 May | 11 | I |
| 2 June | 7[2] | 9 June | 7 | II |
| 16 June | 11 | 26 June | 44 | III |
| 9 August | 10 | 20 August | 19 | IV |
| 9 September | 10 | 19 September | 7 | V |
| 26 September | 3 | 29 September | 4 | not studied |
| 3 October | 8 | 11 October | 15 | VI |
| 26 October | 8 | 3 November | 4 | VII |
| 7 November | ? | ? | ? | not studied |

[1]Natural breaching; all others done by SCWA.

[2]Berm was open for about one hour during an attempted breach on 6 June.

The bar was closed 3 times between late April and early May, but in each of these events the river remained closed for only one to five days before it was breached. Closures beginning with the middle of May were associated with lower river outflows, and were of 7 to 11 days in duration. There were seven such closures during 1997, and each was studied according to the plan outlined above. (A brief closure in late September of only 3 days was not studied.) Table 3-2 lists the days on which field surveys were done in 1997.

Two breachings were studied in June, and one breaching each in May, August, September, October, and November. No breachings occurred in July. The 1997 study plan enabled the study team to accomplish the goal of three surveys (prebreaching, draining, tidal) for each of seven events.

**Table 3-2. Summary of 1997 Field Surveys.**

| Event | Prebreaching Survey | Draining Survey | Tidal Survey |
|---|---|---|---|
| I | 20 May | 23 May | 27 May |
| II | 6 June | 10 June | 13 June |
| III | 22-23 June | 28 June | 1 July |
| IV | 18 August | 21 August | 26 August |
| V | 16 September | 20 September | 23 September |
| VI | 10 October | 12 October | 15 October |
| VII | 31 October | 4 November | 7 November |

## *WATER QUALITY MONITORING*

### In situ *Profiles*

Water quality profiles were made at Stations 1 through 4 on twenty-one dates in 1997. These are listed in Table 3-2. The complete data are given in Appendices A-1 through A-21. Prebreaching, draining, and tidal profiles are illustrated graphically for three breaching events which typify water quality changes associated with breaching during 1997 (event I, breached 22 May; event IV, breached 20 August, and event VII, breached 3 November). These plots are given in Appendices A-22 through A-33.

As was the case in 1992-1993 and 1996, prebreaching profiles at the deeper stations showed a stratified water column with fresh (or brackish) water overlaying a pocket of saline water. Dissolved oxygen in the deeper water typically was reduced or absent after a few days of bar-closed conditions. Station 1 profiles during the draining phase usually showed that dissolved oxygen was mixed into the saline bottom layer, although the salinity stratification remained (Appendix A-22, A-26). Near-bottom dissolved oxygen at the other stations was also renewed by tidal action following breaching events, but depending upon the depth and distance from the mouth, mixing occurred later. For example, at Stations 2 and 3, dissolved oxygen was often not mixed to the bottom until the tidal survey (see Appendix A-23, A-24, A-27). Station 4, being deepest and farthest from the mouth sometimes had near-bottom dissolved oxygen mixed by the tidal survey (Appendix A-33), but more typically did not mix until a few days later. Datasonde

records (see below) show that near-bottom layers at Station 4 sometimes remained anoxic (did not mix) between breaching events.

Water quality profiles made in Willow Creek (Station 3A) during prebreaching surveys never showed anoxia. The lowest dissolved oxygen value recorded for Station 3A was 4.9 mg/L during the draining survey made on 4 November. Creek water, as was found in 1996, was mostly fresh. Thus, the finding of the 1992-1993 study--the saline, anoxic water with dead mysids entering the estuary from Willow Creek following breaching--was not found in either 1996 or 1997. Plankton tows made in 1996 and in 1997 (see below) confirm that the marsh/creek water was not salty or anoxic.

### *Datasonde Records*

Datasonde records of water quality conditions near the bottom are shown for Stations 1, 3, and 4 in Appendix A-32 through A-34. Appendix A-35 shows that at Station 1 the near-bottom dissolved oxygen typically was reduced during bar-closed conditions but increased quickly after breaching events. The records for Station 1 are incomplete after mid-September due to instrument malfunction. Records for Station 3 (Appendix A-35) show a clear pattern of near-bottom anoxia developing within a week of berm closure, followed by increases in dissolved oxygen due to tidal mixing within a few days following breaching. At Station 4 (Appendix A-36) the same general pattern was found, although dissolved oxygen was often not mixed to the bottom until 10 days after breaching. Dissolved oxygen was not mixed to the bottom at Station 4 at all following the breaching of 20 August (Appendix A-35). Data was not collected at Station 4 between mid-June and mid-August due to an inadvertent power loss to the Datasonde.

## *BIOLOGICAL MONITORING*

### *Fish and Macro-Invertebrates*

A list of all the fish species captured by otter trawl and seine in 1996 and 1997 is provided in Table 3-3, showing 34 species representing 18 families. Seven species caught in 1996 were not caught in 1997, and 10 species caught in 1997 were not caught in 1996. Also listed in Table 3-3 are the 24 species in 17 families captured in the 1992-1993 Russian River Estuary study (Heckel, 1994). Sixteen of the species captured in 1996 or 1997were also captured 1992-1993. Such variability is typical of estuaries. Oceanic conditions, climatology, runoff, variable physical nature of estuaries in general, normal year-to-year variability in fish population size, reproductive success, etc. all combine to cause a great deal of year-to-year variability in species caught. Studies at nearby estuaries showed similar variability both from year to year and between estuaries (Commins et al., 1990, 1996). The number of species and list of species observed each year is heavily influenced by sporadic invasions of estuaries by marine species. A great number of nearshsore species may occasionally venture into the mouths of estuaries (e.g., sculpins such as buffalo sculpin, bull sculpin, smoothhead sculpin, cabezon, ling cod, Pacific tomcod, kelp greenling, various surfperches besides shiners, also midshipmen, juvenile rockfish, etc). The number of species that are typical of California estuaries is

quite small (staghorn and prickly sculpin, a few gobies, topsmelt, jacksmelt, surfsmelt, shiner surfperch, stickleback, starry flounder, English sole, bay pipefish, are nearly always represented in the yearly catch), compared to the number of marine and freshwater species likely to occur sporadically in the catches.

| Table 3-3. Fish Species Caught in the Russian River Estuary, 1992-93, 1996, and 1997. | | | | | |
|---|---|---|---|---|---|
| **Family** | **Scientific Name** | **Common Name** | **92-93** | **96** | **97** |
| Atherinidae | *Atherinops affinis* | Topsmelt | | X | X |
| Bothidae | *Citharichthys sordidus* | Pacific sanddab | X | X | X |
| Catostomidae | *Catostomus occidentalis* | Sacramento sucker | X | X | X |
| Centrarchidae | *Lepomis cyanellus* | Green sunfish | X | X | |
| | *Lepomis macrochirus* | Bluegill | | X | |
| | *Micropterus dolomieui* | Smallmouth bass | | X | X |
| Clupeidae | *Clupea harengus pallasii* | Pacific herring | X | X | X |
| Cottidae | *Artedius lateralis* | Smoothhead sculpin | | | X |
| | *Cottus asper* | Prickly sculpin | X | X | X |
| | *Enophrys bison* | Buffalo sculpin | | | X |
| | *Enophrys taurina* | Bull sculpin | | | X |
| | *Leptocottus armatus* | Staghorn sculpin | X | X | X |
| | *Scorpaenichthys marmoratus* | Cabezon | | X | X |
| | *Sebastes sp.* | Unknown Juv. Sebastes | X | | X |
| Cyprinidae | *Cyprinus carpio* | Carp | X | | |
| | *Lavinia symmetricus navarroensis* | Navarro roach | X | X | |
| | *Mylopharodon concephalus* | Hardhead | X | | |
| | *Ptychocheilus grandis* | Sacramento squawfish | | X | |
| Embiotocidae | *Cymatogaster aggregata* | Shiner surfperch | X | X | X |
| | *Hyperprosopon anale* | Spotfin surfperch | | | X |
| | *Hyperprosopon argenteum* | Walleye surfperch | | X | |
| | *Hysterocarpus traskii* | Russian River tuleperch | | X | |
| Engraulididae | *Engraulis mordax* | Northern anchovy | X | | X |
| Gadidae | *Gadus macrocephalus* | Pacific tomcod | | X | X |
| Gasterosteidae | *Gasterosteus aculeatus* | Threespine stickleback | X | X | X |

| Table 3-3. Fish Species Caught in the Russian River Estuary, 1992-93, 1996, and 1997. | | | | | |
|---|---|---|---|---|---|
| **Family** | **Scientific Name** | **Common Name** | **92-93** | **96** | **97** |
| Gobiesocidae | *Gobiesox maendricus* | Northern clingfish | X | | |
| Gobiidae | *Clevelandia ios* | Arrow goby | | X | |
| Hexagrammidae | *Hexagrammos decagrammus* | Kelp greenling | | | X |
| | *Ophiodon elongatus* | Lingcod | | X | X |
| Osmeridae | *Hypomesus pretiosus* | Surf smelt | X | X | X |
| | *Spirinchus thaleichthys* | Longfin smelt | | | X |
| Pleuronectidae | *Isopsetta ischyra* | Hybrid sole | X | X | X |
| | *Parophrys vetulus* | English sole | X | X | X |
| | *Platichthys stellatus* | Starry flounder | X | X | X |
| | *Psettichthys melanostictus* | Sand sole | X | | |
| Pholididae | *Pholis ornata* | Saddleback gunnel | | | X |
| Poecillidae | *Gambusia affinis* | Mosquitofish | X | | |
| Salmonidae | *Oncorhynchus mykiss* | Steelhead | X | X | X |
| | *Oncorhynchus kisutch* | Coho salmon | | | X |
| | *Oncorhynchus tshawytscha* | Chinook salmon | X | | |
| Sciaenidae | *Genyonemus lineatus* | White croaker | X | | |
| Syngnathidae | *Syngnathus griseolineatus* | Bay pipefish | X | X | X |

Otter trawls typically sample epibenthic and benthic species, and at most stations trawls were deployed in deep channels with saline near-bottom layers. Trawl catches therefore included marine-estuarine benthic species. The 1997 otter trawl catch is summarized in Table 3-4. Prickly sculpin comprised 45 percent of the entire catch and were abundant at each station, as were they in 1996 (MSC, 1997). Of the species each representing at least 1 percent of the total catch, all but Sacramento sucker are common estuarine species in this region. Sacramento sucker are generally considered to be strictly freshwater fish (Moyle, 1976). As shown in Table 3-4, nearly all the Sacramento sucker caught in the trawls were caught at Station 3, which is the one station at which it is not possible to do bottom trawls in the deepest channel (owing to massive submerged trees and rock outcrops). Instead, the otter trawling at Station 3 was always done in relatively shallow water (usually only 4-7 ft deep), meaning that a good portion of each trawl at that station was done either in fresh water or low-salinity water (< 2 ppt).

| Table 3-4. Total Catch in Otter Trawls in Russian River Estuary, 1997 | | | | | | |
|---|---|---|---|---|---|---|
| **Common Name** | **Stn 1** | **Stn 2** | **Stn 3** | **Stn 4** | **total** | **%** |
| Prickly sculpin | 153 | 353 | 718 | 367 | 1591 | 44.7 |
| English sole | 321 | 86 | 4 | 15 | 426 | 12.0 |
| Sacramento sucker | 0 | 2 | 388 | 7 | 397 | 11.1 |
| Pacific herring | 31 | 9 | 219 | 93 | 352 | 9.9 |
| Pacific sanddab | 245 | 5 | 1 | 0 | 251 | 7.0 |
| Shiner surfperch | 87 | 19 | 64 | 25 | 195 | 5.5 |
| Starry flounder | 9 | 5 | 26 | 71 | 111 | 3.1 |
| Bay pipefish | 2 | 13 | 33 | 52 | 100 | 2.8 |
| Staghorn sculpin | 18 | 15 | 4 | 6 | 43 | 1.2 |
| Surf smelt | 28 | 0 | 3 | 0 | 31 | 0.9 |
| Threespine stickleback | 1 | 4 | 7 | 4 | 16 | 0.4 |
| Cabezon | 13 | 0 | 0 | 0 | 13 | 0.4 |
| Longfin smelt | 12 | 0 | 0 | 0 | 12 | 0.3 |
| Pacific tomcod | 5 | 0 | 0 | 0 | 5 | 0.1 |
| Topsmelt | 1 | 0 | 2 | 0 | 3 | 0.1 |
| Buffalo sculpin | 3 | 0 | 0 | 0 | 3 | 0.1 |
| Lingcod | 3 | 0 | 0 | 0 | 3 | 0.1 |
| Steelhead | 1 | 0 | 1 | 1 | 3 | 0.1 |
| Unknown Juv. Sebastes | 2 | 0 | 0 | 0 | 2 | 0.1 |
| Kelp greenling | 2 | 0 | 0 | 0 | 2 | 0.1 |
| Bull sculpin | 1 | 0 | 0 | 0 | 1 | 0.0 |
| Spotfin surfperch | 1 | 0 | 0 | 0 | 1 | 0.0 |
| Northern anchovy | 0 | 1 | 0 | 0 | 1 | 0.0 |
| Hybrid sole | 0 | 0 | 0 | 1 | 1 | 0.0 |
| Saddleback gunnel | 1 | 0 | 0 | 0 | 1 | 0.0 |
| **Total** | **940** | **512** | **1470** | **642** | **3564** | **100.0** |

Complete data for each trawl and station are provided in Appendix Tables B-1 through B-21, which also include the data for invertebrates captured in otter trawls. Otter trawl fish catches for each station and date are displayed graphically in Appendices B-22 through B-35. Analysis of the trawl data provided in Appendix B shows no apparent trends in pre- versus post-breaching species captured, number of species, or number of individuals. High variability is the most obvious feature of the data. Three juvenile steelhead were caught by otter trawl in 1997.

Beach seines sample the whole water column in shallow (up to 8 feet) near-shore areas. These areas are typically fresh or brackish, so marine species are not usually caught. Beach seines surround an area, isolating the fish within; they are more effective at catching fast-swimming species (including salmonids) than bottom trawls. Fish captured by beach seine in 1997 are summarized in Table 3-5, which shows 16 species captured, with 69 percent of the total represented by topsmelt alone, followed by Sacramento sucker (18 percent). Topsmelt dominated the catch by beach seine in 1996 as well (MSC, 1997). Thirteen of the 16 species caught by beach seine in 1997 were also captured by beach seine in 1996. Both steelhead and coho salmon smolts were captured by beach seine in 1997. Complete catch data for beach seining (and purse seining) are tabulated in Appendices B-36 through B-57, and are displayed graphically in Appendices B-58 through B-71.

**Table 3-5. Total Catch in Beach Seines in Russian River Estuary, 1997**

| Common Name | Stn 1 | Stn 2 | Stn 3 | Stn 4 | total | % |
|---|---|---|---|---|---|---|
| Topsmelt | 1891 | 225 | 1094 | 246 | 3456 | 68.6 |
| Sacramento sucker | 2 | 13 | 522 | 391 | 928 | 18.4 |
| Pacific herring | 18 | 32 | 138 | 14 | 202 | 4.0 |
| Shiner surfperch | 23 | 57 | 5 | 13 | 98 | 1.9 |
| Starry flounder | 2 | 1 | 69 | 10 | 82 | 1.6 |
| Surf smelt | 0 | 17 | 56 | 0 | 73 | 1.4 |
| Threespine stickleback | 3 | 0 | 48 | 4 | 55 | 1.1 |
| Prickly sculpin | 0 | 5 | 16 | 33 | 54 | 1.1 |
| Steelhead | 2 | 4 | 17 | 11 | 34 | 0.7 |
| Coho salmon | 10 | 5 | 2 | 1 | 18 | 0.4 |
| Staghorn sculpin | 8 | 3 | 1 | 4 | 16 | 0.3 |
| English sole | 0 | 0 | 1 | 13 | 14 | 0.3 |
| Bay pipefish | 1 | 0 | 2 | 1 | 4 | 0.1 |
| Pacific sanddab | 0 | 0 | 0 | 2 | 2 | 0.0 |
| Smoothhead sculpin | 1 | 0 | 0 | 1 | 2 | 0.0 |
| Smallmouth bass | 0 | 1 | 0 | 0 | 1 | 0.0 |
| **Total** | **1961** | **363** | **1971** | **744** | **5039** | **100.0** |

Appendix Tables B-36 and B-37 include results of parallel trials of the purse seine with the beach seine at each station. Not shown are a number of aborted attempts to deploy the purse seine when winds and currents led to impossible tangles of boat, net, and

submerged objects. The purse seine appeared to be more effective at capturing some schooling fishes (mainly juvenile Sacramento sucker and, in one case, Pacific herring), but the purse seine did not capture any salmonids, which may have escaped under the lead line. We could more effectively fish with the beach seine than with the purse seine during draining and tidal surveys. Given the difficulty of deployment and uncertainty of any advantage to using the purse seine during high-water prebreaching surveys, further use of the purse seine was abandoned. We were able to get a sample with the beach seine at high water at every station except Station 2, although Appendix Figures B-58 through B-71 reveal a trend of smaller catches during pre-breach surveys. The same trend was noted in 1996 (MSC, 1997), and is most likely a reflection of both the difficulty of retrieving the seine at high water by pulling it through flooded emergent and terrestrial vegetation and debris, and of the fact that such habitat is less likely to be used by fish for foraging or resting than would be habitat that is normally submerged.

Fish species found in beach seines reflect seasonal patterns of reproduction and migration. Early in the summer (May and June, events I, II, and III), the beach seine catches were dominated by young-of-the-year Sacramento sucker (20-40 mm length). Later in the summer (Events V, VI and VII) the dominant fish were topsmelt of mixed size.

A total of 34 steelhead were captured by beach seine in 1997. The catches were scattered throughout the summer, as shown in Appendix B-72. Those caught in May and June included 13 young-of-the-year juveniles from 51 to 82 mm fork length (including 2 of the 3 caught in otter trawls). All but a couple of these small juveniles appeared to be typical parr, (i.e., not smolts or pre-smolts), whereas all but one of the larger fish appeared to be smolts (with bright silvery, deciduous scales obscuring parr marks) on their way to sea. The one exception was a 410 mm. hatchery-reared "half-pounder" male caught on September 20th, a draining day. (A half-pounder is a small adult that has spent only one year at sea before returning to fresh water to spawn). Figure 3-1 shows the size distribution of all the steelhead captured in 1997. Three year classes appear to be represented (not including the half-pounder). All the steelhead but the half-pounder appeared to be of wild origin (no fin deformities or other marks characteristic of hatchery-reared fish). (Warm Springs Hatchery plans to institute a program for marking coho and steelhead smolts to enable anglers to distinguish between wild and hatchery fish.)

Analysis of Appendix B-72 reveals no tendency for smolts to be clustered at stations nearest the river mouth nor for greater numbers to be caught on pre-breaching surveys (both of which might be expected if the bar-closed condition were impeding their seaward movement). Twelve steelhead were caught on pre-breach surveys, 15 on draining surveys, and 9 on tidal surveys. However, as mentioned above, beach seining is not as effective on pre-breach surveys as it is on post-breach surveys, so the relative abundance of steelhead during bar-closed periods may be under-represented by the data.

Eighteen coho smolts were caught by beach seine in May and June (Appendix B-73). None were caught during pre-breach surveys, 13 were caught on draining surveys, and 5

during tidal surveys (including one caught during the preliminary trials on May 9th). The size distribution of the coho is shown in Figure 3-2. All of the smolts presumably came from eggs spawned by wild fish in December 1996 or January 1997. (No coho smolts were released by the Warm Springs Hatchery in 1997 before or during the 1997 study; their last release was in December 1996--Armando Quinones, *personal communication*).

Figure 3-1

Figure 3-2

Macro-invertebrates collected in otter trawls are included in the Appendix (Tables B-1 to B-21). The most common invertebrates collected were the estuarine shrimps *Crangon franciscorum* and *C. nigricauda* and the mysid *Neomysis mercedis.* A third shrimp species, *Crangon nigromaculata,* was less common. Dungeness crabs, *Cancer magister* (mostly 50-100 mm carapace width), were commonly collected at Station 1 (near the mouth) from mid-August through November. A few specimens of *Cancer productus* were collected as well. Neither *Cancer magister* nor *Crangon nigromaculata* were collected in 1996 surveys, illustrating that year-to-year variability is high.

An invertebrate species also encountered--although inadvertently--was a small octopus, *Octopus rubescens*. On several occasions, individuals of this species emerged from within the PVC pipes (inside diameter = 2 cm) used in the rack holding the Datasonde at Station 1. No octopi were ever collected in fish nets.

### *Plankton*

Plankton tows were made above and below the mouth of Willow Creek during prebreaching and tidal surveys to determine whether the phenomenon observed in 1992-1993 (anoxic water and dead mysids streaming out of the marsh/creek following breaching) would occur in 1996. As discussed above, the marsh/creek water in the summers of 1996 and 1997 was not anoxic, nor was it saline. In neither year did the plankton tows (catches listed in Appendix C-1) contain dead animals, nor did it contain many mysids. In 1996 the downstream channel in September contained extensive stands of macrophytes (*Ruppia* and *Myriophyllum*) and macroalgae (*Spirogyra*). Very little vegetation occurred there in 1997, so the list of planktonic/epibenthic invertebrates is shorter, since plant-inhabiting species (mostly insects) were not collected. The only frequently collected invertebrates were the mysid *Neomysis mercedis*, the amphipods *Eogammarus* (*=Anisogammarus*) *confervicola* and *Corophium* sp., and sphaeromatid isopods. *Neomysis* is often collected in larger numbers in the otter trawls, although it is not collected quantitatively. Mysids are more common in the deeper, saline layers than in the shallows up- and downstream of Willow Creek where plankton collections are made. Variations in numbers of isopods and amphipods in the plankton tows may be due to the inclusion of sediments in the net as it skims along near the bottom, since these may be more benthic than epibenthic in habitat.

### *Pinnipeds*

Detailed observations on harbor seals in the vicinity of the estuary mouth are included in Appendix D-1, "Breaching of the Russian River and its Effects on Seals," by Joseph Mortenson. The major findings of the pinniped observations are similar to those of 1996: Harbor seals are much more abundant in the vicinity of the river mouth and in the estuary when the bar is open than when it is closed. When the bar is closed, the seals congregate on a beach located upcoast from the River. Breaching operations (even with a bulldozer) can be less disturbing to seals than pedestrians on the beach.

In 1997, as in 1996, observations made during pre- and postbreaching water quality and fish sampling cruises showed that a small group of seals (6-8 individuals) were typically seen hauled out on snags at low tide between Stations 3 and 4. Seals were rarely seen in the estuary during flooded conditions.

# *IV. DISCUSSION*

## *WATER QUALITY*

Although the pattern of berm closure and breaching was very different in 1997 compared to 1996, the water quality profiles at each of the four channel stations showed a similar response to each closing/breaching event as was seen in the summer of 1996. The continuous deployment of Datasondes at three stations and the revised program of prebreaching, draining and tidal cruises for each breaching event enabled a more detailed picture of the dynamics of dissolved oxygen in the near-bottom saline channel waters than was possible in 1996. Dissolved oxygen at shallow stations and those nearest the estuary mouth typically renewed immediately following breaching. Stations deeper and farther upstream only re-oxygenated following several tidal cycles, and in some cases did not mix at all or re-oxygenate between breaching events. Highly variable dissolved oxygen conditions in the saline channels undoubtedly favors the health and survivorship of marine-estuarine species, but may not be important to salmonid smolts, which probably occupy fresh or brackish layers closer to the surface.

No anoxic water was found in either 1996 or 1997 in the vicinity of Willow Creek where such water caused a fish and invertebrate kill earlier (Heckel, 1994), which suggests that the frequency of such kills is low. The Heckel study found a kill associated with water levels over nine feet prior to breaching. The present SCWA policy is to breach when the level attains 6 to 9 ft. Most 1997 breachings were accomplished at levels less than 8 ft, which may have helped to prevent kills. On two dates (prior to breaching events VI and VII), levels reached 8.37 and 8.61, respectively, the 1997 maxima.

## *BIOLOGICAL MONITORING*

### *Variability From Year to Year*

The most striking difference of the 1997 study results when compared to 1996 is the large variability in the pattern of berm closure and of biological features in the estuary. In 1997 the berm closed earlier and more often. Steelhead smolts were found in the estuary throughout the study period in both years, but coho salmon smolts were found only in the second year. Additional biological variability observed between the 1996 and 1997 studies include the differences in plankton described earlier (fewer species and smaller numbers collected in 1997); attached macrophytes much less abundant in 1997 than in 1996; and Dungeness crab (*Cancer magister*) and the bay shrimp *Crangon nigromaculata* not seen in 1996, but abundant in 1997. The observed biological variability is typical of aquatic systems and demonstrates the necessity for doing multi-

year studies to support conclusions about how an ecosystem functions.

### *Sampling Bias*

The problem of effectively sampling salmonids during high water (prebreaching) conditions remains to be solved. In times past, gillnets would be the obvious choice for unbiased sampling during high or low-water conditions (e.g., as used in studies of Estero Americano and Estero de San Antonio in 1989-1990—Commins, et al, 1990; Commins, et al, 1996). However, the mortality caused by gillnets now precludes their use for sampling wild steelhead or coho in this region, since both species are now listed as Threatened Species under the Endangered Species Act. Directional fyke nets installed perpendicular to the shore could be effective, but there is always some risk of fish mortality associated with them, as well (either through small fish gilling themselves, or through attacks by mink, otter, or human poachers (Roth, et al, 1995; Fawcett, et al, 1996). Under the circumstances, beach seining may still be the best method, even with the limitation that numbers of fish caught at high water cannot be compared directly to the numbers caught at the same stations after breaching. At the very least, the beach seining has provided valuable evidence that juvenile steelhead and coho use the estuary during the summer months and must therefore be considered in relation to artificial breaching and other human activities. Shapovalov and Taft (1954), in their definitive study of steelhead and coho in Wadell Creek, found that although most smolts migrated in winter and spring, some fish migrated during every month of the year.

### *Pinniped Behavior*

The bar-closed condition discouraged seals from hauling out at their apparently preferred location on Jenner Beach immediately adjacent to the mouth of the Russian River. Seals may prefer the beach at the River mouth under bar-open conditions because prey may be more abundant there or because the environment is otherwise preferable. Breaching may thus represent a benefit to the seals. Pinnipeds are precluded from hauling out near the inlet for several hours after the breaching process has occurred because of the large number of pedestrians that sometimes are attracted to the site by the breaching activity. The behavior of the pedestrians is regulated by SCWA personnel during the breaching event, but behavior is usually not regulated after SCWA leave the site to allow seals unimpeded access to the site.

# V. CONCLUSIONS

The 1997 study confirms most of the conclusions made following the earlier studies (Heckel, 1994; MSC, 1997). The estuary has a biota that is adapted to survival in an environment that alternates between being a tidal estuary and a coastal lagoon, and, in general, the bar-open state is more beneficial to the local biota. The present management plan of breaching the sandbar when the river rises to 7 to 9 feet appears appropriate and should be continued. Additional conclusions derived from the 1997 study program are as follows:

- The biota of the estuary exhibits high variability from one year to the next. Even with this wide variability, the results of the study indicate that the breaching activity is beneficial to biota in the Russian River estuary.

- Smolts of wild coho and steelhead use the estuary during the summer, and breaching provides an intermittent avenue to the sea. The tributary origin of these wild fish is unknown.

- When the bar is open, seals congregate near the inlet. When the bar is closed, seals haul out at other locations where, presumably, prey is less abundant or the environment is otherwise less preferable.

- Crowds of curious people who gather at the breaching site after the SCWA breaching crews leave the site have more impact on pinniped behavior than does the breaching process itself.

# VI. RECOMMENDATIONS

Monitoring of physical and biological conditions in the estuary during the bar-closure/breaching season conducted thus far may be sufficient evidence that breaching is not causing adverse impacts to fish and seals, and that breaching may be beneficial. If monitoring must continue to meet regulatory requirements, recommendations are as follows:

- In light of the increasing concern about the status of remaining wild stocks of steelhead and coho salmon (both species are now federally listed as Threatened Species), future summer monitoring should be more focussed on effectively sampling salmonids in the estuary. The best approach would be to increase the beach seining effort by making replicate hauls, and to sample more sites (spanning the range of shallow-water habitats available). The numbers captured on a given sampling day per habitat type could then be related to the proportional representation of each habitat type within the estuary, so that a rough estimate of the numbers of smolts in the estuary could be made. The use of fyke netting as a means of sampling smolts should also be considered, with the understanding that fyke nets would have to be closely monitored around the clock when in use to prevent incidental fish mortality or human vandalism. Such information is also expected to complement studies being

conducted throughout the watershed regarding the abundance and behavior of salmonids.

- The salmonid sampling program should be coordinated with genetics researchers from the Bodega Marine Laboratory or other institutions so that tissue samples of wild smolts are obtained each time smolts are captured. DNA analysis and archiving may eventually lead to identification of the natal tributary streams of smolts found in the estuary and to valuable information about the timing of outmigration, run strength, and other aspects of their population biology.

Also, the breaching activity could be modified to minimize impacts on seals as follows:

- Exclusion of humans from the beach during and especially following breaching operations would minimize effects on harbor seals and increase visitor safety.

# *V. REFERENCES*

## *PERSONAL CONTACTS*

Bill Cox, California Department of Fish and Game
Tom Hablett, National Marine Fisheries Service
Rich Lawton, California State Parks
Armando Quinones, CDFG, Warm Springs Hatchery

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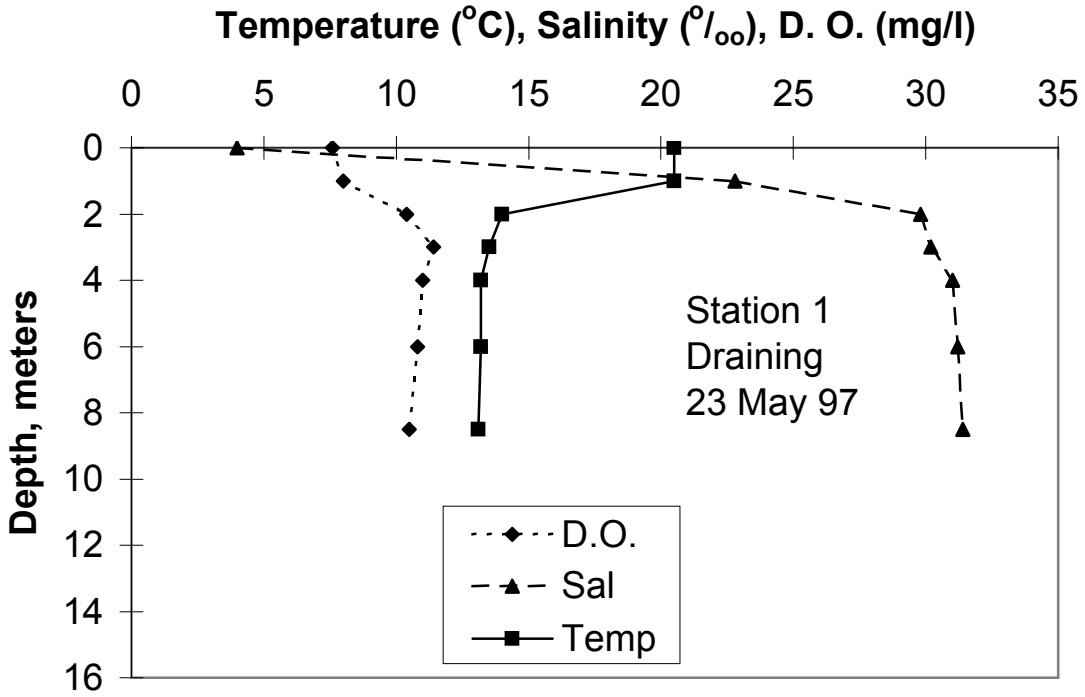
# *VI. APPENDIX*

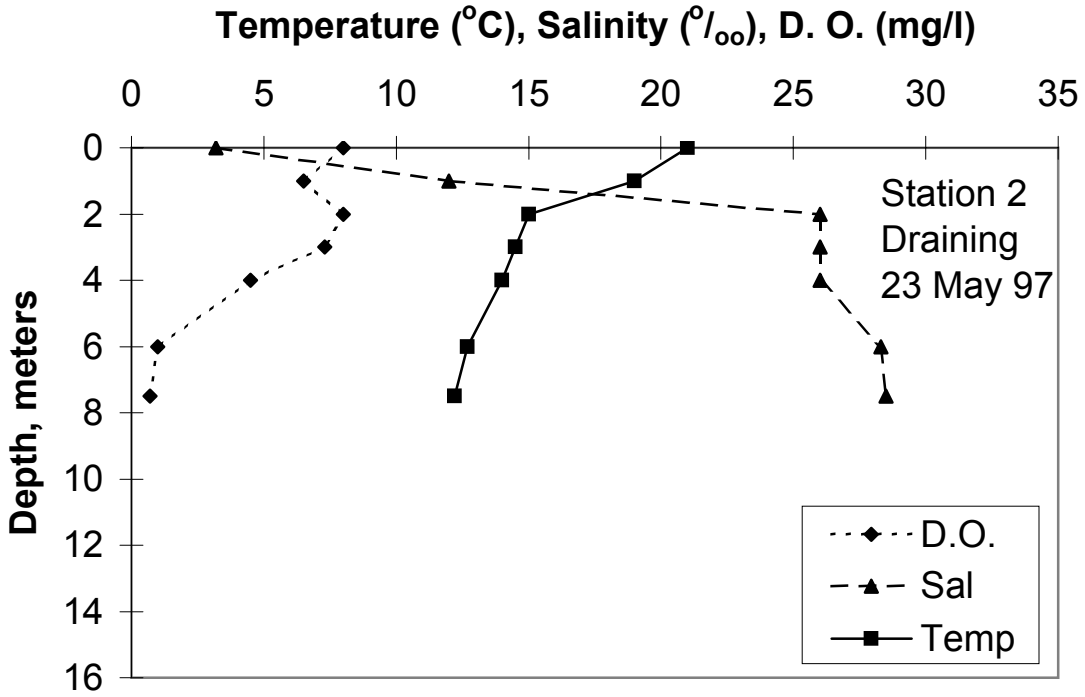
Appendix A-1. Prebreaching Water Quality Profiles, Event I, 20 May 1997

| 20-May-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(1040 hr PDT) | | | | Station 2 (1145 hr PDT) | | | | Station 3 (1215 hr PDT) | | | | Station 3A (1230 hr PDT) | | | | Station 4 (1300 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 21.0 | 1.6 | 2100 | 9.4 | 22.0 | 0.7 | 820 | 8.2 | 22.0 | 0.6 | 670 | 8.0 | 21.2 | 0.7 | 630 | 7.2 | 22.5 | 0.7 | 520 | 8.2 |
| 1 | - | - | - | - | - | - | - | - | 22.0 | 0.7 | 690 | 8.0 | 21.0 | 0.8 | 640 | 6.8 | - | - | - | - |
| 2 | 21.0 | 1.6 | 2100 | 9.2 | 22.0 | 1.2 | 1490 | 7.7 | 21.8 | 0.7 | 690 | 8.0 | 17.0 | 0.7 | 450 | 4.6 | 22.5 | 0.7 | 610 | 7.9 |
| 3 | 21.0 | 20.3 | 30200 | 12.4 | 21.0 | 13.4 | 20300 | 7.9 | 21.5 | 8.9 | 14000 | 7.6 | | | | | 20.0 | 18.5 | 26800 | 6.0 |
| 4 | 14.1 | 23.0 | 34000 | 9.9 | 16.5 | 26.1 | 34300 | 5.2 | 14.5 | 28.0 | 34600 | 3.3 | | | | | 17.0 | 24.5 | 32800 | 3.3 |
| 4.3 | - | - | - | - | - | - | - | - | 13.5 | 28.0 | 34500 | 1.4 | | | | | - | - | - | - |
| 5 | 13.5 | 27.5 | 34000 | 8.1 | 13.3 | 28.3 | 34100 | 3.2 | | | | | | | | | 16.0 | 25.3 | 33000 | 2.8 |
| 6 | 12.7 | 28.1 | 34000 | 6.8 | 12.5 | 28.4 | 34000 | 2.4 | | | | | | | | | - | - | - | - |
| 7 | 12.0 | 29.0 | 34200 | 6.3 | 12.0 | 28.7 | 34000 | 2.0 | | | | | | | | | 15.2 | 26.0 | 33400 | 3.0 |
| 8 | - | - | - | - | 12.0 | 28.7 | 34000 | 1.7 | | | | | | | | | - | - | - | - |
| 9 | - | - | - | - | 12.0 | 28.7 | 34000 | - | | | | | | | | | - | - | - | - |
| 10 | - | - | - | - | | | | | | | | | | | | | 15.0 | 25.1 | 33600 | 2.8 |
| 11 | 11.5 | 29.5 | 34500 | 3.4 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | - | - | - | 2.6 |
| 13 | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | |

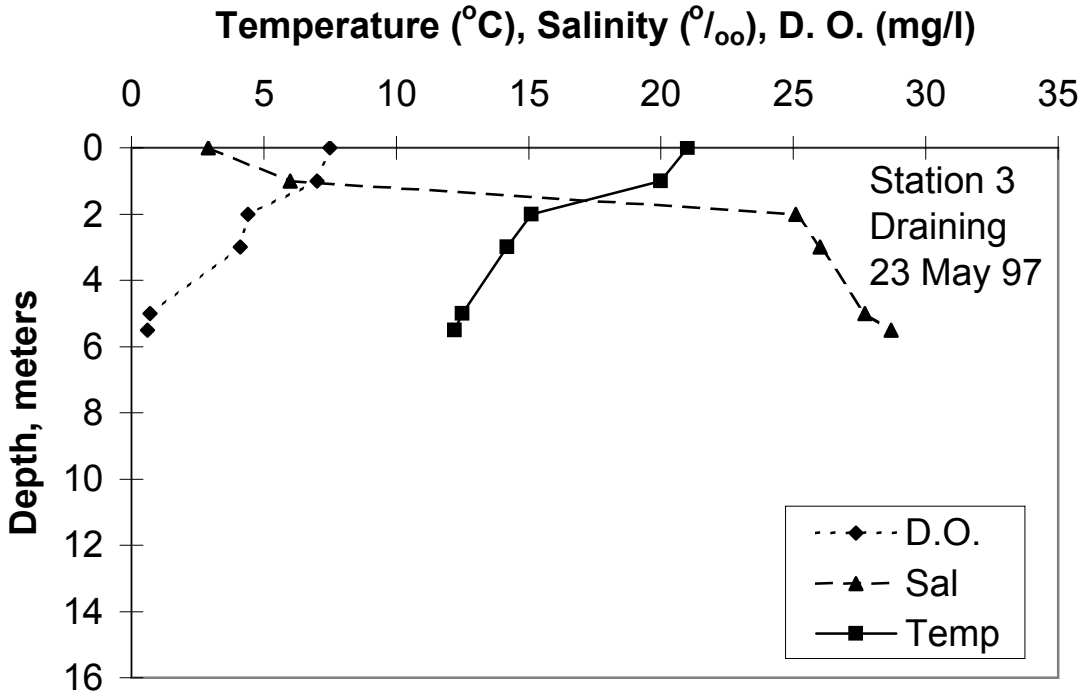
Appendix A-00. Water Quality Profiles, Station 1, Event VII



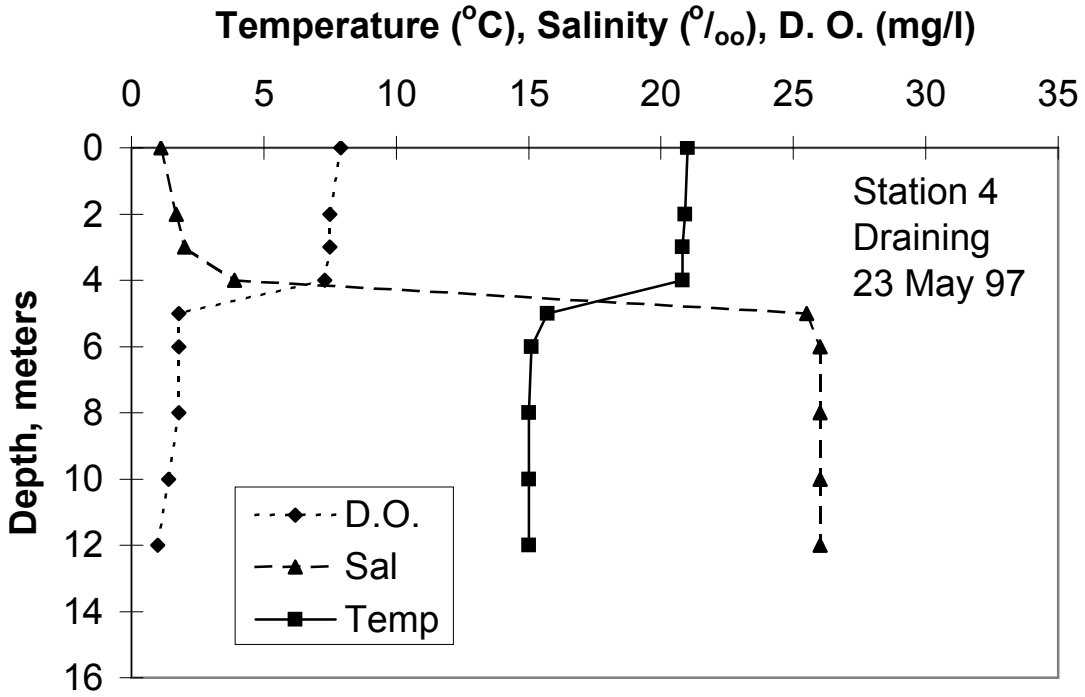
Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII

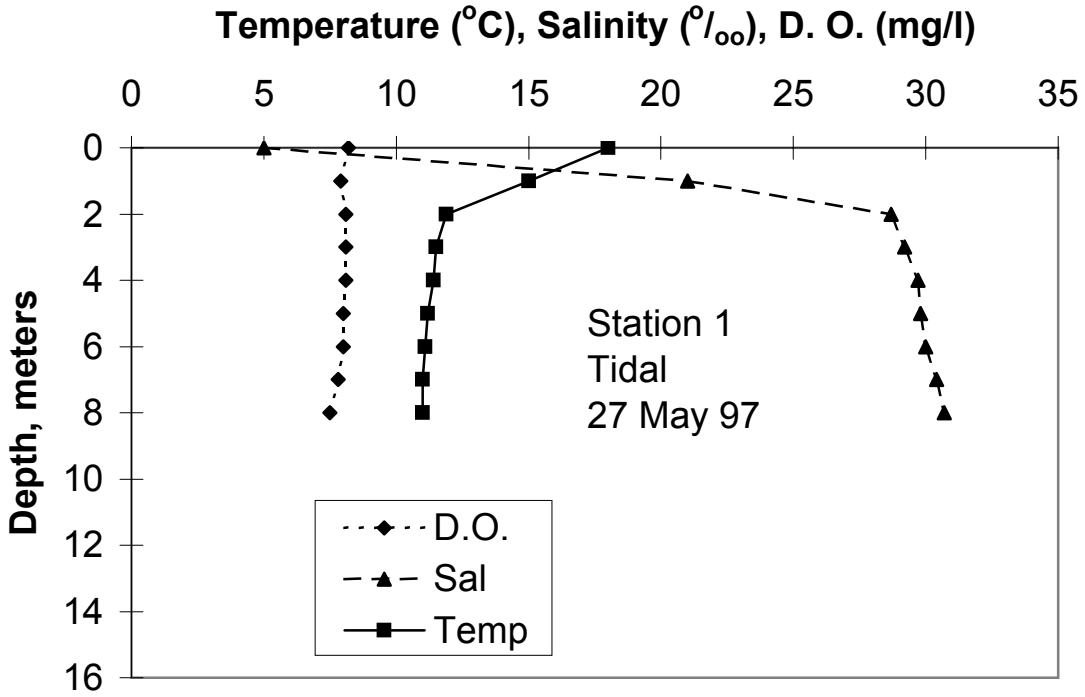


Appendix A-00. Water Quality Profiles, Station 1, Event VII

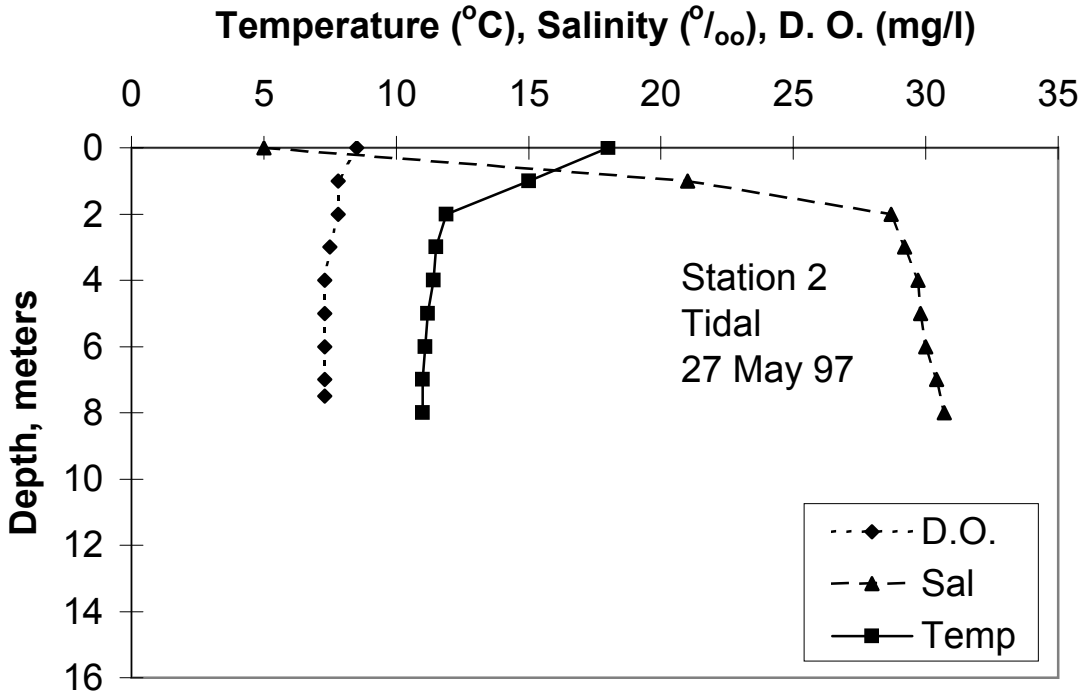


| 23-May-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (1630 hr PDT) | | | | Station 2 (1555 hr PDT) | | | | Station 3 (1500 hr PDT) | | | | Station 4 (1420 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 20.5 | 4.0 | 620 | 7.6 | 21.0 | 3.2 | 4580 | 8.0 | 21.0 | 2.9 | 3800 | 7.5 | 21.0 | 1.1 | 1330 | 7.9 |
| 1 | 20.5 | 22.8 | 32800 | 8.0 | 19.0 | 12.0 | 17700 | 6.5 | 20.0 | 6.0 | 8100 | 7.0 | - | - | - | - |
| 2 | 14.0 | 29.8 | 36200 | 10.4 | 15.0 | 26.0 | 33000 | 8.0 | 15.1 | 25.1 | 32100 | 4.4 | 20.9 | 1.7 | 2280 | 7.5 |
| 3 | 13.5 | 30.2 | 37000 | 11.4 | 14.5 | 26.0 | 33000 | 7.3 | 14.2 | 26.0 | 32500 | 4.1 | 20.8 | 2.0 | 2600 | 7.5 |
| 4 | 13.2 | 31.0 | 37200 | 11.0 | 14.0 | 26.0 | 33200 | 4.5 | - | - | - | - | 20.8 | 3.9 | 3900 | 7.3 |
| 5 | - | - | - | - | - | - | - | - | 12.5 | 27.7 | 34000 | 0.7 | 15.7 | 25.5 | 33000 | 1.8 |
| 5.5 | - | - | - | - | - | - | - | - | 12.2 | 28.7 | 34000 | 0.6 | - | - | - | - |
| 6 | 13.2 | 31.2 | 37500 | 10.8 | 12.7 | 28.3 | 34000 | 1.0 | | | | | 15.1 | 26.0 | 32200 | 1.8 |
| 7 | - | - | - | - | - | - | - | - | | | | | - | - | - | - |
| 7.5 | - | - | - | - | 12.2 | 28.5 | 34000 | 0.7 | | | | | - | - | - | - |
| 8 | - | - | - | - | | | | | | | | | 15.0 | 26.0 | 32200 | 1.8 |
| 8.5 | 13.1 | 31.4 | 37700 | 10.5 | | | | | | | | | - | - | - | - |
| 9 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 15.0 | 26.0 | 32200 | 1.4 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 15.0 | 26.0 | 32400 | 1.0 |
| 13 | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | |

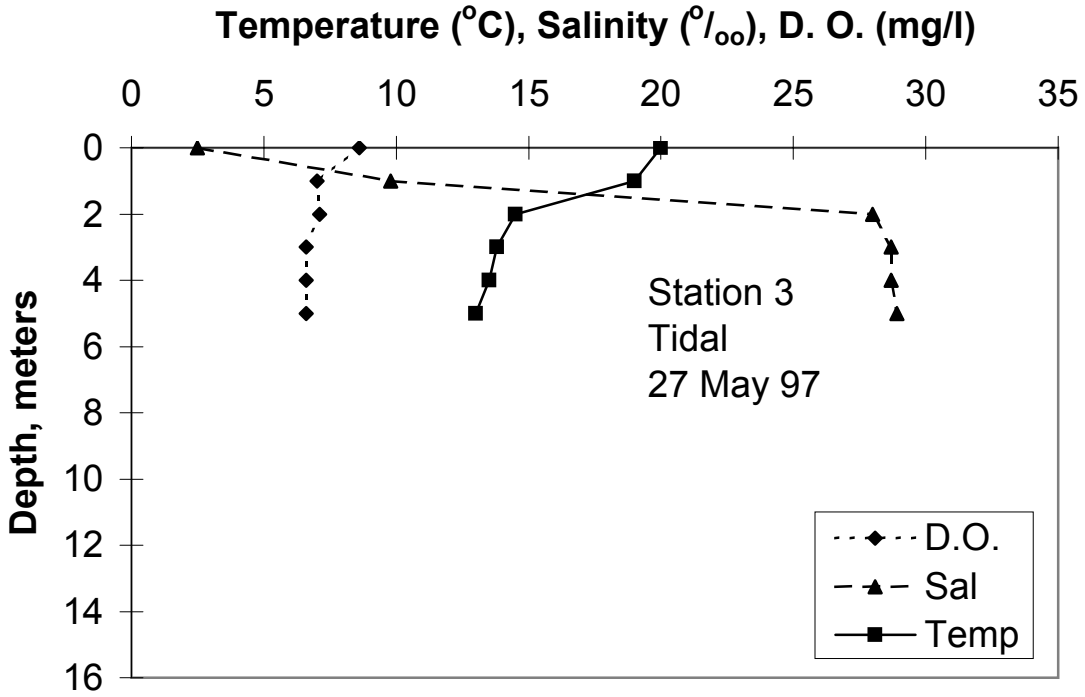
Appendix A-00. Water Quality Profiles, Station 1, Event VII



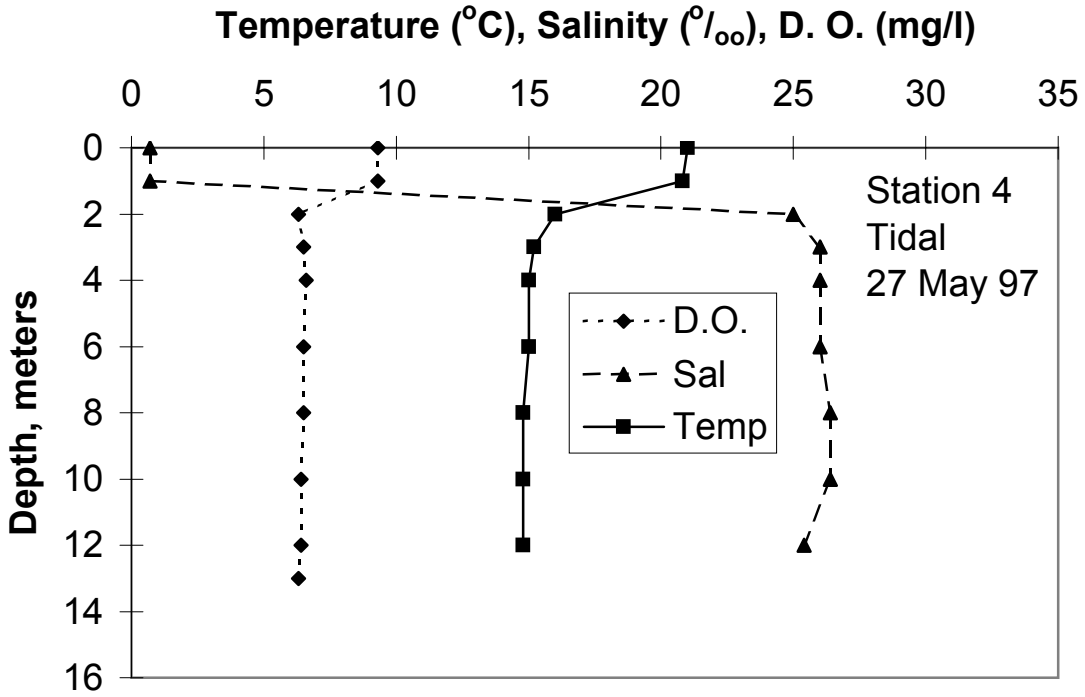
Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-3. Tidal Water Quality Profiles, Event 1, 27 May 1997

| 27-May-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0730 hr PDT) | | | | Station 2 (0910 hr PDT) | | | | Station 3 (1020 hr PDT) | | | | Station 4 (1130 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 18.0 | 5.0 | 7700 | 8.2 | 19.3 | 3.6 | 5700 | 8.5 | 20.0 | 2.5 | 3450 | 8.6 | 21.0 | 0.7 | 780 | 9.3 |
| 1 | 15.0 | 21.0 | 27200 | 7.9 | 18.0 | 13.1 | 18900 | 7.8 | 19.0 | 9.8 | 14000 | 7.0 | 20.8 | 0.7 | 880 | 9.3 |
| 2 | 11.9 | 28.7 | 33800 | 8.1 | 13.4 | 29.0 | 35000 | 7.8 | 14.5 | 28.0 | 35000 | 7.1 | 16.0 | 25.0 | 33000 | 6.3 |
| 3 | 11.5 | 29.2 | 34000 | 8.1 | 12.8 | 29.5 | 35000 | 7.5 | 13.8 | 28.7 | 35200 | 6.6 | 15.2 | 26.0 | 33300 | 6.5 |
| 4 | 11.4 | 29.7 | 34000 | 8.1 | 12.1 | 30.6 | 35000 | 7.3 | 13.5 | 28.7 | 35000 | 6.6 | 15.0 | 26.0 | 33300 | 6.6 |
| 5 | 11.2 | 29.8 | 34300 | 8.0 | 12.0 | 29.8 | 35000 | 7.3 | 13.0 | 28.9 | 35000 | 6.6 | - | - | - | - |
| 6 | 11.1 | 30.0 | 34700 | 8.0 | 12.0 | 29.8 | 35000 | 7.3 | | | | | 15.0 | 26.0 | 33500 | 6.5 |
| 7 | 11.0 | 30.4 | 34800 | 7.8 | 12.0 | 29.8 | 35000 | 7.3 | | | | | - | - | - | - |
| 7.5 | - | - | - | - | - | - | - | 7.3 | | | | | - | - | - | - |
| 8 | 11.0 | 30.7 | 35000 | 7.5 | | | | | | | | | 14.8 | 26.4 | 33500 | 6.5 |
| 9 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 14.8 | 26.4 | 33500 | 6.4 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 14.8 | 25.4 | 33500 | 6.4 |
| 13 | | | | | | | | | | | | | - | - | - | 6.3 |
| 14 | | | | | | | | | | | | | | | | |

Appendix A-4 . Prebreaching Water Quality Profiles, Event II, 6 June 1997

| 6-Jun-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0830 hr PDT) | | | | Station 2 (1015 hr PDT) | | | | Station 3 (1155 hr PDT) | | | | Station 3A (1215 hr PDT) | | | | Station 4 (1435 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm |
| 0 | 18.0 | 3.0 | 3800 | 8.7 | 20.8 | 1.1 | 1900 | 8.6 | 21.0 | 1.2 | 1450 | 8.6 | 20.5 | 1.1 | 1900 | 7.8 | 23.0 | 0.9 | 900 | 8.6 |
| 1 | 17.8 | 4.3 | 6400 | 8.8 | 20.0 | 2.0 | 2900 | 8.6 | 21.0 | 1.2 | 1460 | 8.5 | 17.0 | 0.8 | 1200 | 6.5 | 23.0 | 0.9 | 900 | 8.6 |
| 2 | 17.0 | 4.5 | 6500 | 8.8 | 19.0 | 7.0 | 10400 | 8.5 | 19.0 | 7.5 | 11400 | 8.6 | 18.0 | 4.8 | 6800 | 7.9 | 21.0 | 6.0 | 9500 | 8.5 |
| 3 | 17.0 | 23.0 | 28500 | 8.6 | 18.2 | 20.8 | 29000 | 7.7 | 18.0 | 18.0 | 24900 | 7.9 | 17.0 | 5.8 | 8100 | 6.7 | 18.0 | 25.5 | 34500 | 4.4 |
| 4 | 14.9 | 24.0 | 30000 | 7.8 | 15.2 | 28.0 | 35900 | 3.7 | 14.9 | 29.0 | 35500 | 3.4 | | | | | 16.1 | 28.0 | 35900 | 3.8 |
| 5 | 14.0 | 25.1 | 32000 | 6.7 | 14.5 | 28.9 | 36000 | 3.1 | 13.9 | 29.0 | 35500 | 2.7 | | | | | - | - | - | - |
| 6 | 14.1 | 25.1 | 32000 | 5.9 | 13.8 | 29.2 | 36000 | 2.5 | 13.1 | 29.5 | 35400 | 1.2 | | | | | 15.1 | 28.5 | 36000 | 2.8 |
| 7 | 13.5 | 26.7 | 33000 | 5.9 | 13.0 | 29.5 | 36000 | - | | | | | | | | | - | - | - | - |
| 8 | 13.0 | 27.9 | 33900 | 5.5 | | | | | | | | | | | | | 14.9 | 28.3 | 35800 | 2.4 |
| 9 | 12.0 | 28.9 | 34000 | 5.3 | | | | | | | | | | | | | - | - | - | - |
| 10 | 12.0 | 28.5 | 34000 | 5.0 | | | | | | | | | | | | | 14.9 | 28.3 | 35900 | 1.9 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 14.9 | 28.3 | 35900 | 1.9 |
| 13 | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | |

Appendix A-5. Draining Water Quality Profiles, Event II, 10 June 1997

| 10-Jun-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0935 hr PDT) | | | | Station 2 (1110 hr PDT) | | | | Station 3 (1245 hr PDT) | | | | Station 4 (1415 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 20.5 | 3.4 | 4900 | 7.3 | 20.0 | 1.6 | 2300 | 7.4 | 20.5 | 0.5 | 1000 | 7.4 | 21.0 | 1.0 | 2000 | 8.1 |
| 1 | 20.7 | 3.5 | 5200 | 7.3 | 21.0 | 1.6 | 2500 | 7.2 | 21.0 | 1.5 | 2200 | 7.3 | 21.0 | 1.5 | 2000 | 7.9 |
| 2 | 20.7 | 3.5 | 5200 | 6.0 | 21.0 | 2.5 | 3300 | 6.9 | 18.0 | 26.0 | 35200 | 1.8 | 21.5 | 2.0 | 3000 | 7.4 |
| 3 | 17.0 | 25.2 | 34000 | 2.4 | 16.0 | 27.0 | 35000 | 1.6 | 15.0 | 29.0 | 36000 | 1.4 | 17.0 | 27.0 | 35500 | 2.5 |
| 4 | 15.2 | 27.9 | 35100 | 1.9 | 14.5 | 27.0 | 35000 | 1.2 | 14.0 | 29.0 | 35000 | - | 16.0 | 28.0 | 36000 | 2.1 |
| 5 | 14.0 | 28.8 | 35100 | 3.1 | 13.5 | 28.8 | 35000 | 0.6 | 13.0 | 29.0 | 35000 | 0.6 | 15.0 | 28.0 | 360 | 1.6 |
| 6 | 13.5 | 29.2 | 35200 | 2.7 | 13.0 | 29.0 | 35000 | 0.4 | | | | | - | - | - | - |
| 7 | 13.1 | 29.5 | 35200 | 2.4 | 13.0 | 29.0 | 35000 | 0.3 | | | | | - | - | - | - |
| 8 | | | | | | | | | | | | | 15.0 | 28.0 | 36000 | 1.2 |
| 9 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | - | - | - | - |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 15.0 | 28.0 | 36000 | 1.0 |
| 13 | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | |

Appendix A-6. Tidal Water Quality Profiles, Event II, 13 June 1997

| 13-Jun-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0815 hr PDT) | | | | Station 2 (0930 hr PDT) | | | | Station 3 (1035 hr PDT) | | | | Station 4 (1200 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 16.5 | 4.0 | 5500 | 8.9 | 18.5 | 2.0 | 2500 | 8.5 | 21.0 | 1.0 | 2000 | 8.3 | 21.5 | 0.5 | 1000 | 8.3 |
| 1 | 16.5 | 6.0 | 8200 | 8.7 | 18.0 | 8.7 | 12500 | 7.8 | 21.0 | 1.0 | 2000 | 8.1 | 21.5 | 0.5 | 1000 | 8.2 |
| 2 | 12.0 | 24.5 | 32500 | 8.6 | 14.5 | 28.0 | 35000 | 6.4 | 15.0 | 27.0 | 34500 | 3.6 | 21.5 | 0.5 | 1000 | 8.2 |
| 3 | 12.0 | 27.0 | 34500 | 8.5 | 13.5 | 29.0 | 35500 | 6.5 | 14.0 | 28.2 | 34800 | 4.3 | 19.0 | 21.5 | 30000 | 1.1 |
| 4 | 11.0 | 31.5 | 35500 | 8.0 | 13.0 | 30.0 | 35500 | 6.6 | 14.0 | 28.0 | 34800 | 4.4 | 16.0 | 26.5 | 34500 | 1.1 |
| 5 | 11.0 | 31.5 | 36000 | 8.2 | 13.0 | 30.0 | 35500 | 6.8 | 14.0 | 28.1 | 35000 | 5.0 | - | - | - | - |
| 6 | 11.0 | 32.0 | 36000 | 8.2 | 13.0 | 30.0 | 35500 | 6.8 | | | | | 16.0 | 26.5 | 34500 | 1.0 |
| 7 | 11.0 | 32.0 | 360 | 8.2 | 13.0 | 30.0 | 355 | 6.8 | | | | | - | - | - | - |
| 8 | | | | | | | | | | | | | - | - | - | - |
| 9 | | | | | | | | | | | | | 15.5 | 27.0 | 34500 | 0.8 |
| 10 | | | | | | | | | | | | | - | - | - | - |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 15.5 | 25.5 | 32500 | 0.6 |
| 13 | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | |

Appendix A-7. Prebreaching Water Quality Profiles, Event III, 22 June 1997

| 22-Jun-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0805 hr PDT) | | | | Station 2 (0900 hr PDT) | | | | Station 3 (0930 hr PDT) | | | | Station 3A (1000 hr PDT) | | | | Station 4 (1045 hr PDT) | | | |
| Depth Meters | Temp ᵒC | Sal °/₀₀ | Cond µmho | D. O. ppm | Temp ᵒC | Sal °/₀₀ | Cond µmho | D. O. ppm | Temp ᵒC | Sal °/₀₀ | Cond µmho | D. O. ppm | Temp ᵒC | Sal °/₀₀ | Cond µmho | D. O. ppm | Temp ᵒC | Sal °/₀₀ | Cond µmho | D. O. ppm |
| 0 | 17.2 | 5.3 | 7800 | 9.2 | 18.9 | 2.2 | 2730 | 8.7 | 19.8 | 1.8 | 2230 | 8.5 | 17.1 | 0.9 | 940 | 7.0 | 20.6 | 0.9 | 1100 | 8.5 |
| 1 | 17.2 | 5.3 | 7800 | 9.2 | 18.9 | 3.1 | 4210 | 8.7 | 20.0 | 1.8 | 2140 | 8.3 | 19.0 | 2.5 | 3200 | 7.2 | 21.7 | 2.6 | 3450 | 8.5 |
| 1.4 | - | - | - | - | - | - | - | - | - | - | - | - | 19.0 | 2.5 | 3400 | 7.2 | - | - | - | - |
| 2 | 17.9 | 6.2 | 9100 | 9.0 | 18.8 | 6.1 | 9300 | 8.3 | 19.1 | 6.6 | 10000 | 7.8 | | | | | 21.0 | 5.8 | 9000 | 8.0 |
| 3 | 18.0 | 15.4 | 22700 | 9.0 | 18.3 | 19.0 | 22000 | 7.8 | 18.8 | 17.4 | 25000 | 7.2 | | | | | 19.5 | 24.0 | 34000 | 9.8 |
| 4 | 15.1 | 26.1 | 33800 | 10.2 | 15.2 | 26.6 | 34200 | 4.4 | 15.0 | 27.3 | 33900 | 3.9 | | | | | 17.5 | 25.4 | 34200 | 5.5 |
| 5 | 13.5 | 27.8 | 34200 | 8.5 | 13.9 | 27.8 | 34400 | 2.5 | | | | | | | | | 16.2 | 26.1 | 34200 | 3.2 |
| 6 | 12.9 | 28.2 | 34000 | 7.2 | 13.2 | 28.5 | 34500 | 2.1 | | | | | | | | | - | - | - | - |
| 7 | 12.3 | 28.4 | 34000 | 6.6 | 13.0 | 28.5 | 34500 | 1.1 | | | | | | | | | - | - | - | - |
| 8 | 12.0 | 28.9 | 34000 | 5.8 | 12.8 | 29.0 | 34500 | 0.7 | | | | | | | | | 15.0 | 27.0 | 34200 | 0.3 |
| 9 | 11.9 | 28.9 | 340 | 4.4 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | | | | | 14.8 | 27.0 | 34200 | 0.2 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 14.7 | 27.0 | 34200 | - |
| 13 | | | | | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | | | | | - | - | - | - |
| 15 | | | | | | | | | | | | | | | | | 14.4 | 27.1 | 34200 | - |

Appendix A-8. Draining Water Quality Profiles, Event III, 28 June 1997

| 28-Jun-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0815 hr PDT) | | | | Station 2 (0945 hr PDT) | | | | Station 3 (1045 hr PDT) | | | | Station 3A* (1110 hr PDT) | | | | Station 4 (1315 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 19.5 | 2.8 | 4300 | 7.7 | 20.8 | 0.2 | 2050 | 7.6 | 21.0 | 1.4 | 1880 | 7.3 | - | - | - | - | 22.5 | 1.0 | 1220 | 7.5 |
| 0.15 | - | - | - | - | - | - | - | - | - | - | - | - | 19.5 | 1.5 | 2180 | 7.4 | - | - | - | - |
| 1 | 19.0 | 3.5 | 7000 | 7.3 | 20.8 | 2.8 | 4200 | 7.1 | 21.0 | 1.4 | 1880 | 7.2 | | | | | 22.5 | 1.0 | 1220 | 7.4 |
| 2 | 11.5 | 22.5 | 26500 | 7.8 | 15.0 | 23.3 | 30200 | 6.7 | 16.9 | 21.0 | 28600 | 4.3 | | | | | 22.5 | 1.0 | 1300 | 7.3 |
| 3 | 11.0 | 23.0 | 27500 | 7.9 | 13.1 | 25.2 | 31000 | 6.9 | 15.0 | 23.7 | 30800 | 4.6 | | | | | 22.2 | 1.2 | 1720 | 7.0 |
| 4 | 11.0 | 23.5 | 27800 | 8.0 | 12.9 | 25.7 | 31200 | 6.8 | 14.5 | 28.0 | 34700 | 0.7 | | | | | 17.0 | 25.3 | 33500 | 1.3 |
| 4.5 | - | - | - | - | - | - | - | - | - | - | - | 0.7 | | | | | - | - | - | - |
| 5 | 10.9 | 23.5 | 27900 | 8.1 | 13.1 | 28.4 | 34500 | 0.8 | 14.0 | 28.1 | 34800 | - | | | | | 16.0 | 25.7 | 33800 | 0.4 |
| 6 | 10.9 | 20.6 | 25000 | 8.2 | 13.0 | 28.7 | 34800 | 0.6 | | | | | | | | | 15.3 | 26.5 | 33900 | 0.2 |
| 7 | 10.8 | 22.5 | 26500 | 8.1 | | | | | | | | | | | | | - | - | - | - |
| 8 | 10.8 | 21.0 | 25300 | 8.1 | | | | | | | | | | | | | 15.0 | 26.8 | 33900 | 0.2 |
| 9 | 10.8 | 21.0 | 26000 | - | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | | | | | 15.0 | 26.7 | 33900 | 0.2 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 15.0 | 26.7 | 33900 | 0.1 |
| 13 | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | |

* Sampled at mouth of Willow creek--depth = 30 cm

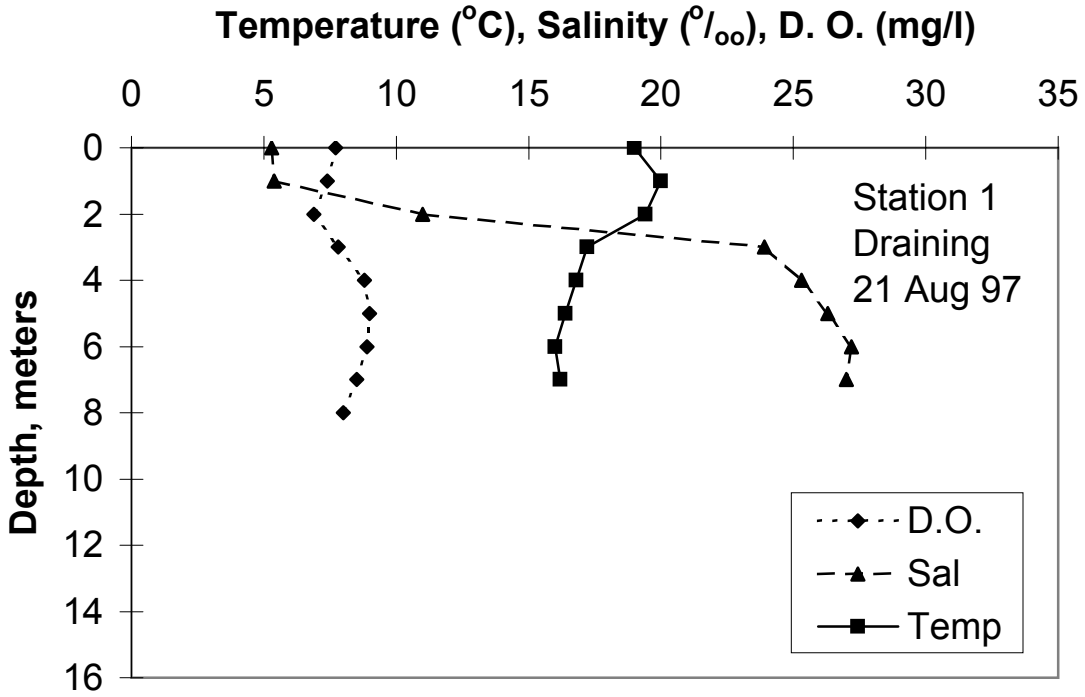
Appendix A-9. Tidal Water Quality Profiles, Event III, 1 July 1997

| 1-Jul-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1(0915 hr PDT) | | | | Station 2 (1000 hr PDT) | | | | Station 3 (1025 hr PDT) | | | | Station 4 (1100 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 16.5 | 12.2 | 16500 | 8.4 | 19.6 | 7.0 | 10400 | 7.8 | 20.0 | 5.2 | 8000 | 7.7 | 21.0 | 3.5 | 5300 | 7.6 |
| 1 | 13.0 | 24.8 | 30500 | 8.1 | 16.0 | 21.7 | 29100 | 7.4 | 16.5 | 18.9 | 25200 | 7.2 | 20.0 | 7.3 | 12000 | 7.2 |
| 2 | 11.8 | 28.4 | 33000 | 8.1 | 13.0 | 27.3 | 33200 | 7.6 | 13.0 | 28.0 | 33900 | 7.0 | 17.0 | 26.0 | 32000 | 5.6 |
| 3 | 11.5 | 28.0 | 33900 | 8.2 | 12.5 | 28.0 | 33800 | 7.6 | 12.6 | 28.0 | 33800 | 7.0 | 14.9 | 22.2 | 32500 | 5.7 |
| 4 | 11.2 | 29.2 | 33900 | 8.2 | 12.2 | 28.4 | 33800 | 7.6 | 12.2 | 28.4 | 33900 | 6.9 | 14.0 | 296.5 | 32900 | 6.1 |
| 5 | 11.5 | 29.2 | 33900 | 8.2 | 12.0 | 28.8 | 34000 | 7.5 | | | | | - | - | - | - |
| 6 | 11.5 | 29.5 | 34000 | 8.1 | 12.0 | 28.8 | 34000 | 7.4 | | | | | 14.0 | 26.5 | 33000 | 6.3 |
| 6.5 | - | - | - | - | 12.0 | 28.8 | 34000 | 7.4 | | | | | - | - | - | - |
| 7 | 11.5 | 29.5 | 34000 | 8.0 | | | | | | | | | - | - | - | - |
| 8 | 11.5 | 29.6 | 34000 | 8.0 | | | | | | | | | 13.9 | 26.9 | 33000 | 6.2 |
| 9 | - | - | - | 8.0 | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 13.9 | 27.0 | 33100 | 6.1 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 13.9 | 27.0 | 33100 | 6.1 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 139.0 | 27.0 | 33100 | 6.2 |

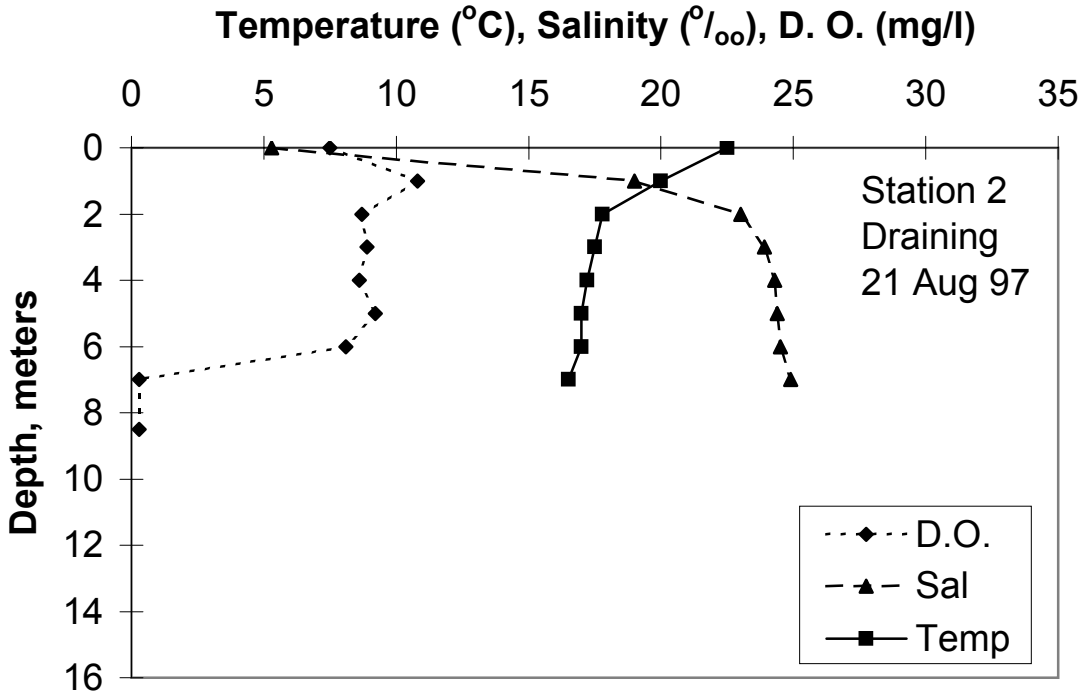
Appendix A-10. Prebreaching Water Quality Profiles, Event IV, 18 August 1997

| 18-Aug-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0920 hr PDT) | | | | Station 2 (1530 hr PDT) | | | | Station 3 (1505 hr PDT) | | | | Station 3A (1450 hr PDT) | | | | Station 4 (1325 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 18.0 | 2.0 | 2480 | 9.1 | 21.0 | 1.0 | 1310 | 8.0 | 21.0 | 0.7 | 760 | 8.0 | 21.0 | 0.7 | 770 | 7.4 | 21.5 | 0.5 | 4850 | 7.9 |
| 1 | 18.0 | 2.0 | 2500 | 9.0 | 21.0 | 1.1 | 1400 | 8.2 | 21.0 | 0.7 | 750 | 8.0 | 21.0 | 0.8 | 770 | 7.3 | 21.0 | 0.5 | 4900 | 7.9 |
| 2 | 18.3 | 2.0 | 2540 | 9.0 | 20.5 | 3.2 | 4000 | 8.7 | 21.0 | 3.0 | 4100 | 9.5 | 21.0 | 2.6 | 4000 | 7.3 | 21.0 | 3.2 | 4200 | 8.8 |
| 2.5 | 19.5 | 10.0 | 14500 | 10.0 | - | - | - | - | - | - | - | - | | | | | - | - | - | - |
| 3 | 19.0 | 21.5 | 31500 | 10.0 | 21.5 | 20.0 | 35500 | 13.8 | 21.9 | 19.2 | 29000 | 14.5 | | | | | 22.0 | 22.0 | 33000 | 8.5 |
| 4 | 17.7 | 24.9 | 34000 | 6.2 | 18.0 | 25.4 | 34700 | 3.2 | 18.0 | 24.5 | 33900 | 2.1 | | | | | 19.6 | 25.2 | 35500 | 5.0 |
| 5 | 16.0 | 26.0 | 34000 | 6.4 | 16.0 | 26.0 | 34000 | 2.3 | 16.0 | 25.7 | 33600 | 1.9 | | | | | 18.5 | 25.7 | 35300 | 3.4 |
| 5.9 | - | - | - | - | - | - | - | - | 15.0 | 26.3 | 33800 | 0.4 | | | | | - | - | - | - |
| 6 | 15.0 | 26.9 | 34000 | 4.9 | 14.8 | 26.5 | 34000 | 1.1 | | | | | | | | | - | - | - | - |
| 7 | 14.7 | 27.0 | 34000 | 3.2 | 14.5 | 26.7 | 34000 | 0.4 | | | | | | | | | 17.2 | 26.2 | 35000 | 2.3 |
| 8 | 14.5 | 27.0 | 34000 | 2.5 | - | - | - | - | | | | | | | | | - | - | - | - |
| 9 | 14.3 | 27.0 | 34000 | 1.6 | 14.0 | 27.0 | 33500 | 0.2 | | | | | | | | | 17.0 | 26.4 | 35000 | 1.8 |
| 10 | 14.0 | 27.1 | 34000 | 1.5 | | | | | | | | | | | | | - | - | - | - |
| 11 | | | | | | | | | | | | | | | | | 16.9 | 26.4 | 35000 | 1.2 |
| 12 | | | | | | | | | | | | | | | | | - | - | - | - |
| 13 | | | | | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | | | | | 16.9 | 26.5 | 35000 | 0.9 |

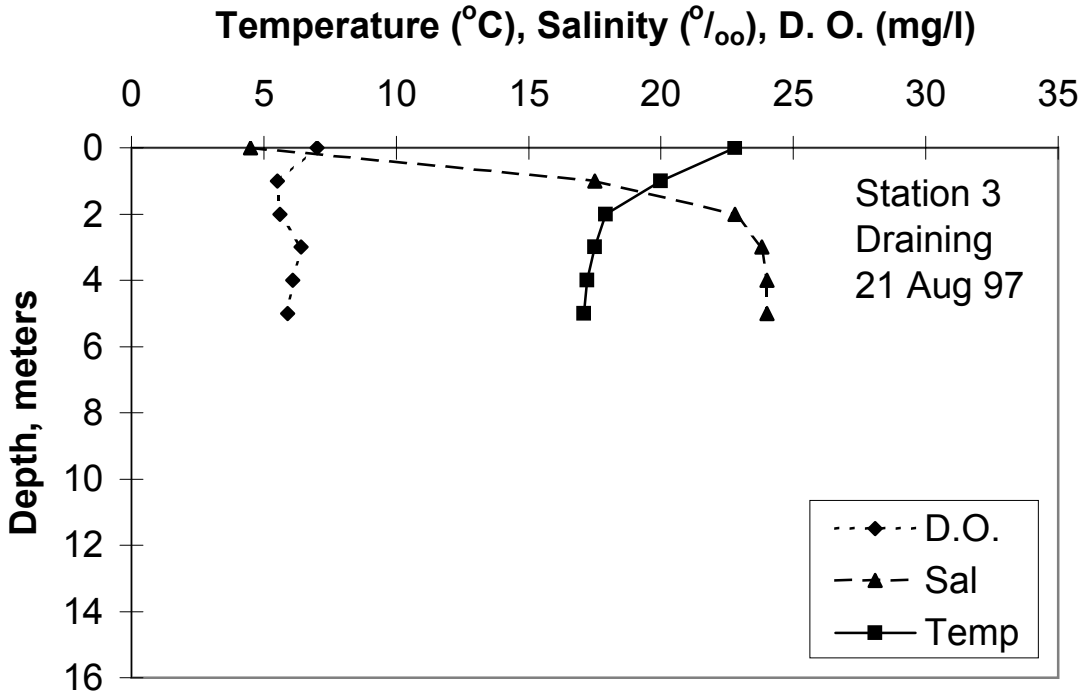
Appendix A-00. Water Quality Profiles, Station 1, Event VII



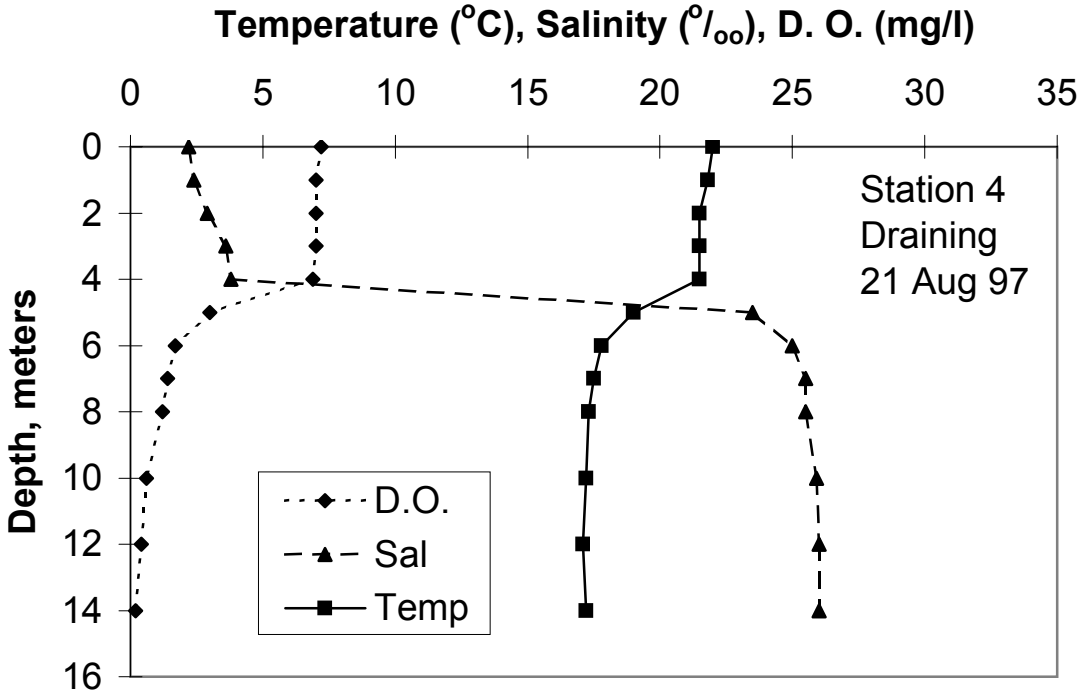
Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



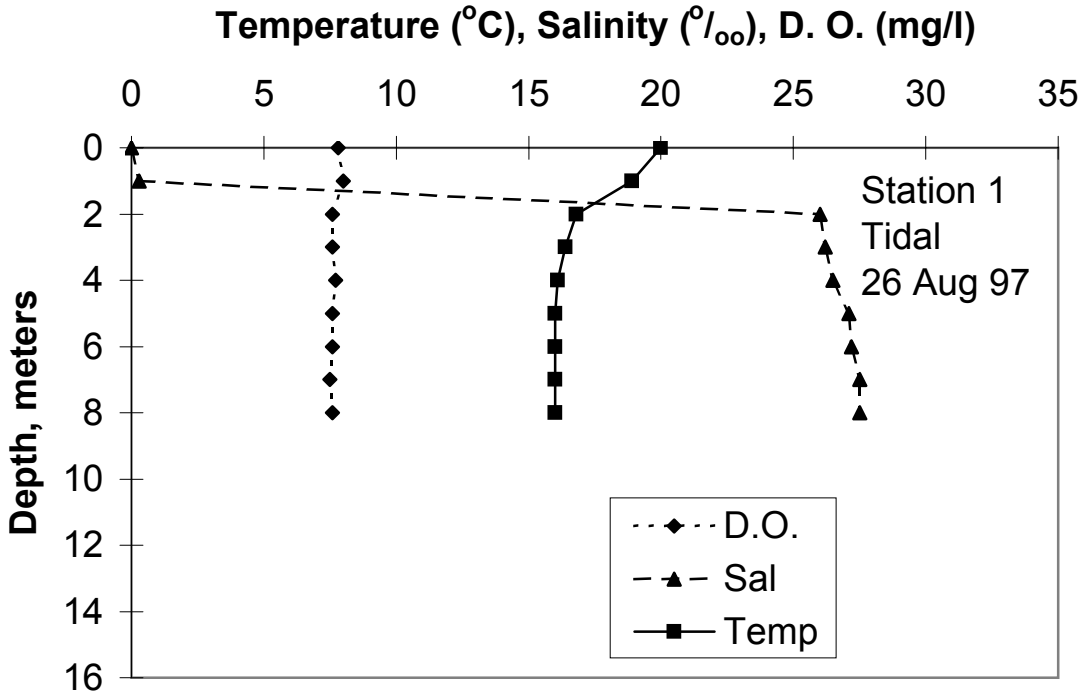
Appendix A-00. Water Quality Profiles, Station 1, Event VII



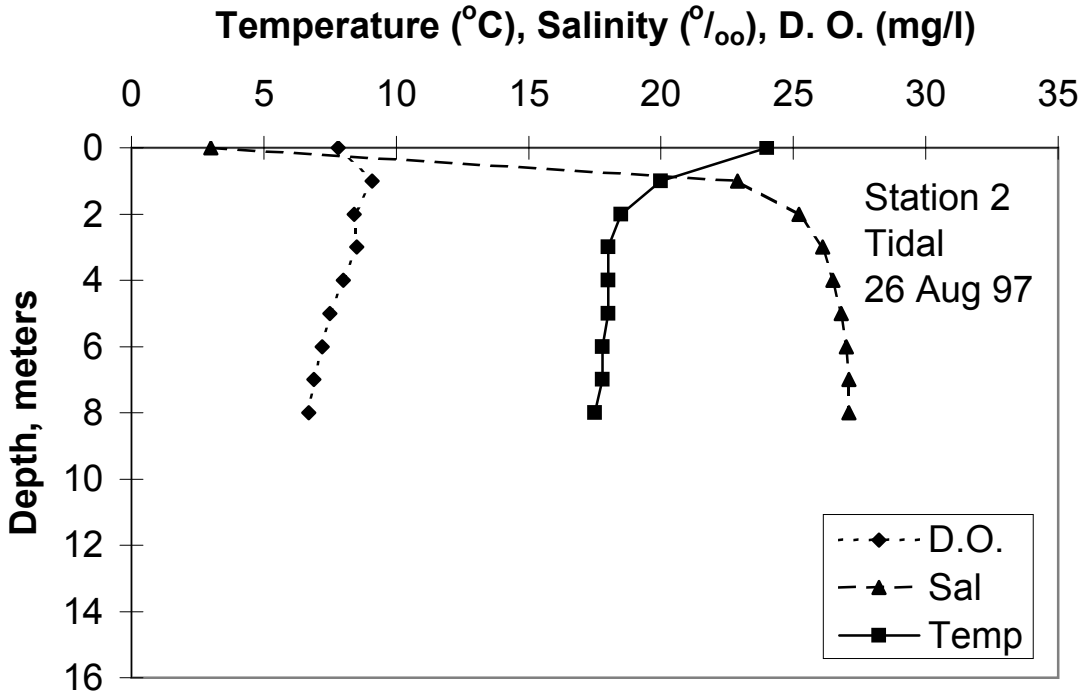
Appendix A-11. Draining Water Quality Profiles, Event IV, 21 August 1997

| 21-Aug-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0915 hr PDT) | | | | Station 2 (1510 hr PDT) | | | | Station 3 (1450 hr PDT) | | | | Station 4 (1340 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 19.0 | 5.3 | 8000 | 7.7 | 22.5 | 5.3 | 8500 | 7.5 | 22.8 | 4.5 | 7200 | 7.0 | 22.0 | 2.2 | 3120 | 7.2 |
| 1 | 20.0 | 5.4 | 8100 | 7.4 | 20.0 | 19.0 | 27500 | 10.8 | 20.0 | 17.5 | 25200 | 5.5 | 21.8 | 2.4 | 3420 | 7.0 |
| 2 | 19.4 | 11.0 | 16300 | 6.9 | 17.8 | 23.0 | 31800 | 8.7 | 17.9 | 22.8 | 31500 | 5.6 | 21.5 | 2.9 | 4400 | 7.0 |
| 3 | 17.2 | 23.9 | 32200 | 7.8 | 17.5 | 23.9 | 32500 | 8.9 | 17.5 | 23.8 | 32200 | 6.4 | 21.5 | 3.6 | 5800 | 7.0 |
| 4 | 16.8 | 25.3 | 33800 | 8.8 | 17.2 | 24.3 | 32900 | 8.6 | 17.2 | 24.0 | 32600 | 6.1 | 21.5 | 3.8 | 6000 | 6.9 |
| 5 | 16.4 | 26.3 | 34700 | 9.0 | 17.0 | 24.4 | 33000 | 9.2 | 17.1 | 24.0 | 32800 | 5.9 | 19.0 | 23.5 | 32000 | 3.0 |
| 6 | 16.0 | 27.2 | 35200 | 8.9 | 17.0 | 24.5 | 32000 | 8.1 | | | | | 17.8 | 25.0 | 34000 | 1.7 |
| 7 | 16.2 | 27.0 | 35200 | 8.5 | 16.5 | 24.9 | 33000 | 0.3 | | | | | 17.5 | 25.5 | 34500 | 1.4 |
| 8 | - | - | - | 8.0 | - | - | - | - | | | | | 17.3 | 25.5 | 34500 | 1.2 |
| 8.5 | | | | | - | - | - | 0.3 | | | | | - | - | - | - |
| 9 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 17.2 | 25.9 | 34700 | 0.6 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 17.1 | 26.0 | 35000 | 0.4 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 17.2 | 26.0 | 34800 | 0.2 |

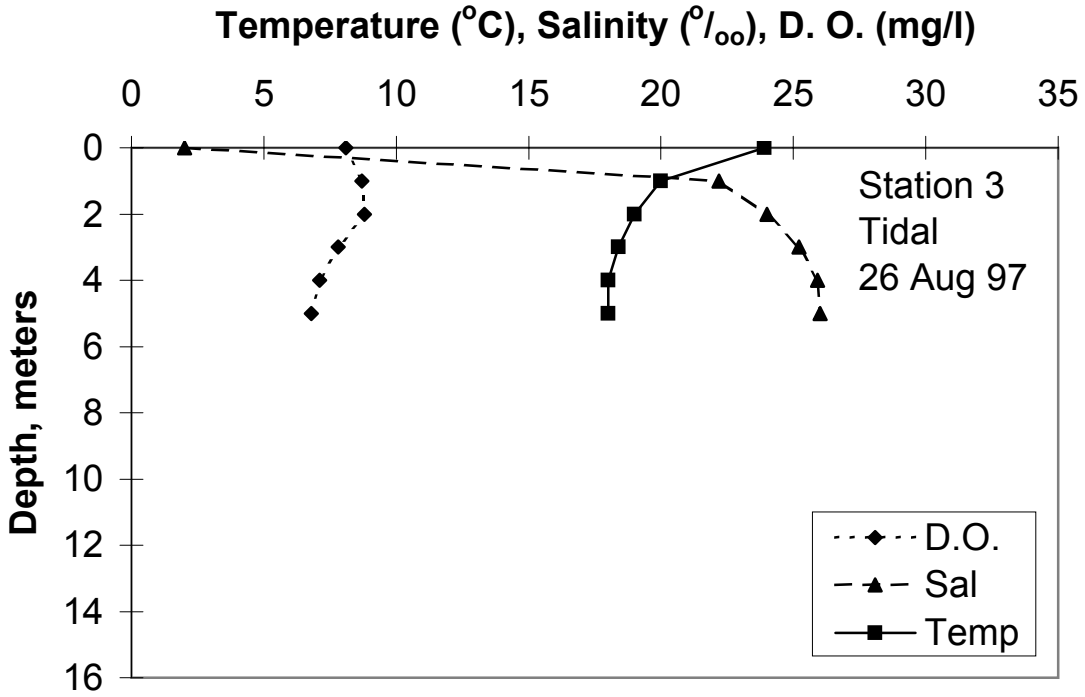
Appendix A-00. Water Quality Profiles, Station 1, Event VII



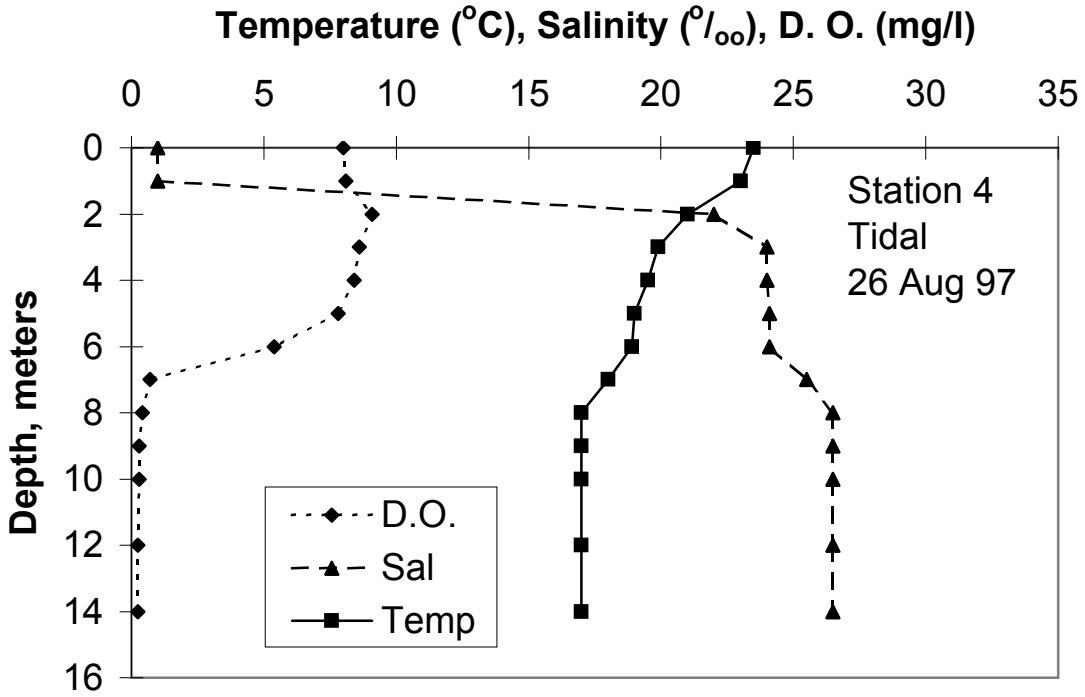
Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-12. Tidal Water Quality Profiles, Event IV, 26 August 1997

| 26-Aug-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0905 hr PDT) | | | | Station 2 (1400 hr PDT) | | | | Station 3 (1330 hr PDT) | | | | Station 4 (1300 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 20.0 | 0.0 | 100 | 7.8 | 24.0 | 3.0 | 4900 | 7.8 | 23.9 | 2.0 | 2900 | 8.1 | 23.5 | 1.0 | 1140 | 8.0 |
| 1 | 18.9 | 0.3 | 320 | 8.0 | 20.0 | 22.9 | 32500 | 9.1 | 20.0 | 22.2 | 32500 | 8.7 | 23.0 | 1.0 | 1300 | 8.1 |
| 2 | 16.8 | 26.0 | 33700 | 7.6 | 18.5 | 25.2 | 35000 | 8.4 | 19.0 | 24.0 | 34800 | 8.8 | 21.0 | 22.0 | 32000 | 9.1 |
| 3 | 16.4 | 26.2 | 34200 | 7.6 | 18.0 | 26.1 | 35500 | 8.5 | 18.4 | 25.2 | 35000 | 7.8 | 19.9 | 24.0 | 33100 | 8.6 |
| 4 | 16.1 | 26.5 | 34700 | 7.7 | 18.0 | 26.5 | 36000 | 8.0 | 18.0 | 25.9 | 35100 | 7.1 | 19.5 | 24.0 | 33900 | 8.4 |
| 5 | 16.0 | 27.1 | 35000 | 7.6 | 18.0 | 26.8 | 36000 | 7.5 | 18.0 | 26.0 | 35200 | 6.8 | 19.0 | 24.1 | 34000 | 7.8 |
| 6 | 16.0 | 27.2 | 35100 | 7.6 | 17.8 | 27.0 | 36200 | 7.2 | | | | | 18.9 | 24.1 | 34000 | 5.4 |
| 7 | 16.0 | 27.5 | 35400 | 7.5 | 17.8 | 27.1 | 36100 | 6.9 | | | | | 18.0 | 25.5 | 34700 | 0.7 |
| 8 | 16.0 | 27.5 | 35500 | 7.6 | 17.5 | 27.1 | 36200 | 6.7 | | | | | 17.0 | 26.5 | 35000 | 0.4 |
| 9 | | | | | | | | | | | | | 17.0 | 26.5 | 35000 | 0.3 |
| 10 | | | | | | | | | | | | | 17.0 | 26.5 | 35000 | 0.3 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 17.0 | 26.5 | 35000 | 0.3 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 17.0 | 26.5 | 35000 | 0.3 |

Appendix A-13. Prebreaching Water Quality Profiles, Event V, 16 September 1997

| 16-Sep-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (1005 hr PDT) | | | | Station 2 (1740 hr PDT) | | | | Station 3 (1715 hr PDT) | | | | Station 3A (1345 hr PDT) | | | | Station 4 (1610 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 19.0 | 2.9 | 3900 | 8.2 | 21.0 | 1.9 | 2520 | 8.4 | 21.5 | 1.0 | 1400 | 8.2 | 21.0 | 1.2 | 1550 | 7.4 | 21.9 | 0.2 | 30 | 8.3 |
| 1 | 19.2 | 3.0 | 4050 | 8.3 | 21.2 | 2.0 | 2800 | 8.3 | 21.5 | 1.0 | 1400 | 8.1 | 20.8 | 1.2 | 1600 | 7.4 | 21.8 | 0.2 | 33 | 8.2 |
| 2 | 19.1 | 3.2 | 4220 | 8.3 | 21.3 | 2.2 | 3100 | 8.2 | 21.7 | 2.6 | 3850 | 8.0 | 19.7 | 1.5 | 1900 | 6.5 | 22.6 | 0.2 | 39 | 8.5 |
| 3 | 22.0 | 21.3 | 32900 | 10.4 | 23.2 | 19.8 | 31000 | 8.8 | 23.5 | 17.1 | 27000 | 7.9 | | | | | 24.5 | 19.8 | 32300 | 8.3 |
| 4 | 20.2 | 24.5 | 35300 | 11.6 | 21.0 | 24.5 | 36000 | 6.7 | 21.0 | 24.6 | 36000 | 6.5 | | | | | 23.3 | 21.1 | 32800 | 8.0 |
| 5 | 19.0 | 25.4 | 35300 | 11.4 | 19.5 | 25.5 | 36000 | 4.1 | 19.0 | 25.6 | 36000 | 3.1 | | | | | 21.9 | 22.9 | 34100 | 6.3 |
| 6 | 17.8 | 26.0 | 35500 | 8.9 | 18.2 | 26.0 | 35500 | 2.7 | 17.9 | 26.6 | 36000 | 1.4 | | | | | 20.5 | 24.7 | 35500 | 4.7 |
| 7 | 17.0 | 26.3 | 35200 | 7.5 | 17.1 | 26.3 | 35000 | 0.6 | | | | | | | | | 20.0 | 24.6 | 34300 | 4.6 |
| 8 | 16.5 | 27.2 | 35200 | 4.9 | 16.9 | 26.4 | 35000 | 0.3 | | | | | | | | | 19.4 | 24.8 | 35000 | 4.1 |
| 8.8 | - | - | - | - | 16.0 | 27.1 | 35000 | 0.3 | | | | | | | | | - | - | - | - |
| 9 | 16.1 | 27.0 | 35200 | 2.7 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | | | | | 19.0 | 26.0 | 36100 | 2.6 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 17.9 | 26.9 | 35300 | 0.8 |
| 13 | | | | | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | | | | | 17.3 | 26.1 | 35200 | 0.2 |

Appendix A-14. Draining Water Quality Profiles, Event V, 20 September 1997

| 20-Sep-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0845 hr PDT) | | | | Station 2 (1500 hr PDT) | | | | Station 3 (1440 hr PDT) | | | | Station 4 (1345 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 20.3 | 3.7 | 5600 | 7.9 | 22.2 | 3.4 | 5200 | 7.6 | 22.2 | 3.0 | 4400 | 7.6 | 20.8 | 1.6 | 2040 | 7.4 |
| 1 | 20.7 | 3.8 | 5800 | 7.8 | 19.0 | 18.0 | 26000 | 7.1 | 21.0 | 12.2 | 18500 | 7.4 | 21.0 | 1.7 | 2270 | 7.4 |
| 2 | 20.8 | 3.9 | 6000 | 7.8 | 17.0 | 23.1 | 31300 | 5.9 | 20.1 | 22.0 | 32000 | 5.9 | 21.0 | 1.9 | 2350 | 7.4 |
| 3 | 20.0 | 19.3 | 28400 | 7.6 | 17.3 | 24.0 | 32300 | 5.6 | 20.0 | 23.1 | 33000 | 5.3 | 21.0 | 1.9 | 2380 | 7.5 |
| 4 | 19.5 | 23.5 | 33700 | 6.6 | 16.4 | 24.0 | 32100 | 5.8 | 20.0 | 23.6 | 33600 | 5.3 | 21.0 | 3.5 | 6000 | 7.5 |
| 4.5 | - | - | - | - | - | - | - | - | 20.0 | 24.2 | 34200 | - | - | - | - | - |
| 5 | 19.7 | 25.2 | 35700 | 4.5 | 16.0 | 24.5 | 32800 | 5.8 | - | - | - | 2.6 | 21.0 | 22.5 | 34000 | 3.5 |
| 6 | 18.0 | 25.9 | 35300 | 4.8 | 16.5 | 25.0 | 33200 | 5.1 | | | | | 20.3 | 24.5 | 35200 | 2.8 |
| 7 | 17.5 | 26.1 | 35200 | 2.9 | 17.0 | 26.0 | 34000 | 4.4 | | | | | 20.0 | 24.7 | 35500 | 2.3 |
| 8 | 17.2 | 26.1 | 35200 | 2.6 | 16.7 | 25.6 | 35200 | 0.6 | | | | | 19.8 | 25.1 | 35500 | 2.1 |
| 9 | | | | | 16.4 | 26.3 | 35000 | 0.4 | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 19.0 | 25.1 | 35100 | 0.5 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 18.0 | 25.3 | 35000 | 0.5 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 18.0 | 25.3 | 34700 | 0.3 |

Appendix A-15. Tidal Water Quality Profiles, Event V, 23 September 1997

| 23-Sep-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0930 hr PDT) | | | | Station 2 (1410 hr PDT) | | | | Station 3 (1355 hr PDT) | | | | Station 4 (1315 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 16.8 | 9.0 | 12500 | 8.1 | 20.5 | 6.0 | 9300 | 7.9 | 21.0 | 3.3 | 4750 | 8.1 | 20.8 | 1.2 | 1630 | 7.7 |
| 1 | 14.8 | 23.4 | 30400 | 8.1 | 17.9 | 19.0 | 25000 | 8.3 | 18.8 | 15.0 | 22000 | 9.8 | 20.5 | 1.3 | 1630 | 7.7 |
| 2 | 13.6 | 25.7 | 32000 | 8.2 | 15.4 | 24.8 | 32000 | 9.2 | 16.0 | 24.0 | 31800 | 10.2 | 17.9 | 19.8 | 28000 | 8.8 |
| 3 | 13.5 | 26.3 | 32500 | 8.3 | 15.0 | 25.3 | 32400 | 9.3 | 15.4 | 24.5 | 32500 | 10.2 | 17.5 | 22.9 | 36200 | 8.8 |
| 4 | 13.5 | 26.6 | 33000 | 8.3 | 14.8 | 25.7 | 32700 | 9.3 | 15.0 | 25.5 | 32500 | 9.3 | 17.0 | 23.8 | 32200 | 8.2 |
| 5 | 13.5 | 26.8 | 33000 | 8.3 | 14.7 | 25.7 | 32800 | 9.1 | 14.9 | 25.8 | 33000 | 8.9 | 17.0 | 24.1 | 32500 | 7.8 |
| 5.6 | - | - | - | - | - | - | - | - | - | - | - | 8.7 | - | - | - | - |
| 6 | 13.4 | 27.2 | 33300 | 8.2 | 14.7 | 25.9 | 33000 | 8.9 | | | | | 17.0 | 24.3 | 32800 | 7.8 |
| 7 | 13.3 | 27.4 | 33500 | 8.2 | 14.7 | 26.0 | 33000 | 8.9 | | | | | - | - | - | - |
| 8 | 13.3 | 27.5 | 33600 | - | 14.7 | 25.9 | 33000 | 8.8 | | | | | 17.5 | 25.5 | 34700 | 5.7 |
| 9 | | | | | 14.7 | 26.1 | 33100 | 8.4 | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 18.4 | 27.0 | 36000 | 0.6 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 18.2 | 26.0 | 35500 | 0.3 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 18.1 | 26.2 | 35700 | 0.2 |

Appendix A-16. Prebreaching Water Quality Profiles, Event VI, 10 October 1997

| 10-Oct-97 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0830 hr PDT) | | | | Station 2 (1540 hr PDT) | | | | Station 3 (1505 hr PDT) | | | | Station 3A (1450 hr PDT) | | | | Station 4 (1335 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm |
| 0 | 14.8 | 4.5 | 6000 | 9.8 | 17.7 | 2.5 | 3050 | 9.6 | 17.2 | 1.5 | 1820 | 9.7 | 17.4 | 1.6 | 2000 | 9.4 | 18.0 | 0.8 | 820 | 9.2 |
| 1 | 15.0 | 4.5 | 6000 | 9.8 | 16.5 | 5.1 | 7200 | 9.7 | 17.4 | 2.0 | 2390 | 9.7 | 16.0 | 2.9 | 3650 | 6.0 | 17.9 | 0.9 | 800 | 9.3 |
| 2 | 15.3 | 5.2 | 7000 | 9.7 | 16.5 | 9.2 | 13100 | 10.0 | 16.3 | 8.3 | 11900 | 9.6 | 17.8 | 10.4 | 14800 | 6.8 | 17.0 | 8.6 | 12200 | 9.1 |
| 3 | 16.7 | 15.6 | 21600 | 8.5 | 18.0 | 16.4 | 23500 | 9.7 | 18.0 | 16.0 | 22800 | 8.7 | | | | | 19.0 | 17.5 | 23500 | 8.1 |
| 4 | 17.8 | 20.4 | 28300 | 7.9 | 18.2 | 21.7 | 30200 | 6.6 | 18.2 | 21.8 | 30800 | 6.0 | | | | | 19.7 | 21.7 | 31000 | 6.5 |
| 5 | 17.7 | 21.5 | 30000 | 6.9 | 17.7 | 23.2 | 32000 | 5.4 | 17.5 | 23.1 | 32300 | 4.8 | | | | | 18.8 | 24.0 | 33500 | 5.2 |
| 6 | 17.5 | 22.4 | 31000 | 6.3 | 17.2 | 24.4 | 32900 | 3.4 | 16.0 | 25.6 | 33300 | 0.8 | | | | | 18.0 | 24.3 | 33500 | 3.7 |
| 7 | 17.0 | 23.5 | 31500 | 4.9 | 16.0 | 25.6 | 33500 | 1.5 | | | | | | | | | 17.3 | 24.3 | 33000 | 3.7 |
| 8 | 16.9 | 23.5 | 31700 | 4.6 | 15.5 | 26.0 | 33500 | 1.1 | | | | | | | | | 16.8 | 24.7 | 32900 | 3.7 |
| 9 | 16.8 | 23.7 | 32000 | 3.6 | 15.2 | 26.2 | 33500 | 1.0 | | | | | | | | | - | - | - | - |
| 10 | - | - | - | 2.4 | | | | | | | | | | | | | 16.1 | 25.0 | 32600 | 3.2 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 16.1 | 25.0 | 32600 | 2.9 |
| 13 | | | | | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | | | | | 16.1 | 25.0 | 325 | 2.7 |

Appendix A-17. Draining Water Quality Profiles, Event VI, 12 October 1997

| 12-Oct-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0955 hr PDT) | | | | Station 2 (1530 hr PDT) | | | | Station 3 (1515 hr PDT) | | | | Station 4 (1400 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 15.3 | 4.7 | 5800 | 8.7 | 18.2 | 4.7 | 7000 | 8.0 | 18.5 | 4.3 | 6100 | 7.7 | 17.2 | 3.5 | 4650 | 7.6 |
| 1 | 17.0 | 5.9 | 8300 | 8.3 | 18.0 | 5.0 | 7200 | 7.9 | 18.2 | 4.4 | 6500 | 7.7 | 17.2 | 3.6 | 5200 | 7.6 |
| 2 | 17.0 | 9.4 | 13200 | 7.9 | 18.0 | 5.5 | 8000 | 7.9 | 19.0 | 6.1 | 9500 | 7.7 | 17.2 | 3.6 | 5200 | 7.6 |
| 3 | 14.8 | 18.0 | 23800 | 7.5 | 18.0 | 21.0 | 29700 | 4.2 | 17.0 | 23.3 | 31900 | 3.3 | 17.2 | 18.5 | 25000 | 6.6 |
| 4 | 14.1 | 20.7 | 21400 | 7.3 | 17.0 | 23.8 | 32100 | 2.2 | 16.1 | 25.0 | 32800 | 1.4 | 17.2 | 23.3 | 32000 | 3.2 |
| 5 | 13.9 | 22.1 | 28000 | 7.0 | 16.0 | 25.0 | 33000 | 1.1 | 16.0 | 25.1 | 33000 | 1.3 | 16.5 | 24.0 | 32100 | 3.0 |
| 6 | 13.9 | 22.8 | 28800 | 6.6 | 16.0 | 25.2 | 33200 | 0.8 | | | | | 16.0 | 24.5 | 32200 | 3.0 |
| 7 | 15.0 | 24.5 | 31500 | 5.1 | 15.7 | 25.2 | 32800 | 0.6 | | | | | 15.5 | 25.0 | 32300 | 2.7 |
| 8 | 15.0 | 24.8 | 31800 | 4.8 | 15.5 | 26.0 | 33400 | 0.5 | | | | | 15.5 | 25.0 | 32400 | 2.3 |
| 9 | | | | | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 15.5 | 25.2 | 32500 | 2.2 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 15.5 | 25.3 | 32600 | 2.0 |
| 13 | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | |

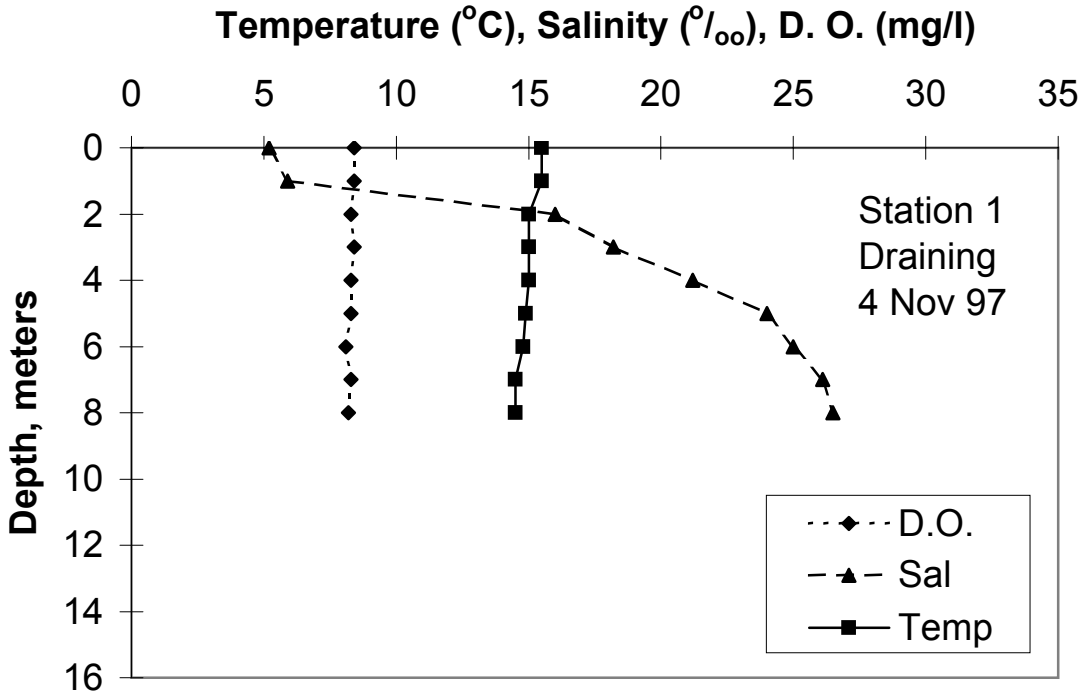
Appendix A-18. Tidal Water Quality Profiles, Event VI, 15 October 1997

| 15-Oct-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (1105 hr PDT) | | | | Station 2 (1530 hr PDT) | | | | Station 3 (1455 hr PDT) | | | | Station 4 ( 1300hr PDT) | | | |
| Depth Meters | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm | Temp ºC | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 12.9 | 26.0 | 31400 | 8.4 | 16.8 | 14.8 | 20700 | 8.2 | 17.8 | 13.1 | 18800 | 8.0 | 17.1 | 12.3 | 17200 | 8.0 |
| 1 | 12.9 | 26.3 | 31800 | 8.5 | 16.0 | 16.8 | 23000 | 8.2 | 16.5 | 15.8 | 21800 | 8.2 | 16.0 | 15.0 | 20800 | 8.0 |
| 2 | 12.9 | 26.6 | 32100 | 8.5 | 14.7 | 22.0 | 28400 | 8.1 | 15.4 | 19.4 | 26500 | 8.2 | 15.0 | 19.0 | 25000 | 7.8 |
| 3 | 12.9 | 26.9 | 32400 | 8.5 | 13.9 | 24.1 | 30400 | 8.2 | 14.0 | 22.6 | 30500 | 8.2 | 14.9 | 20.2 | 26300 | 7.8 |
| 4 | 12.8 | 27.0 | 32600 | 8.5 | 13.5 | 24.9 | 31000 | 8.2 | 14.0 | 24.3 | 30800 | 8.2 | 14.8 | 21.0 | 27200 | 7.6 |
| 5 | 12.8 | 27.0 | 32600 | 8.6 | 13.4 | 25.2 | 31100 | 8.2 | 13.7 | 24.7 | 31000 | 8.2 | 14.5 | 22.4 | 28500 | 7.2 |
| 6 | 12.8 | 27.2 | 32800 | 8.5 | 13.1 | 25.7 | 31500 | 8.2 | | | | | 14.5 | 23.0 | 29500 | 6.4 |
| 7 | 12.8 | 27.3 | 32800 | 8.5 | 13.0 | 25.9 | 31600 | 8.2 | | | | | 14.7 | 23.5 | 29800 | 6.2 |
| 8 | 12.8 | 27.4 | 33000 | 8.5 | 13.0 | 26.0 | 31800 | 8.2 | | | | | 14.8 | 23.5 | 30200 | 5.6 |
| 9 | 12.8 | 27.5 | 33100 | 8.5 | | | | | | | | | 15.1 | 24.3 | 31500 | 1.8 |
| 10 | | | | | | | | | | | | | 15.9 | 25.0 | 32800 | 1.6 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 16.0 | 25.3 | 33000 | 1.4 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 16.0 | 25.3 | 33100 | 1.3 |

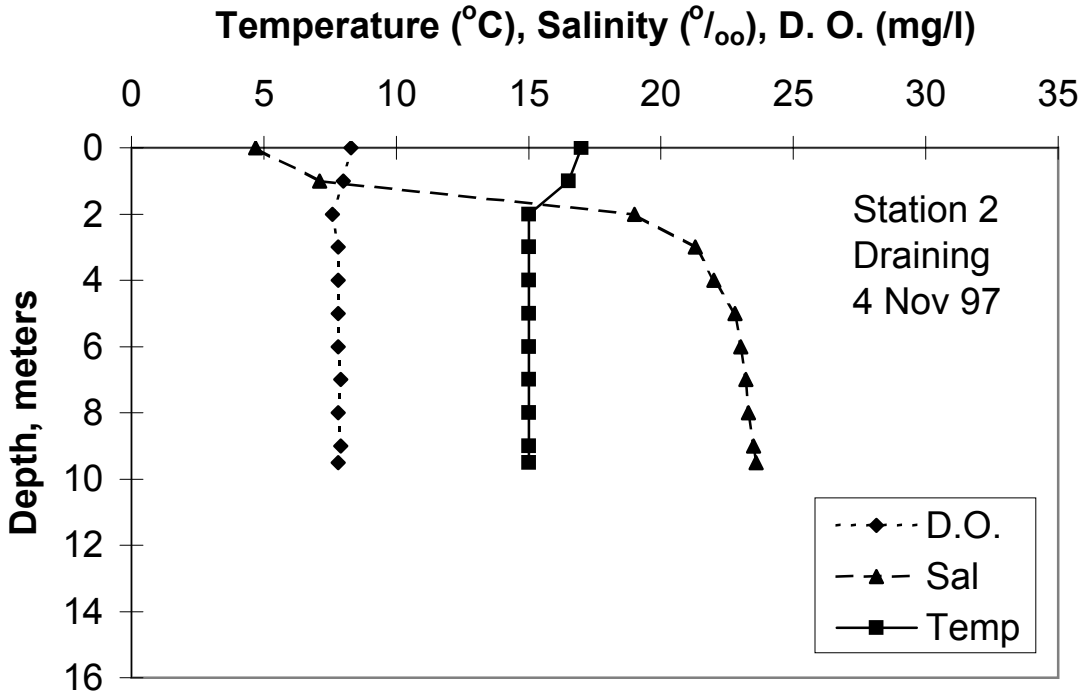
Appendix A-19. Prebreaching Water Quality Profiles, Event VII, 31 October 1997

| 31-Oct | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (1315 hr PDT) | | | | Station 2 (1640 hr PDT) | | | | Station 3 (1625 hr PDT) | | | | Station 3A (1615 hr PDT) | | | | Station 4 (1540 hr PDT) | | | |
| Depth Meters | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm | Temp ºC | Sal ‰ | Cond µmho | D. O. ppm |
| 0 | 14.9 | 5.3 | 6900 | 8.8 | 15.9 | 2.4 | 2850 | 9.5 | 16.5 | 1.0 | 900 | 9.7 | 16.5 | 0.7 | 710 | 8.7 | 16.5 | 0.6 | 650 | 9.7 |
| 1 | 15.0 | 7.0 | 9800 | 10.0 | 15.9 | 2.5 | 2900 | 10.0 | 16.0 | 1.5 | 2000 | 9.7 | 16.0 | 0.8 | 740 | 8.3 | 16.5 | 0.9 | 650 | 9.9 |
| 2 | 15.0 | 12.0 | 16000 | 9.8 | 14.9 | 4.0 | 5500 | 10.0 | 14.5 | 4.0 | 5200 | 9.7 | 15.5 | 5.3 | 7800 | 9.4 | 14.9 | 4.2 | 5900 | 9.8 |
| 3 | 14.5 | 20.0 | 25400 | 9.2 | 15.5 | 18.1 | 24000 | 8.5 | 15.2 | 15.9 | 21000 | 8.7 | | | | | 16.0 | 16.0 | 22000 | 8.4 |
| 4 | 15.0 | 24.0 | 30900 | 9.6 | 15.0 | 23.5 | 30500 | 6.5 | 15.0 | 22.9 | 30000 | 6.5 | | | | | 16.0 | 22.0 | 29000 | 7.8 |
| 5 | 15.0 | 24.9 | 31500 | 9.1 | 15.0 | 24.2 | 31100 | 6.4 | 14.5 | 24.0 | 30900 | 6.0 | | | | | - | - | - | - |
| 6 | 14.0 | 25.1 | 32000 | 8.4 | 14.5 | 25.0 | 32000 | 6.0 | 14.0 | 25.0 | 31100 | 4.0 | | | | | 15.0 | 23.4 | 30000 | 6.4 |
| 7 | 14.0 | 26.1 | 32300 | 7.2 | 14.2 | 25.2 | 32000 | 5.3 | 14.0 | 25.1 | 31400 | 2.7 | | | | | - | - | - | - |
| 8 | 13.9 | 26.8 | 32500 | 6.6 | 14.0 | 25.8 | 32100 | 4.6 | | | | | | | | | 14.5 | 24.0 | 30400 | 5.6 |
| 9 | | | | | 14.0 | 26.0 | 32500 | 4.0 | | | | | | | | | - | - | - | - |
| 10 | | | | | 14.0 | 26.0 | 32500 | 3.7 | | | | | | | | | 14.1 | 24.5 | 30900 | 4.4 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 14.0 | 24.9 | 31000 | 3.8 |
| 13 | | | | | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | | | | | 13.0 | 25.9 | 31100 | 3.7 |

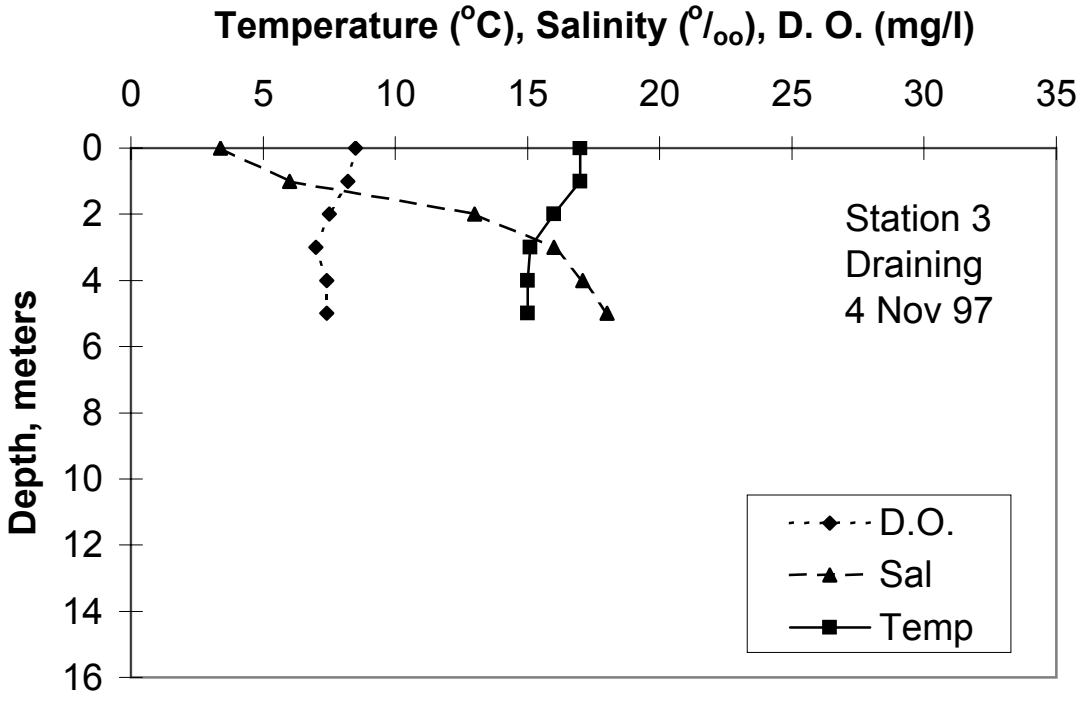
Appendix A-00. Water Quality Profiles, Station 1, Event VII



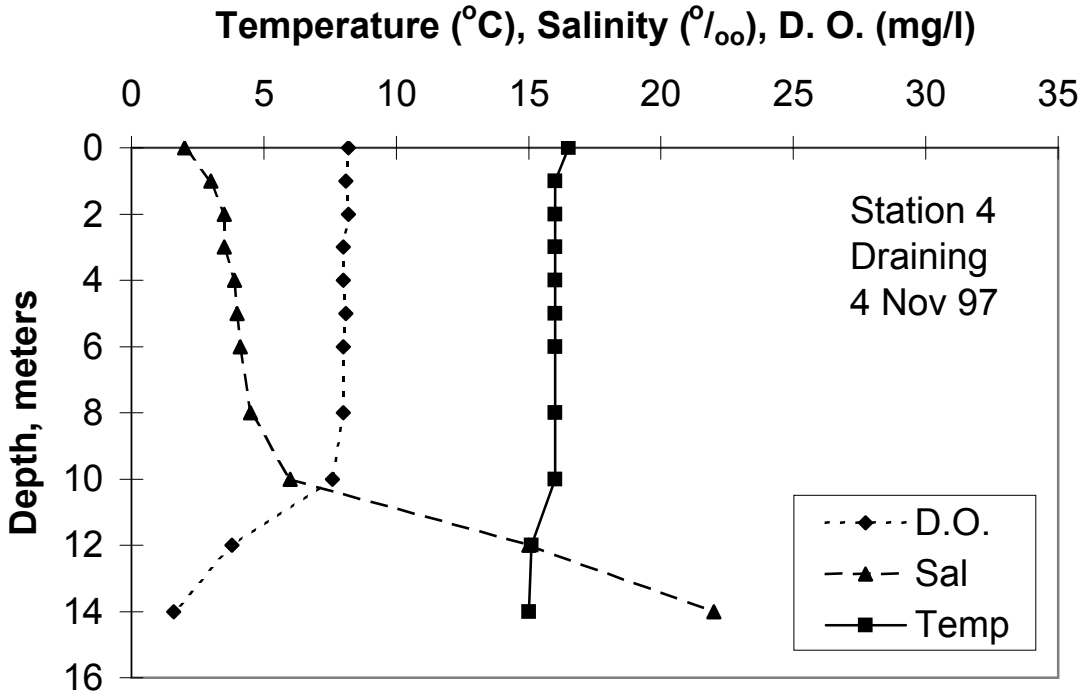
Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



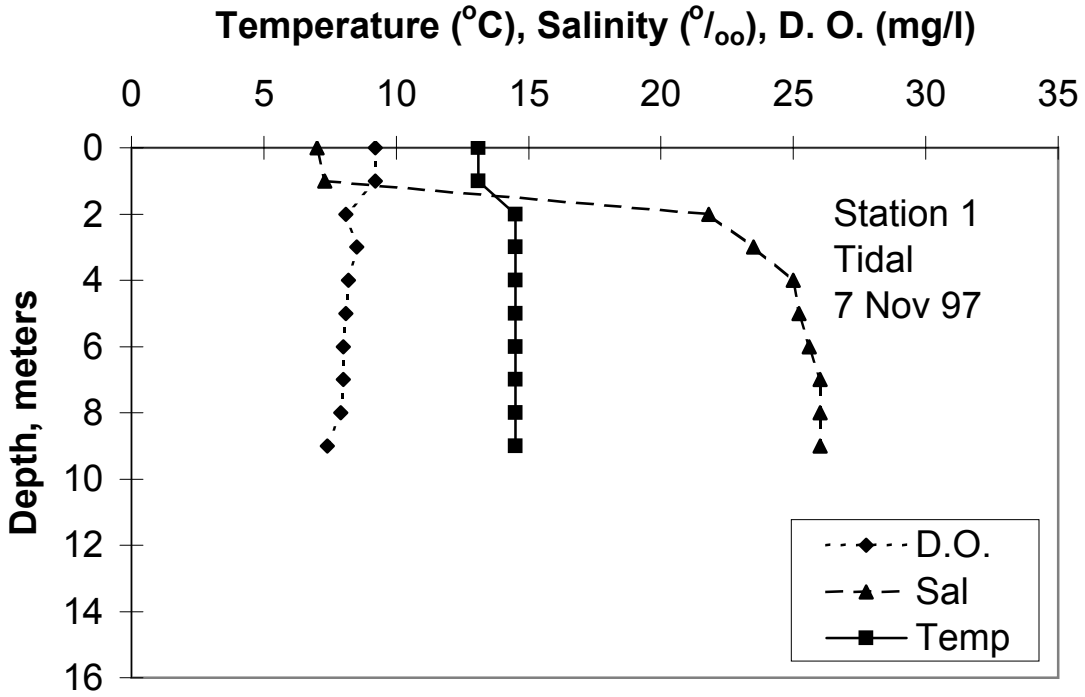
Appendix A-00. Water Quality Profiles, Station 1, Event VII



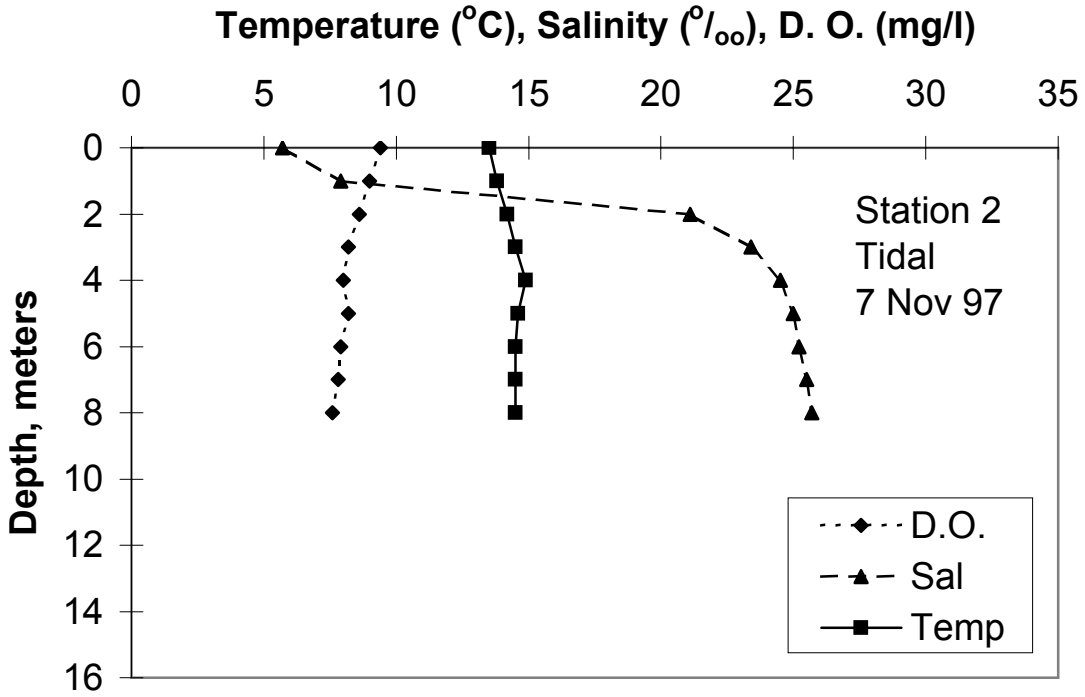
Appendix A-20. Draining Water Quality Profiles, Event VII, 4 November 1997

| Depth Meters | Station 1 (0900 hr PDT) | | | | Station 2 (1420 hr PDT) | | | | Station 3 (1350 hr PDT) | | | | Station 3A (1340 hr PDT) | | | | Station 4 (1245 hr PDT) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 15.5 | 5.2 | 7500 | 8.4 | 17.0 | 4.7 | 6500 | 8.3 | 17.0 | 3.4 | 4600 | 8.5 | 14.9 | 2.0 | 2120 | 4.9 | 16.5 | 2.0 | 2500 | 8.2 |
| 1 | 15.5 | 5.9 | 7900 | 8.4 | 16.5 | 7.1 | 10300 | 8.0 | 17.0 | 6.0 | 9000 | 8.2 | 14.8 | 2.0 | 2400 | - | 16.0 | 3.0 | 4100 | 8.1 |
| 2 | 15.0 | 16.0 | 22000 | 8.3 | 15.0 | 19.0 | 25000 | 7.6 | 16.0 | 13.0 | 17800 | 7.5 | | | | | 16.0 | 3.5 | 4900 | 8.2 |
| 3 | 15.0 | 18.2 | 25000 | 8.4 | 15.0 | 21.3 | 27900 | 7.8 | 15.1 | 16.0 | 21100 | 7.0 | | | | | 16.0 | 3.5 | 4900 | 8.0 |
| 4 | 15.0 | 21.2 | 27000 | 8.3 | 15.0 | 22.0 | 28600 | 7.8 | 15.0 | 17.1 | 23000 | 7.4 | | | | | 16.0 | 3.9 | 5100 | 8.0 |
| 5 | 14.9 | 24.0 | 31000 | 8.3 | 15.0 | 22.8 | 29200 | 7.8 | 15.0 | 18.0 | 23700 | 7.4 | | | | | 16.0 | 4.0 | 5500 | 8.1 |
| 6 | 14.8 | 25.0 | 31000 | 8.1 | 15.0 | 23.0 | 29900 | 7.8 | | | | | | | | | 16.0 | 4.1 | 5700 | 8.0 |
| 7 | 14.5 | 26.1 | 32000 | 8.3 | 15.0 | 23.2 | 30000 | 7.9 | | | | | | | | | - | - | - | - |
| 8 | 14.5 | 26.5 | 32700 | 8.2 | 15.0 | 23.3 | 30100 | 7.8 | | | | | | | | | 16.0 | 4.5 | 6000 | 8.0 |
| 9 | | | | | 15.0 | 23.5 | 30400 | 7.9 | | | | | | | | | - | - | - | - |
| 9.5 | | | | | 15.0 | 23.6 | 30500 | 7.8 | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | | | | | 16.0 | 6.0 | 8100 | 7.6 |
| 11 | | | | | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | | | | | 15.1 | 15.0 | 20000 | 3.8 |
| 13 | | | | | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | | | | | 15.0 | 22.0 | 28000 | 1.6 |

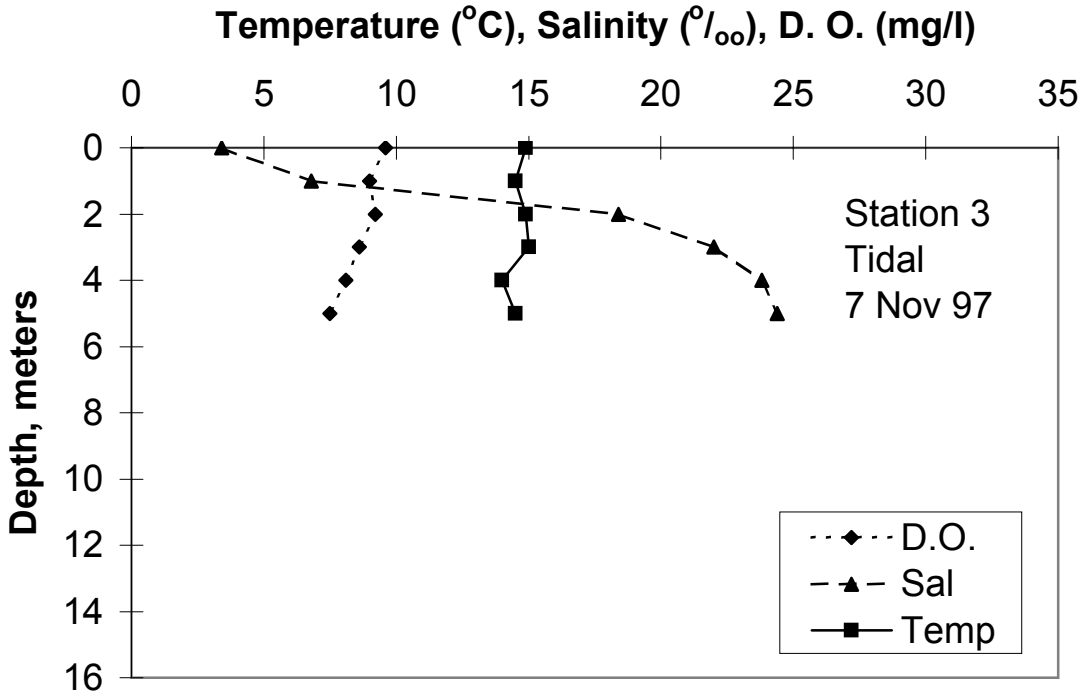
Appendix A-00. Water Quality Profiles, Station 1, Event VII



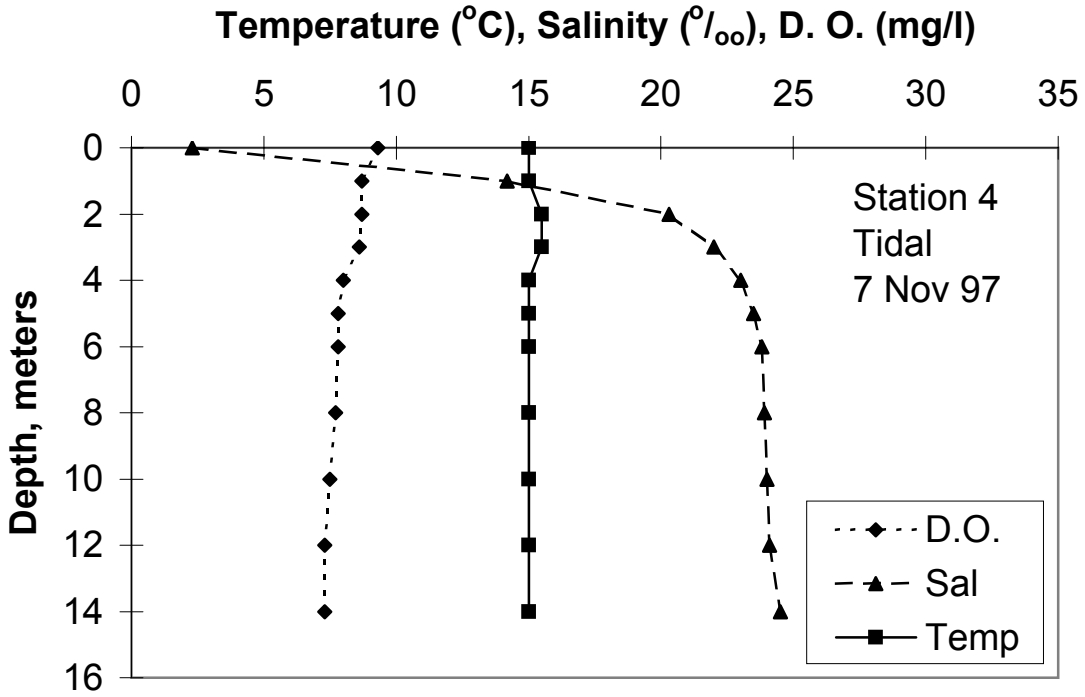
Appendix A-00. Water Quality Profiles, Station 1, Event VII



Appendix A-00. Water Quality Profiles, Station 1, Event VII



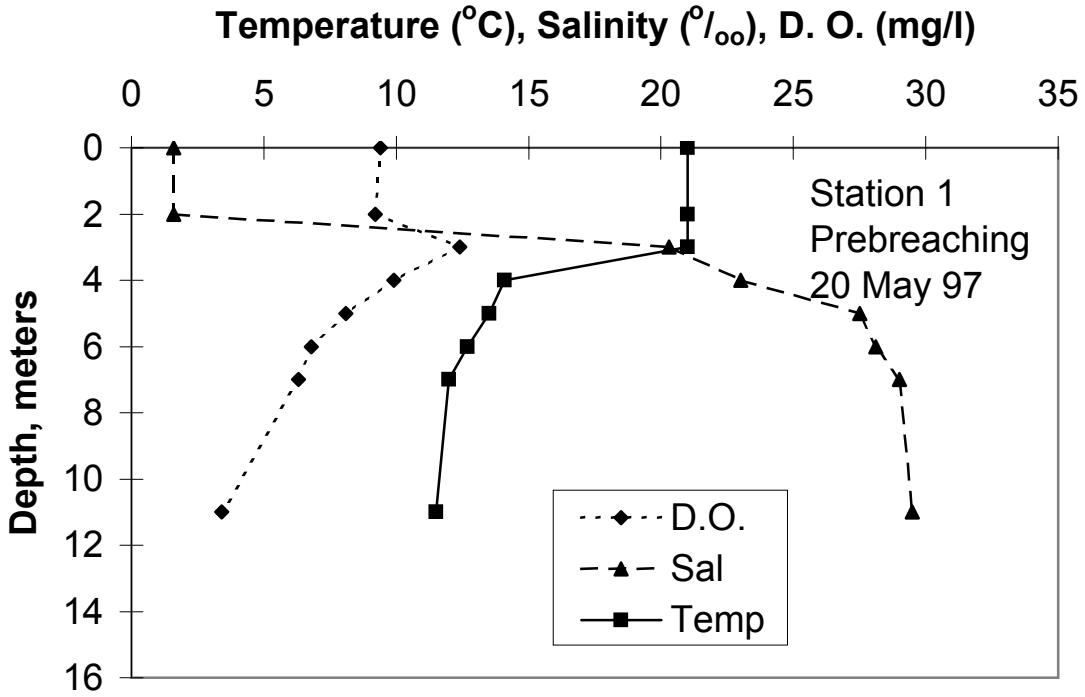
Appendix A-00. Water Quality Profiles, Station 1, Event VII



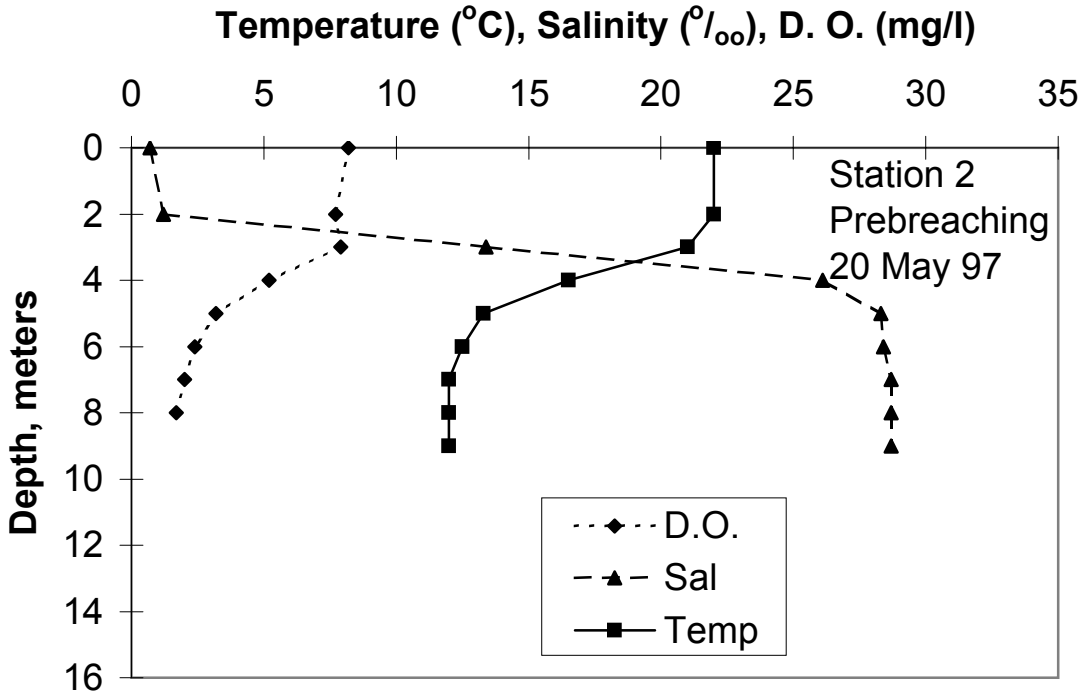
Appendix A-21. Tidal Water Quality Profiles, Event VII, 7 November 1997

| 7-Nov-97 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 (0945 hr PDT) | | | | Station 2 (1550 hr PDT) | | | | Station 3 (1515 hr PDT) | | | | Station 4 (1435 hr PDT) | | | |
| Depth Meters | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm | Temp °C | Sal °/oo | Cond µmho | D. O. ppm |
| 0 | 13.1 | 7.0 | 9100 | 9.2 | 13.5 | 5.7 | 10000 | 9.4 | 14.9 | 3.4 | 4400 | 9.6 | 15.0 | 2.3 | 3000 | 9.3 |
| 1 | 13.1 | 7.3 | 9800 | 9.2 | 13.8 | 7.9 | 10200 | 9.0 | 14.5 | 6.8 | 9000 | 9.0 | 15.0 | 14.2 | 20000 | 8.7 |
| 2 | 14.5 | 21.8 | 28000 | 8.1 | 14.2 | 21.1 | 27100 | 8.6 | 14.9 | 18.4 | 24200 | 9.2 | 15.5 | 20.3 | 27000 | 8.7 |
| 3 | 14.5 | 23.5 | 30100 | 8.5 | 14.5 | 23.4 | 30000 | 8.2 | 15.0 | 22.0 | 28900 | 8.6 | 15.5 | 22.0 | 29000 | 8.6 |
| 4 | 14.5 | 25.0 | 31500 | 8.2 | 14.9 | 24.5 | 31200 | 8.0 | 14.0 | 23.8 | 30800 | 8.1 | 15.0 | 23.0 | 29900 | 8.0 |
| 5 | 14.5 | 25.2 | 32000 | 8.1 | 14.6 | 25.0 | 31900 | 8.2 | 14.5 | 24.4 | 31200 | 7.5 | 15.0 | 23.5 | 30300 | 7.8 |
| 6 | 14.5 | 25.6 | 32200 | 8.0 | 14.5 | 25.2 | 32000 | 7.9 | | | | | 15.0 | 23.8 | 30500 | 7.8 |
| 7 | 14.5 | 26.0 | 32500 | 8.0 | 14.5 | 25.5 | 32200 | 7.8 | | | | | - | - | - | - |
| 8 | 14.5 | 26.0 | 32500 | 7.9 | 14.5 | 25.7 | 32500 | 7.6 | | | | | 15.0 | 23.9 | 30900 | 7.7 |
| 9 | 14.5 | 26.0 | 32800 | 7.4 | | | | | | | | | - | - | - | - |
| 10 | | | | | | | | | | | | | 15.0 | 24.0 | 31000 | 7.5 |
| 11 | | | | | | | | | | | | | - | - | - | - |
| 12 | | | | | | | | | | | | | 15.0 | 24.1 | 31000 | 7.3 |
| 13 | | | | | | | | | | | | | - | - | - | - |
| 14 | | | | | | | | | | | | | 15.0 | 24.5 | 30000 | 7.3 |

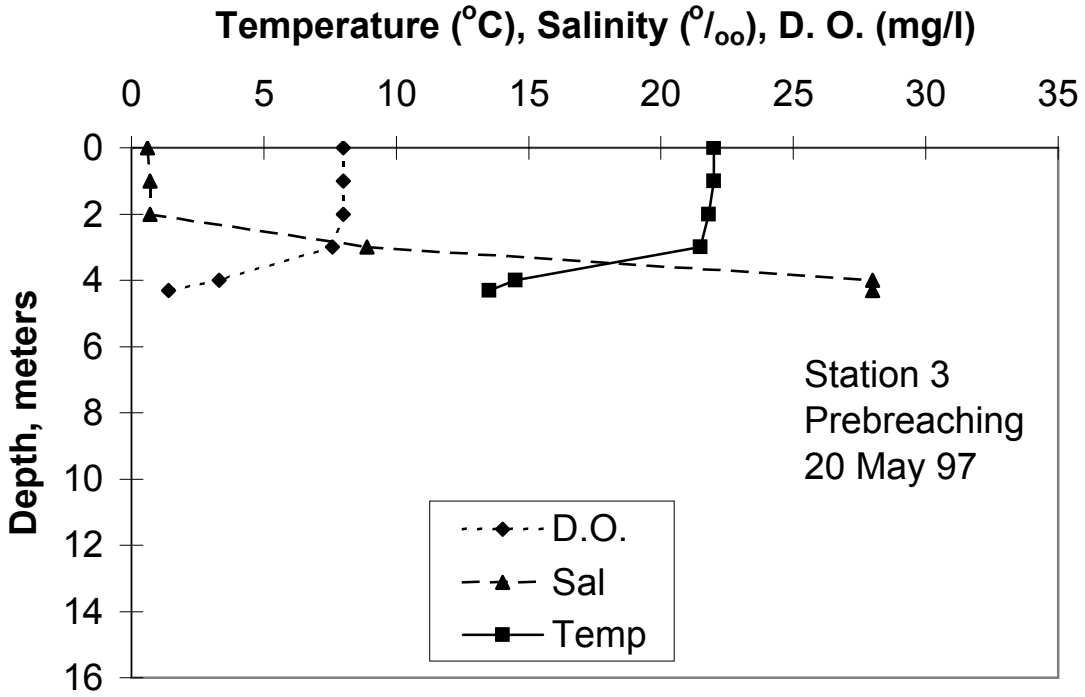
Appendix A-22. Water Quality Profile Plots, Station 1, Event I



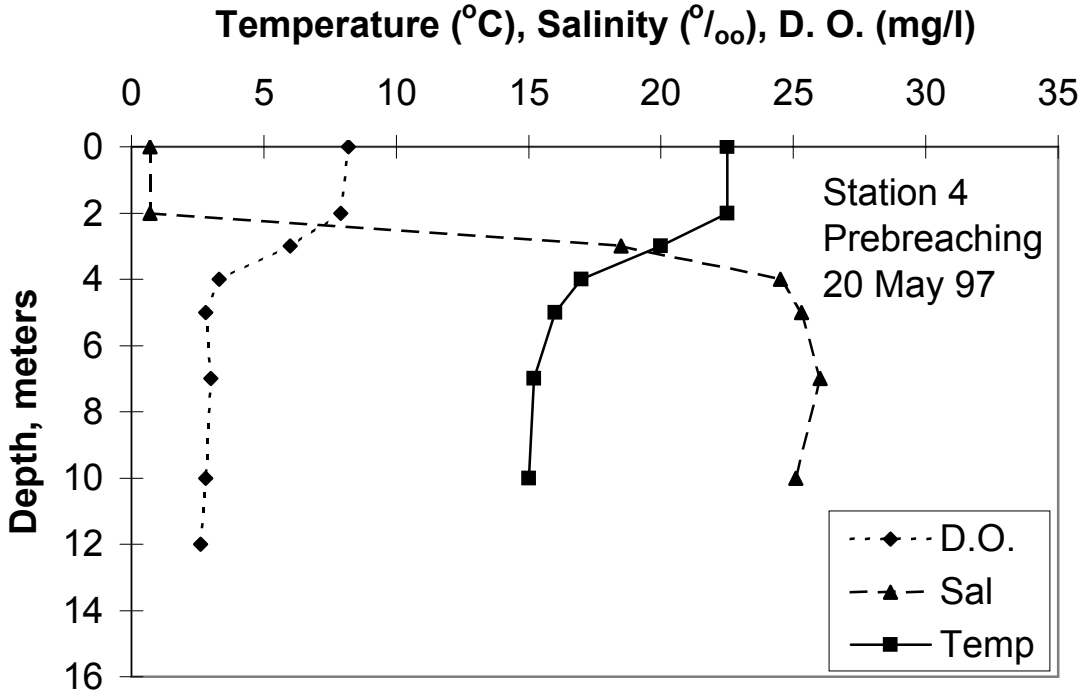
Appendix A-23. Water Quality Profile Plots, Station 2, Event I



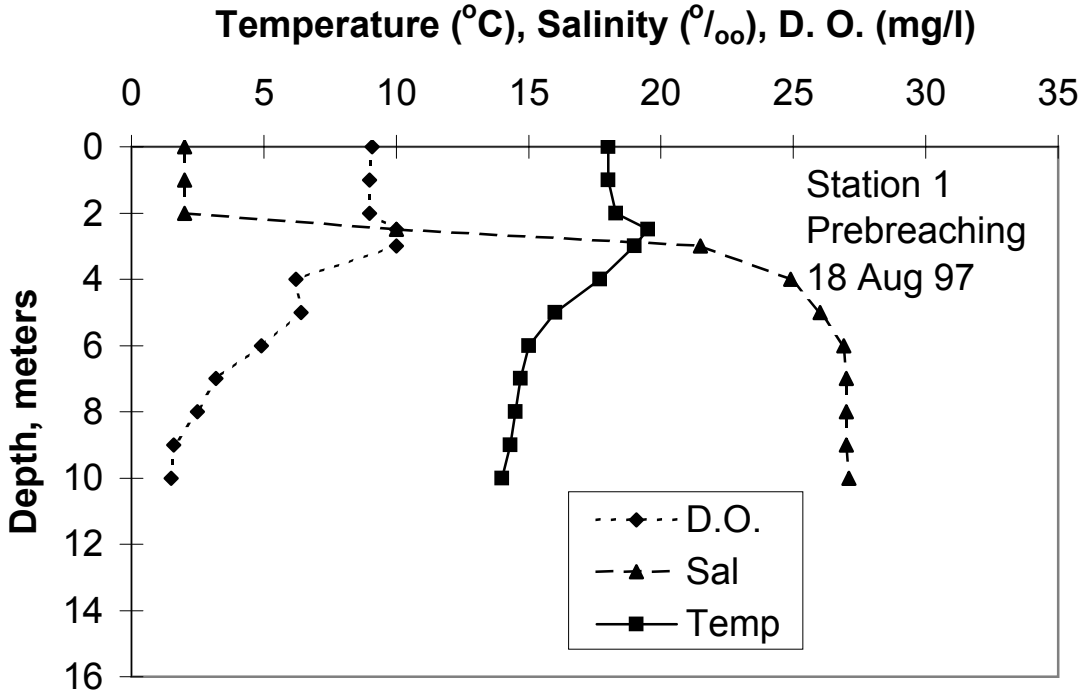
Appendix A-24. Water Quality Profile Plots, Station 3, Event I



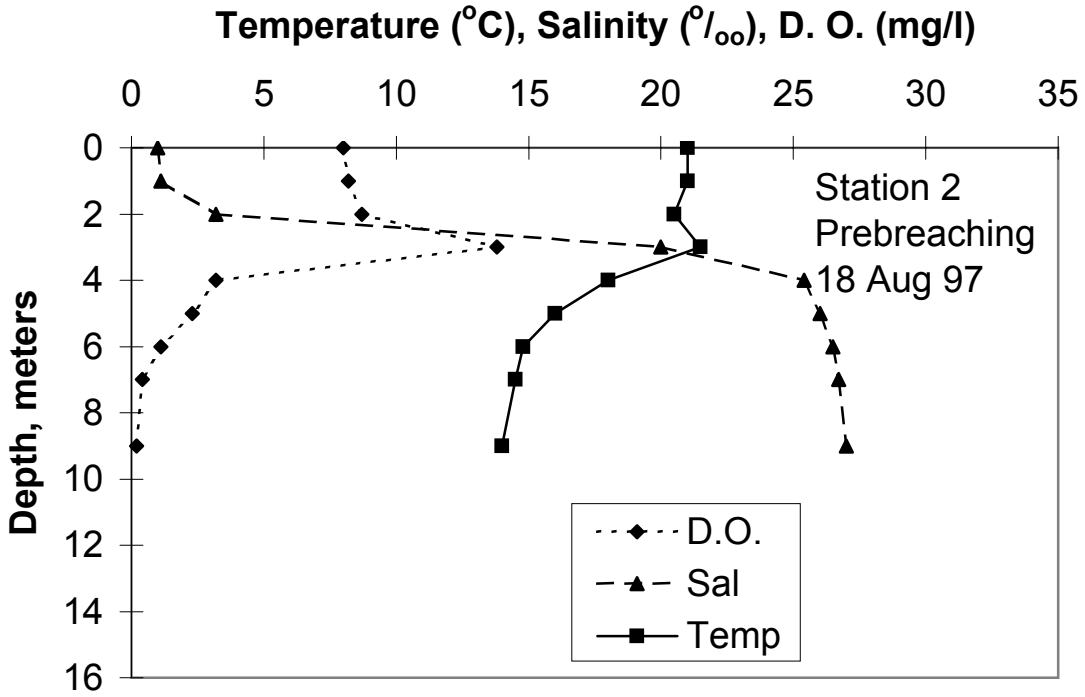
Appendix A-25. Water Quality Profile Plots, Station 4, Event I



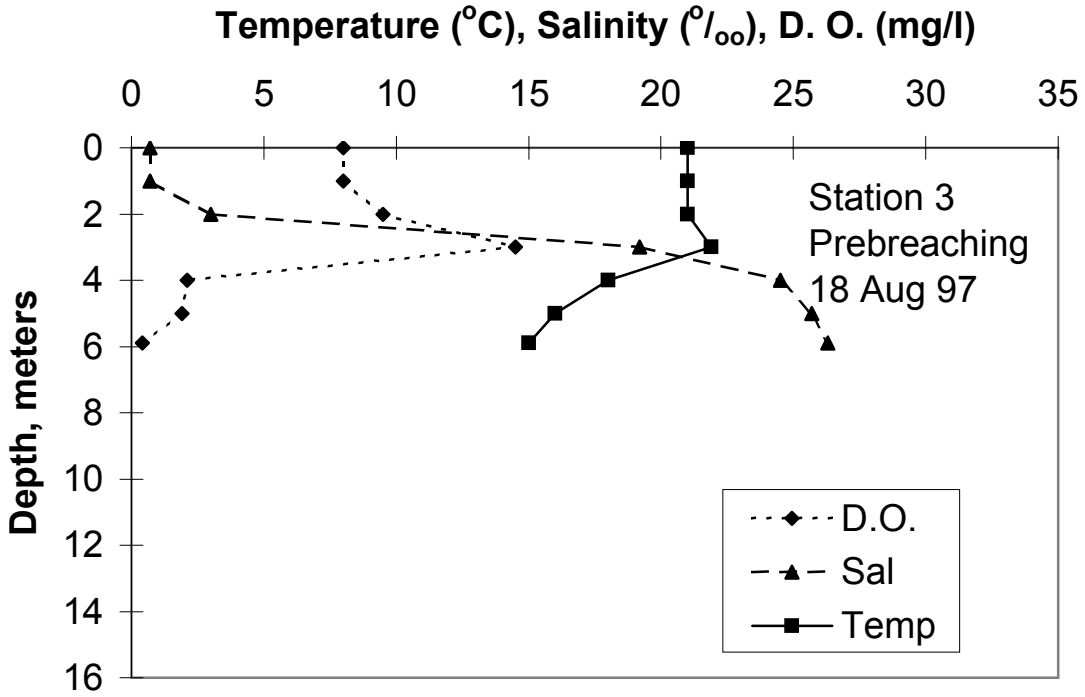
Appendix A-26. Water Quality Profile Plots, Station 1, Event IV



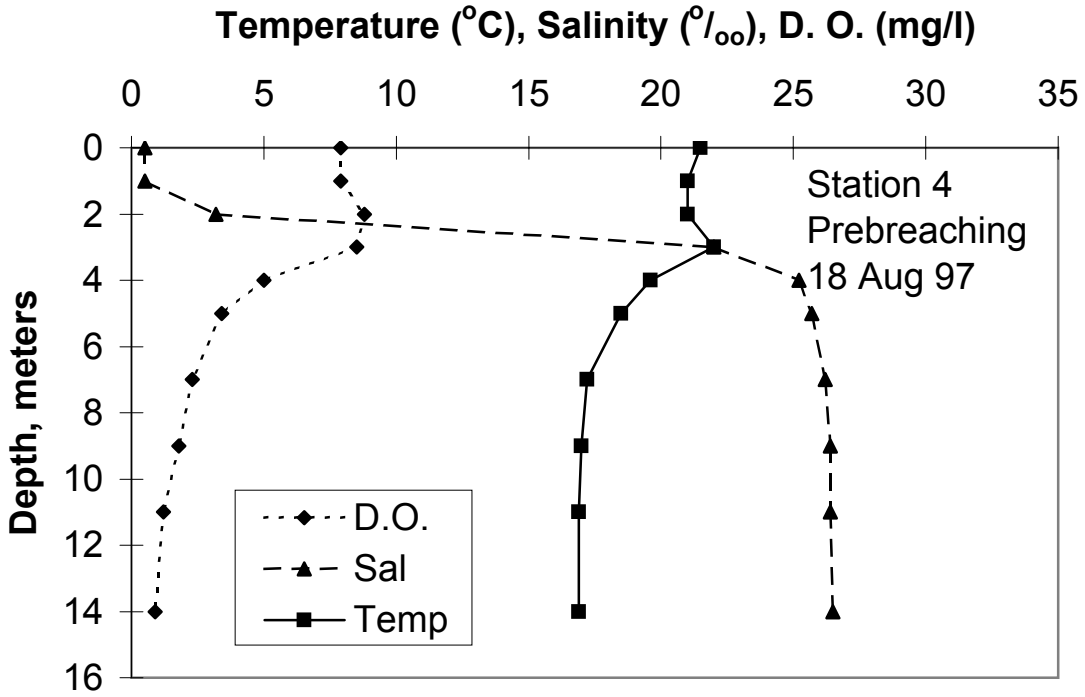
Appendix A-27. Water Quality Profile Plots, Station 2, Event IV



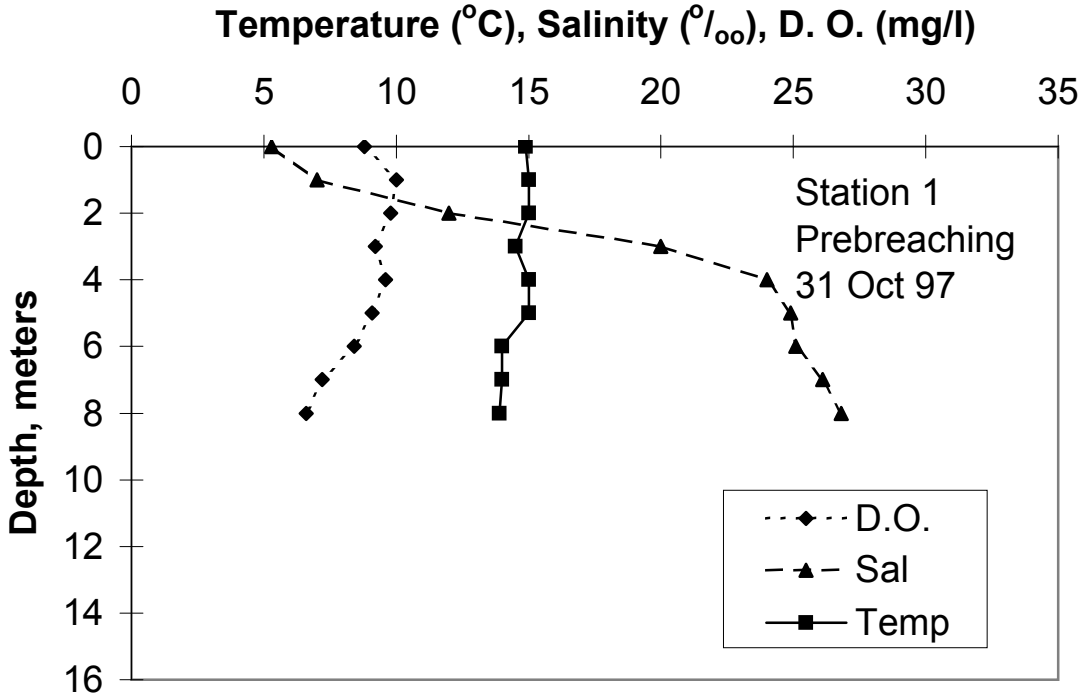
Appendix A-28. Water Quality Profile Plots, Station 3, Event IV



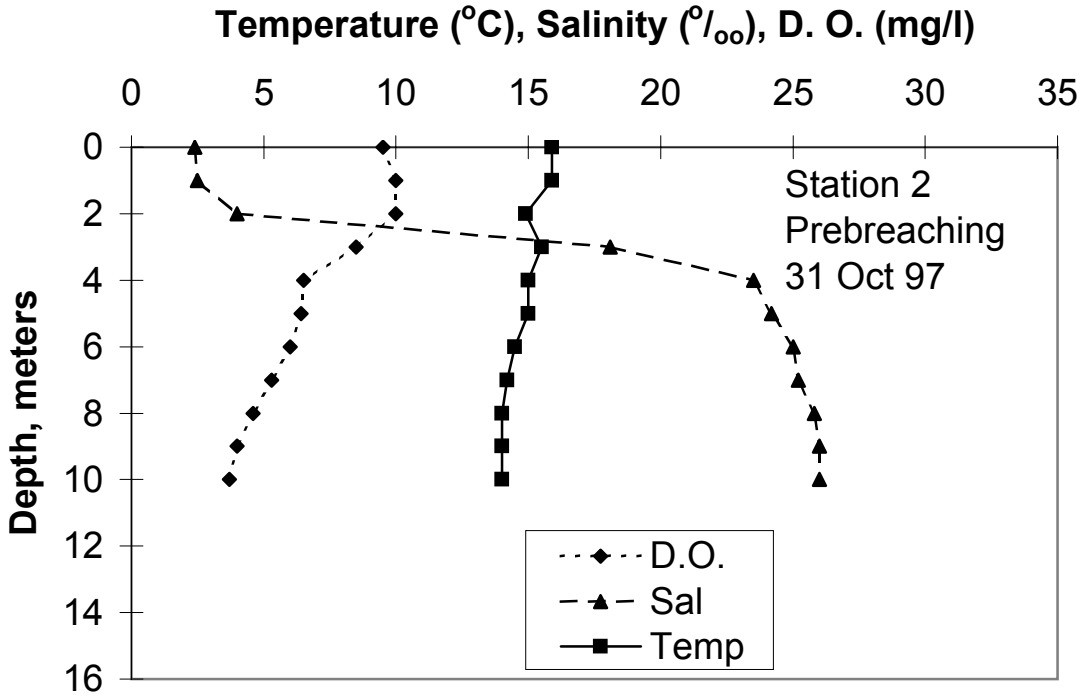
Appendix A-29. Water Quality Profile Plots, Station 4, Event IV



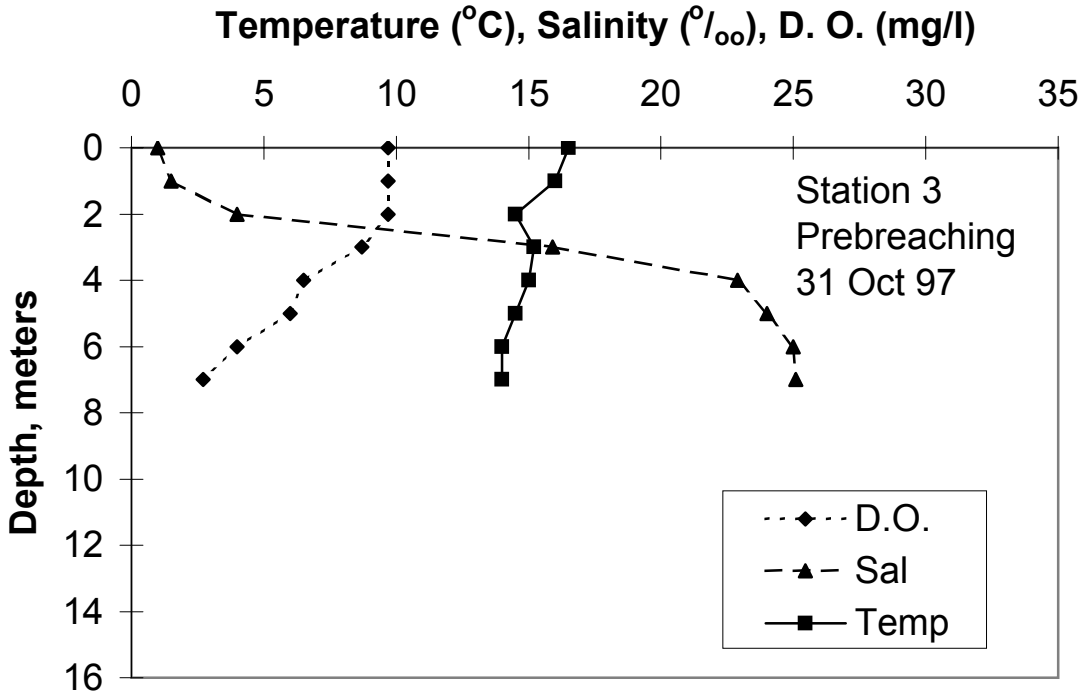
Appendix A-30. Water Quality Profile Plots, Station 1, Event VII



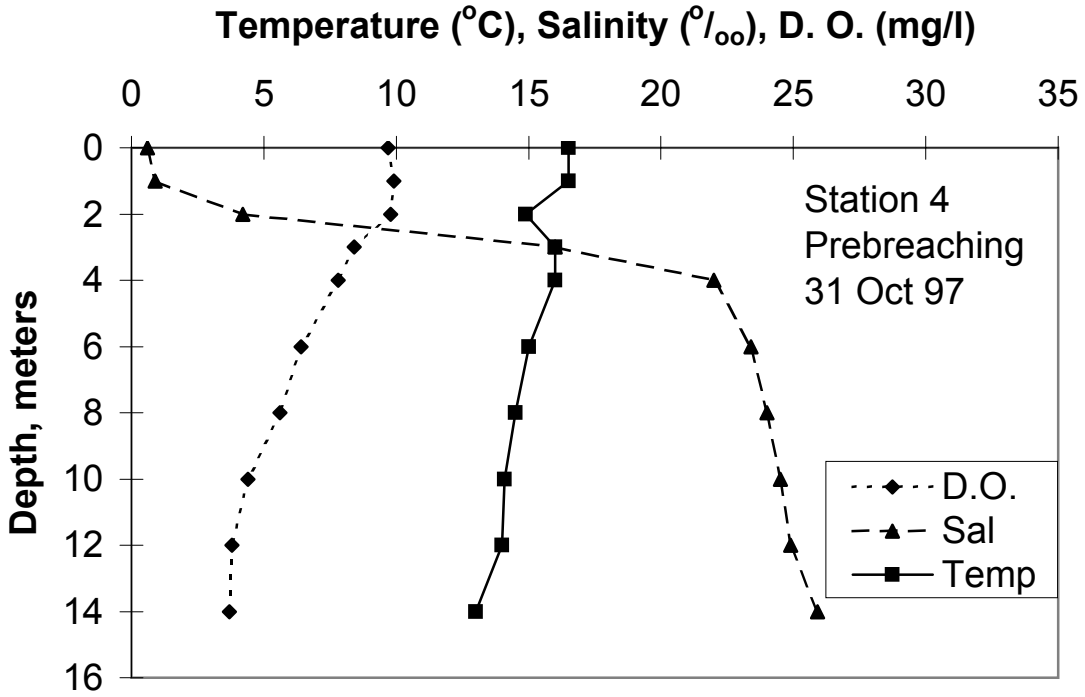
Appendix A-31. Water Quality Profile Plots, Station 2, Event VII



Appendix A-32. Water Quality Profile Plots, Station 3, Event VII



Appendix A-33. Water Quality Profile Plots, Station 4, Event VII



Appendix B-1. Prebreaching Otter Trawl Catch Summary, Event I, 20 May 1997

| | 20-May-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1810 hr PDT | | Station 2 4-min tow 1630 hr PDT | | Station 3 4-min tow 1515 hr PDT | | Station 4 4-min tow 1400 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 39 | 9.75 | | | | | | |
| Sacramento sucker | | | 1 | 0.25 | 161 | 40.25 | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 1 | 0.25 | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | | | 20 | 5 | 291 | 72.75 | 4 | 1 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 2 | 0.5 | 2 | 0.5 | | | | |
| Cabezon | 1 | 0.25 | | | | | | |
| Unknown Juv. Sebastes | 1 | 0.25 | | | | | | |
| Shiner surfperch | | | | | | | 1 | 0.25 |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | 1 | 0.25 | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | 2 | 0.5 | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 30 | 7.5 | 31 | 7.75 | | | | |
| Starry flounder | | | 1 | 0.25 | 11 | 2.75 | 9 | 2.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| Number of fish species | 8 | | 5 | | 3 | | 3 | |
| Total fish | 77 | 19.25 | 55 | 13.75 | 463 | 115.75 | 14 | 3.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | | | | | | | | |
| *Crangon nigricauda* | 50 | | 200 | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 150 | | 1000's | | 30 | |
| *Cancer magister* | | | 1 | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | b | | bf | | | | a | |

Appendix B-2. Draining Otter Trawl Catch Summary, Event I, 23 May 1997

| | 23-May-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0810 hr PDT | | Station 2 4-min tow 1000 hr PDT | | Station 3 4-min tow 1030 hr PDT | | Station 4 4- min tow 1200 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 46 | 11.5 | 1 | 0.25 | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 1 | 0.25 | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 2 | 0.5 | 10 | 2.5 | 5 | 1.25 | 62 | 15.5 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 1 | 0.25 | | | | | 1 | 0.25 |
| Cabezon | 9 | 2.25 | | | | | | |
| Unknown Juv. *Sebastes* | 1 | 0.25 | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | 1 | 0.25 | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | 2 | 0.5 | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | 1 | 0.25 |
| English sole | 120 | 30 | 11 | 2.75 | | | 3 | 0.75 |
| Starry flounder | | | 1 | 0.25 | 2 | 0.5 | 13 | 3.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| Number of fish species | 8 | | 5 | | 2 | | 5 | |
| Total fish | 182 | 45.5 | 24 | 6 | 7 | 1.75 | 80 | 20 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | | | | | | | | |
| *Crangon nigricauda* | 50 | 150 | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | 125 | | | 100's | | 1000's | |
| *Cancer magister* | | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | bg | | | | | | | |

Appendix B-3. Tidal Otter Trawl Catch Summary, Event I, 27 May 1997

| | 27-May-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0800 hr PDT | | Station 2 4-min tow 0920 hr PDT | | Station 3 4-min tow 1035 hr PDT | | Station 4 4- min tow 1155 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | 2 | 0.5 | | |
| Pacific sanddab | 23 | 5.75 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | 50 | 12.5 |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 1 | 0.25 | 4 | 1 | 79 | 19.75 | 4 | 1 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | 9 | 2.25 | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 13 | 3.25 | 24 | 6 | | | 1 | 0.25 |
| Starry flounder | 2 | 0.5 | | | 3 | 0.75 | 5 | 1.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| | | | | | | | | |
| Number of fish species | 4 | | 3 | | 3 | | 4 | |
| Total fish | 39 | 9.75 | 37 | 9.25 | 84 | 21 | 60 | 15 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 5 | | | | | | | |
| *Crangon nigricauda* | | | 20 | | 4 | | 15 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 200 | | 300 | | x | |
| *Cancer magister* | | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | e | | | | | |

Appendix B-4. Prebreaching Otter Trawl Catch Summary, Event II, 6 June 1997

| | 6-Jun-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0920 hr PDT | | Station 2 4-min tow 1038 hr PDT | | Station 3 4-min tow 1315 hr PDT | | Station 4 4- min tow 1500 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 23 | 5.75 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 1 | 0.25 | 1 | 0.25 | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 1 | 0.25 | 22 | 5.5 | 14 | 3.5 | 17 | 4.25 |
| Buffalo sculpin | 1 | 0.25 | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | 3 | 0.75 | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 34 | 8.5 | 6 | 1.5 | 2 | 0.5 | 2 | 0.5 |
| Starry flounder | | | | | | | 7 | 1.75 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| Number of fish species | 6 | | 3 | | 2 | | 3 | |
| Total fish | 63 | 15.75 | 29 | 7.25 | 16 | 4 | 26 | 6.5 |

| Invertebrates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Crangon franciscorum* | | | | | | | | |
| *Crangon nigricauda* | 29 | | 35 | | 2 | | 3 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 50 | | 250 | | 200 | |
| *Cancer magister* | | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | a | | af | | af | | a | |

Appendix B-5. Draining Otter Trawl Catch Summary, Event II, 10 June 1997

| | 10-Jun-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1000 hr PDT | | Station 2 4-min tow 1140 hr PDT | | Station 3 4-min tow 1320 hr PDT | | Station 4 4- min tow 1430 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 1 | 0.25 | | | | | | |
| Sacramento sucker | | | | | 1 | 0.25 | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | | | 21 | 5.25 | 7 | 1.75 | 49 | 12.25 |
| Buffalo sculpin | 2 | 0.5 | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | 1 | 0.25 | | |
| Kelp greenling | | | | | | | | |
| Lingcod | 1 | 0.25 | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | 3 | 0.75 | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 42 | 10.5 | 3 | 0.75 | | | 5 | 1.25 |
| Starry flounder | | | | | 2 | 0.5 | 4 | 1 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | 1 | 0.25 | | | | | 1 | 0.25 |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | 2 | 0.5 |
| | | | | | | | | |
| Number of fish species | 6 | | 2 | | 4 | | 5 | |
| Total fish | 50 | 12.5 | 24 | 6 | 11 | 2.75 | 61 | 15.25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | | | | | | | | |
| *Crangon nigricauda* | 78 | | 6 | | 3 | | 14 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 500 | | 300 | | 1000 | |
| *Cancer magister* | 1 | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | a | | | | | | | |

Appendix B-6. Tidal Otter Trawl Catch Summary, Event II, 13 June 1997

| | 13-Jun-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0830 hr PDT | | Station 2 4-min tow 0940 hr PDT | | Station 3 4-min tow 1045 hr PDT | | Station 4 4- min tow 1220 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 9 | 2.25 | | | | | | |
| Sacramento sucker | | | | | 3 | 0.75 | 2 | 0.5 |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | 2 | 0.5 | 31 | 7.75 |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 1 | 0.25 | 26 | 6.5 | 73 | 18.25 | 17 | 4.25 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 2 | 0.5 | 1 | 0.25 | | | 3 | 0.75 |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | 11 | 2.75 |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 36 | 9 | | | | | 2 | 0.5 |
| Starry flounder | 1 | 0.25 | | | 2 | 0.5 | 7 | 1.75 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | 1 | 0.25 | | | 3 | 0.75 |
| Number of fish species | 5 | | 3 | | 4 | | 8 | |
| Total fish | 49 | 12.25 | 28 | 7 | 80 | 20 | 76 | 19 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | | | | | | | | |
| *Crangon nigricauda* | 77 | | 119 | | 11 | | 11 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | 30 | | 100 | | 750 | | 500 | |
| *Cancer magister* | 2 | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | af | | af | | a | |

Appendix B-7. Prebreaching Otter Trawl Catch Summary, Event III, 22-23 June 1997

| | 22-23 June 1997 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0820 hr PDT 23-Jun | | Station 2 4-min tow 1430 hr PDT 22-Jun | | Station 3 4-min tow 1400 hr PDT 22-Jun | | Station 4 4- min tow 1155 hr PDT 22-Jun | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | | | | | | | | |
| Sacramento sucker | | | | | 198 | 49.5 | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 1 | 0.25 | | | 2 | 0.5 | 5 | 1.25 |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 16 | 4 | 35 | 8.75 | 14 | 3.5 | 28 | 7 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | | | 7 | 1.75 | | | 1 | 0.25 |
| Starry flounder | | | 1 | 0.25 | | | 4 | 1 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | 1 | 0.25 | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| Number of fish species | 2 | | 3 | | 4 | | 4 | |
| Total fish | 17 | 4.25 | 43 | 10.75 | 215 | 53.75 | 38 | 9.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | | | | | | | | |
| *Crangon nigricauda* | | | 120 | | | | 14 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 120 | | 1000 | | 25 | |
| *Cancer magister* | | | | | | | | |
| *Cancer productus* | 1 | | | | | | | |
| Other invertebrates* | af | | a | | af | | | |

Appendix B-8. Draining Otter Trawl Catch Summary, Event III, 28 June 1997

| | 28-Jun-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0845 hr PDT | | Station 2 4-min tow 1025 hr PDT | | Station 3 4-min tow 1140 hr PDT | | Station 4 4- min tow 1335 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | 1 | 0.25 | | | | | | |
| Pacific sanddab | 16 | 4 | 1 | 0.25 | | | | |
| Sacramento sucker | | | 1 | 0.25 | 24 | 6 | 5 | 1.25 |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 1 | 0.25 | 3 | 0.75 | 192 | 48 | 2 | 0.5 |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 5 | 1.25 | 25 | 6.25 | 33 | 8.25 | 41 | 10.25 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 1 | 0.25 | 1 | 0.25 | 1 | 0.25 | 1 | 0.25 |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | 3 | 0.75 | 1 | 0.25 |
| Spotfin surfperch | 1 | 0.25 | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 4 | 1 | 1 | 0.25 | | | 1 | 0.25 |
| Starry flounder | 1 | 0.25 | 1 | 0.25 | 1 | 0.25 | 8 | 2 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | 1 | 0.25 | 5 | 1.25 |
| | | | | | | | | |
| Number of fish species | 8 | | 7 | | 7 | | 8 | |
| Total fish | 30 | 7.5 | 33 | 8.25 | 255 | 63.75 | 64 | 16 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 4 | | | | | | 2 | |
| *Crangon nigricauda* | 18 | | 22 | | 4 | | 9 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | 30 | | 150 | | 500 | | 2000 | |
| *Cancer magister* | | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | af | | af | | af | | | |

Appendix B-9. Tidal Otter Trawl Catch Summary, Event III, 1 July 1997

| | 1-Jul-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1500 hr PDT | | Station 2 4-min tow 1345 hr PDT | | Station 3 4-min tow 1330 hr PDT | | Station 4 4- min tow 1200 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 4 | 1 | | | | | | |
| Sacramento sucker | | | | | 1 | 0.25 | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 1 | 0.25 | 3 | 0.75 | 18 | 4.5 | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 15 | 3.75 | 45 | 11.25 | 67 | 16.75 | 25 | 6.25 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 3 | 0.75 | 1 | 0.25 | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | 1 | 0.25 |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 19 | 4.75 | 1 | 0.25 | | | | |
| Starry flounder | | | | | 2 | 0.5 | 3 | 0.75 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | 1 | 0.25 | | | | | 3 | 0.75 |
| Number of fish species | 6 | | 4 | | 4 | | 4 | |
| Total fish | 43 | 10.75 | 50 | 12.5 | 88 | 22 | 32 | 8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 4 | | | | | | | |
| *Crangon nigricauda* | 46 | | 139 | | | | 5 | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | 25 | | 200 | | 50 | | 300 | |
| *Cancer magister* | | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | af | | | | | |

Appendix B-10. Prebreaching Otter Trawl Catch Summary, Event IV, 18 August 1997

| | 18-Aug-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1025 hr PDT | | Station 2 4-min tow 1138 hr PDT | | Station 3 4-min tow 1200 hr PDT | | Station 4 4- min tow 1300 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 4 | 1 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 3 | 0.75 | 1 | 0.25 | | | 10 | 2.5 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 1 | 0.25 | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | | | | | | | | |
| Starry flounder | | | 1 | 0.25 | 1 | 0.25 | 1 | 0.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | 1 | 0.25 | 1 | 0.25 |
| Number of fish species | 3 | | 2 | | 2 | | 3 | |
| Total fish | 8 | 2 | 2 | 0.5 | 2 | 0.5 | 12 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 7 | | 3 | | 1 | | 196 | |
| *Crangon nigricauda* | | | 54 | | 3 | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | 6 | | | | | | | |
| *Cancer magister* | 5 | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | adf | | adfi | | | |

Appendix B-11. Draining Otter Trawl Catch Summary, Event IV, 21 August 1997

| | 21-Aug-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0950 hr PDT | | Station 2 4-min tow 1110 hr PDT | | Station 3 4-min tow 1140 hr PDT | | Station 4 4- min tow 1325 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 5 | 1.25 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 1 | 0.25 | 32 | 8 | 20 | 5 | 6 | 1.5 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | 1 | 0.25 |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | 1 | 0.25 | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | 1 | 0.25 | | | 1 | 0.25 | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | | | | | | | | |
| Starry flounder | 2 | 0.5 | | | | | | |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | 3 | 0.75 | 8 | 2 | 12 | 3 |
| Number of fish species | 5 | | 2 | | 3 | | 3 | |
| Total fish | 10 | 2.5 | 35 | 8.75 | 29 | 7.25 | 19 | 4.75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 44 | | 243 | | 145 | | 59 | |
| *Crangon nigricauda* | | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | 6 | | | | 100 | | 20 | |
| *Cancer magister* | 5 | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | f | | af | | af | | af | |

Appendix B-12. Tidal Otter Trawl Catch Summary, Event IV, 26 August 1997

| | 26-Aug-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0930 hr PDT | | Station 2 4-min tow 1035 hr PDT | | Station 3 4-min tow 1100 hr PDT | | Station 4 4- min tow 1140 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 13 | 3.25 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 5 | 1.25 | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 1 | 0.25 | 15 | 3.75 | 3 | 0.75 | 8 | 2 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | 1 | 0.25 | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | 9 | 2.25 | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | 3 | 0.75 | 2 | 0.5 | 1 | 0.25 |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 1 | 0.25 | | | | | | |
| Starry flounder | | | | | | | 2 | 0.5 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | 1 | 0.25 | 2 | 0.5 | 3 | 0.75 |
| Number of fish species | 5 | | 4 | | 3 | | 4 | |
| Total fish | 29 | 7.25 | 20 | 5 | 7 | 1.75 | 14 | 3.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 18 | | 277 | | 121 | | 37 | |
| *Crangon nigricauda* | | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 50 | | 20 | | 100 | |
| *Cancer magister* | 11 | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | af | | af | | af | |

Appendix B-13. Prebreaching Otter Trawl Catch Summary, Event V, 16 September 1997

| | 16-Sep-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1150 hr PDT | | Station 2 4-min tow 1300 hr PDT | | Station 3 4-min tow 1430 hr PDT | | Station 4 4- min tow 1520 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 9 | 2.25 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | 18 | 4.5 | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 54 | 13.5 | 2 | 0.5 | 2 | 0.5 | 18 | 4.5 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 4 | 1 | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | 18 | 4.5 | 14 | 3.5 | | | 7 | 1.75 |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | 1 | 0.25 | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | 21 | 5.25 | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 4 | 1 | 1 | 0.25 | | | | |
| Starry flounder | 2 | 0.5 | | | | | 1 | 0.25 |
| Saddleback gunnel | 1 | 0.25 | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | 1 | 0.25 | | | 9 | 2.25 | 8 | 2 |
| Number of fish species | 10 | | 3 | | 3 | | 4 | |
| Total fish | 132 | 33 | 17 | 4.25 | 12 | 3 | 34 | 8.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 220 | | 84 | | 11 | | 42 | |
| *Crangon nigricauda* | | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 10 | | 20 | | | |
| *Cancer magister* | 40 | | 2 | | | | | |
| *Cancer productus* | 2 | | | | | | | |
| Other invertebrates* | | | | | af | | | |

Appendix B-14. Draining Otter Trawl Catch Summary, Event V, 20 September 1997

| | 20-Sep-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1050 hr PDT | | Station 2 4-min tow 1150 hr PDT | | Station 3 4-min tow 1215 hr PDT | | Station 4 4- min tow 1310 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 32 | 8 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | 2 | 0.5 | 4 | 1 | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 14 | 3.5 | 50 | 12.5 | 41 | 10.25 | 3 | 0.75 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 3 | 0.75 | | | 2 | 0.5 | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | 36 | 9 | 5 | 1.25 | 48 | 12 | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | 1 | 0.25 | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | 1 | 0.25 | | | 1 | 0.25 | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 2 | 0.5 | | | | | | |
| Starry flounder | | | | | | | 4 | 1 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | 3 | 0.75 | 4 | 1 | 8 | 2 |
| | | | | | | | | |
| Number of fish species | 6 | | 4 | | 7 | | 3 | |
| Total fish | 88 | 22 | 60 | 15 | 101 | 25.25 | 15 | 3.75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 59 | | 58 | | 49 | | 78 | |
| *Crangon nigricauda* | 1 | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | | | 5 | | | |
| *Cancer magister* | 38 | | 1 | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | c | | | | f | | | |

Appendix B-15. Tidal Otter Trawl Catch Summary, Event V, 23 September 1997

| | 23-Sep-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0950 hr PDT | | Station 2 4-min tow 1105 hr PDT | | Station 3 4-min tow 1130 hr PDT | | Station 4 4- min tow 1200 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 5 | 1.25 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | 1 | 0.25 | 5 | 1.25 |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 3 | 0.75 | 12 | 3 | 19 | 4.75 | 18 | 4.5 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | 13 | 3.25 | 3 | 0.75 |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | 1 | 0.25 | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | 1 | 0.25 | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 1 | 0.25 | | | 2 | 0.5 | | |
| Starry flounder | | | | | | | 1 | 0.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | 5 | 1.25 | | |
| Number of fish species | 3 | | 1 | | 7 | | 4 | |
| Total fish | 9 | 2.25 | 12 | 3 | 42 | 10.5 | 27 | 6.75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 10 | | 223 | | 13 | | 59 | |
| *Crangon nigricauda* | | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | | | 20 | | 20 | | | |
| *Cancer magister* | 12 | | | | | | | |
| *Cancer productus* | 1 | | | | | | | |
| Other invertebrates* | | | | | af | | | |

Appendix B-16. Prebreaching Otter Trawl Catch Summary, Event VI, 10 October 1997

| | 10-Oct-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0925 hr PDT | | Station 2 4-min tow 1150 hr PDT | | Station 3 4-min tow 1210 hr PDT | | Station 4 4- min tow 1240 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 9 | 2.25 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 10 | 2.5 | 9 | 2.25 | 2 | 0.5 | 11 | 2.75 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | 2 | 0.5 | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | 2 | 0.5 |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | 6 | 1.5 | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 5 | 1.25 | | | | | | |
| Starry flounder | | | | | | | 1 | 0.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | 2 | 0.5 | | | 1 | 0.25 |
| Number of fish species | 5 | | 2 | | 1 | | 4 | |
| Total fish | 32 | 8 | 11 | 2.75 | 2 | 0.5 | 15 | 3.75 |
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 20 | | 70 | | 23 | | 44 | |
| *Crangon nigricauda* | | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | |
| *Neomysis mercedis* | 1 | | 30 | | 15 | | 20 | |
| *Cancer magister* | 25 | | | | 2 | | | |
| *Cancer productus* | 1 | | | | | | | |
| Other invertebrates* | | | | | | | e | |

Appendix B-17. Draining Otter Trawl Catch Summary, Event VI, 12 October 1997

| | 12-Oct-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1020 hr PDT | | Station 2 4-min tow 1130 hr PDT | | Station 3 4-min tow 1200 hr PDT | | Station 4 4- min tow 1250 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 3 | 0.75 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 8 | 2 | 13 | 3.25 | 19 | 4.75 | 28 | 7 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | 1 | 0.25 | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | 13 | 3.25 | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | 1 | 0.25 | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 7 | 1.75 | | | | | | |
| Starry flounder | 1 | 0.25 | | | | | 1 | 0.25 |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | 3 | 0.75 | | | 6 | 1.5 |
| Number of fish species | 7 | | 2 | | 1 | | 3 | |
| Total fish | 34 | 8.5 | 16 | 4 | 19 | 4.75 | 35 | 8.75 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 6 | | 152 | | 51 | | 68 | |
| *Crangon nigricauda* | 2 | | | | | | | |
| *Crangon nigromaculata* | 6 | | | | | | | |
| *Neomysis mercedis* | | | 100 | | 50 | | 25 | |
| *Cancer magister* | 9 | | | | 1 | | | |
| *Cancer productus* | 3 | | | | | | | |
| Other invertebrates* | | | | | f | | | |

Appendix B-18. Tidal Otter Trawl Catch Summary, Event VI, 15 October 1997

| | 15-Oct-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1130 hr PDT | | Station 2 4-min tow 1535 hr PDT | | Station 3 4-min tow 1445 hr PDT | | Station 4 4- min tow 1330 hr PDT | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | 3 | 0.75 | | | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 8 | 2 | 5 | 1.25 | 20 | 5 | 11 | 2.75 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | 1 | 0.25 | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | 1 | 0.25 |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | 1 | 0.25 | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | | | 1 | 0.25 | | | | |
| Starry flounder | | | | | | | | |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| Number of fish species | 3 | | 3 | | 1 | | 2 | |
| Total fish | 12 | 3 | 7 | 1.75 | 20 | 5 | 12 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 6 | | 149 | | 14 | | 75 | |
| *Crangon nigricauda* | | | | | | | | |
| *Crangon nigromaculata* | 6 | | | | | | | |
| *Neomysis mercedis* | | | 200 | | 200 | | 15 | |
| *Cancer magister* | 20 | | | | 3 | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | | | adf | | f | |

Appendix B-19. Prebreaching Otter Trawl Catch Summary, Event VII, 31 October 1997

| | 31-Oct-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1330 hr PST | | Station 2 4-min tow 1415 hr PST | | Station 3 4-min tow 1430 hr PST | | Station 4 4- min tow 1510 hr PST | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | | | 1 | 0.25 | | | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 7 | 1.75 | | | 5 | 1.25 | 1 | 0.25 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | | | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | | | | |
| Longfin smelt | | | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | | | | | | | | |
| Starry flounder | | | | | 1 | 0.25 | | |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | | | | |
| Number of fish species | 1 | | 1 | | 2 | | 1 | |
| Total fish | 7 | 1.75 | 1 | 0.25 | 6 | 1.5 | 1 | 0.25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 8 | | 13 | | 3 | | 46 | |
| *Crangon nigricauda* | 2 | | | | | | | |
| *Crangon nigromaculata* | 2 | | | | | | | |
| *Neomysis mercedis* | | | | | 12 | | 20 | |
| *Cancer magister* | 3 | | | | | | 1 | |
| *Cancer productus* | 1 | | | | | | | |
| Other invertebrates* | | | | | f | | | |

Appendix B-20. Draining Otter Trawl Catch Summary, Event VII, 4 November 1997

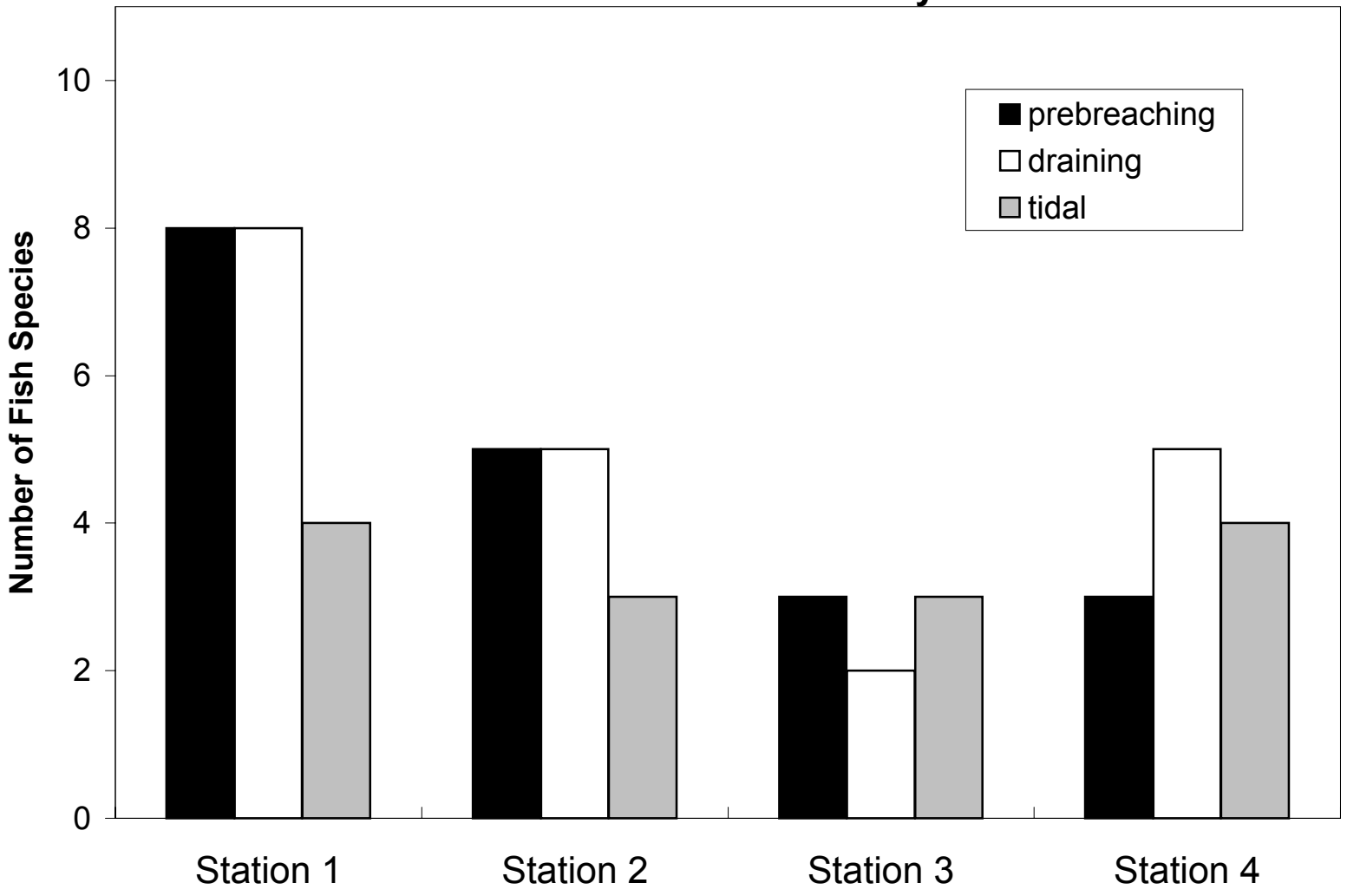
| | 4-Nov-97 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 0930 hr PST | | Station 2 4-min tow 1040 hr PST | | Station 3 4-min tow 1105 hr PST | | Station 3 4- min tow 1110 hr PST | | Station 4 4- min tow 1150 hr PST | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | | | |
| Pacific sanddab | 1 | 0.25 | | | | | | | | |
| Sacramento sucker | | | | | | | | | | |
| Smallmouth bass | | | | | | | | | | |
| Pacific herring | 2 | 0.5 | | | | | | | | |
| Smoothhead sculpin | | | | | | | | | | |
| Prickly sculpin | | | 3 | 0.75 | 1 | 0.25 | 2 | 0.5 | 4 | 1 |
| Buffalo sculpin | | | | | | | | | | |
| Bull sculpin | | | | | | | | | | |
| Staghorn sculpin | | | | | 1 | 0.25 | | | | |
| Cabezon | | | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | | | |
| Shiner surfperch | 8 | 2 | | | | | | | | |
| Spotfin surfperch | | | | | | | | | | |
| Northern anchovy | | | | | | | | | | |
| Pacific tomcod | | | | | | | | | | |
| Threespine stickleback | | | | | | | | | 1 | 0.25 |
| Kelp greenling | | | | | | | | | | |
| Lingcod | | | | | | | | | | |
| Surf smelt | | | | | | | | | | |
| Longfin smelt | | | | | | | | | | |
| Hybrid sole | | | | | | | | | | |
| English sole | | | | | | | | | | |
| Starry flounder | | | | | | | 1 | 0.25 | | |
| Saddleback gunnel | | | | | | | | | | |
| Steelhead | | | | | | | | | | |
| Coho salmon | | | | | | | | | | |
| Bay pipefish | | | | | 2 | 0.5 | | | | |
| Number of fish species | 3 | | 1 | | 3 | | 2 | | 2 | |
| Total fish | 11 | 2.75 | 3 | 0.75 | 4 | 1 | 3 | 0.75 | 5 | 1.25 |
| Invertebrates | | | | | | | | | | |
| *Crangon franciscorum* | 2 | | 39 | | 6 | | 2 | | | |
| *Crangon nigricauda* | 24 | | | | | | | | | |
| *Crangon nigromaculata* | | | | | | | | | | |
| *Neomysis mercedis* | | | 50 | | | | 10 | | 25 | |
| *Cancer magister* | 16 | | | | | | | | | |
| *Cancer productus* | | | | | | | | | | |
| Other invertebrates* | h | | f | | | | f | | f | |

Appendix B-21. Tidal Otter Trawl Catch Summary, Event VII, 7 November 1997

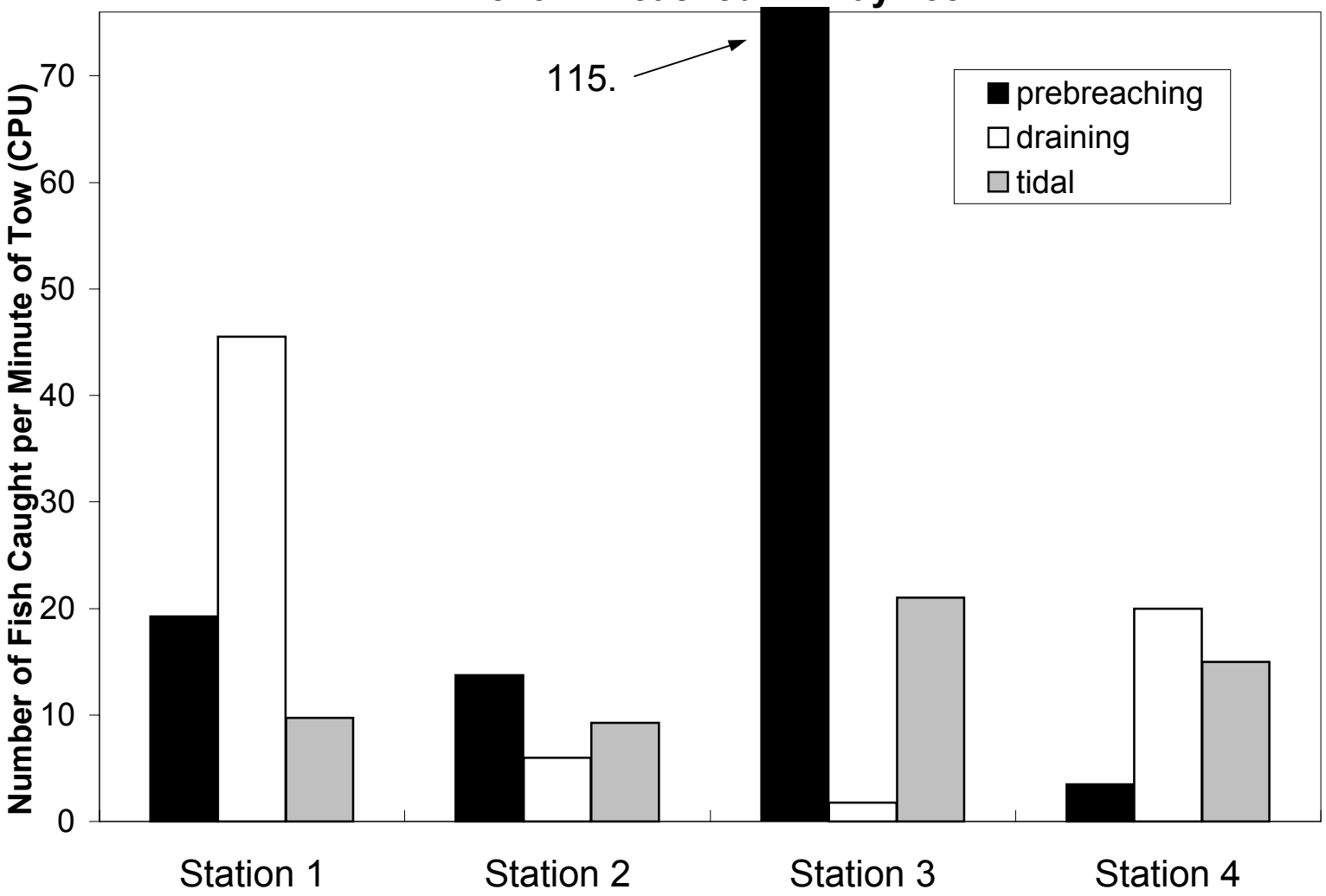
| | 7-Nov-97 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Station 1 4-min tow 1100 hr PST | | Station 2 4-min tow 1205 hr PST | | Station 3 4-min tow 1220 hr PST | | Station 4 4- min tow 1400 hr PST | |
| Common Name | No. | CPU | No. | CPU | No. | CPU | No. | CPU |
| Topsmelt | | | | | | | | |
| Pacific sanddab | | | 2 | 0.5 | 1 | 0.25 | | |
| Sacramento sucker | | | | | | | | |
| Smallmouth bass | | | | | | | | |
| Pacific herring | | | | | | | | |
| Smoothhead sculpin | | | | | | | | |
| Prickly sculpin | 3 | 0.75 | 3 | 0.75 | 1 | 0.25 | 2 | 0.5 |
| Buffalo sculpin | | | | | | | | |
| Bull sculpin | | | | | | | | |
| Staghorn sculpin | | | | | | | | |
| Cabezon | | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | | |
| Shiner surfperch | | | | | | | | |
| Spotfin surfperch | | | | | | | | |
| Northern anchovy | | | | | | | | |
| Pacific tomcod | 3 | 0.75 | | | | | | |
| Threespine stickleback | | | | | | | | |
| Kelp greenling | | | | | | | | |
| Lingcod | | | | | | | | |
| Surf smelt | | | | | 1 | 0.25 | | |
| Longfin smelt | 9 | 2.25 | | | | | | |
| Hybrid sole | | | | | | | | |
| English sole | 3 | 0.75 | | | | | | |
| Starry flounder | | | | | | | | |
| Saddleback gunnel | | | | | | | | |
| Steelhead | | | | | | | | |
| Coho salmon | | | | | | | | |
| Bay pipefish | | | | | 1 | 0.25 | | |
| Number of fish species | 4 | | 2 | | 4 | | 1 | |
| Total fish | 18 | 4.5 | 5 | 1.25 | 4 | 1 | 2 | 0.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Invertebrates | | | | | | | | |
| *Crangon franciscorum* | 2 | | 12 | | 8 | | 26 | |
| *Crangon nigricauda* | 25 | | | | | | | |
| *Crangon nigromaculata* | 10 | | | | | | | |
| *Neomysis mercedis* | | | 25 | | 50 | | 30 | |
| *Cancer magister* | 3 | | | | | | | |
| *Cancer productus* | | | | | | | | |
| Other invertebrates* | | | | | af | | f | |

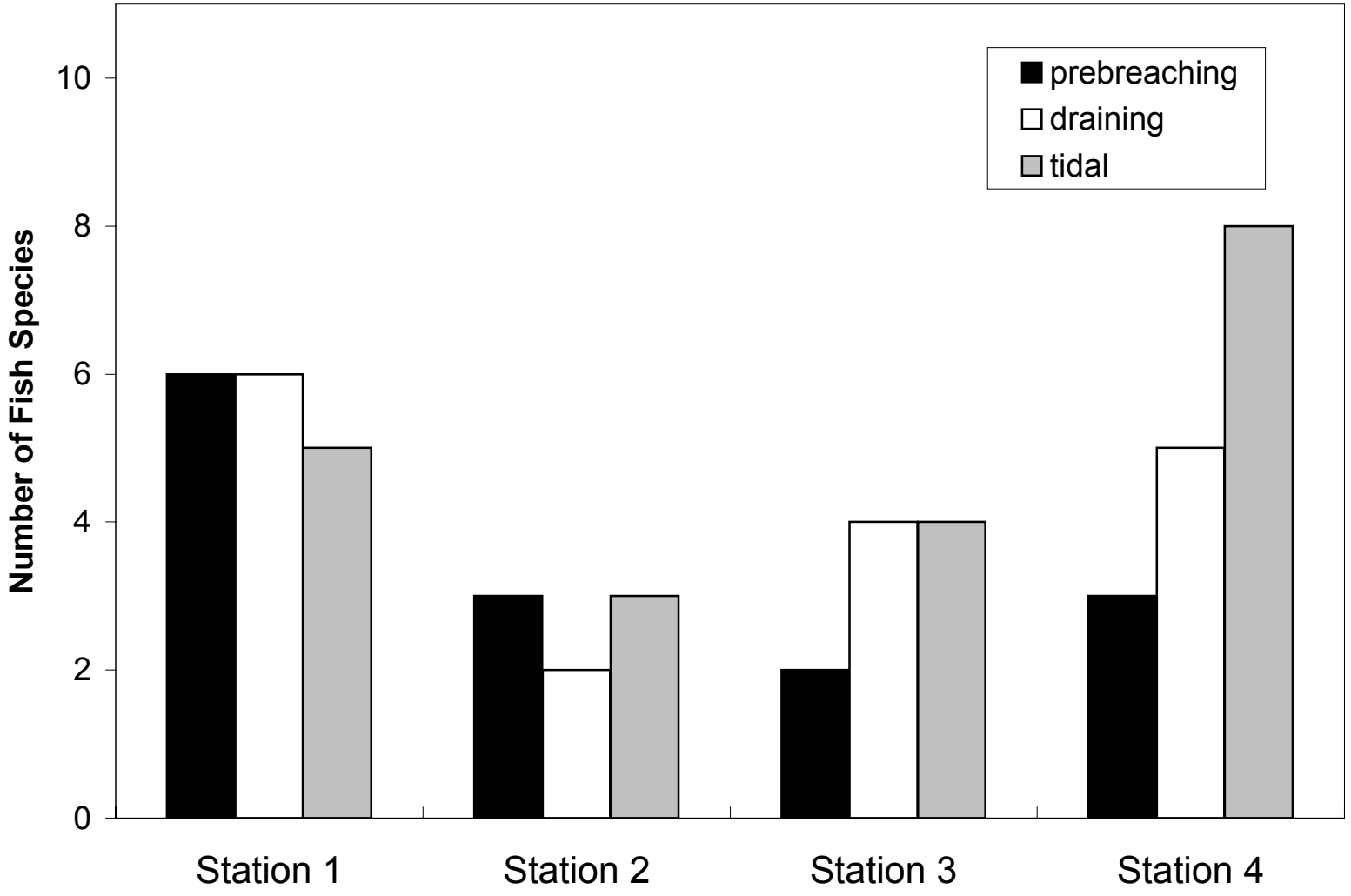
**Appendix B-22**
**Number of Fish Species in Otter Trawls**
**Event I--Breached 22 May 1997**



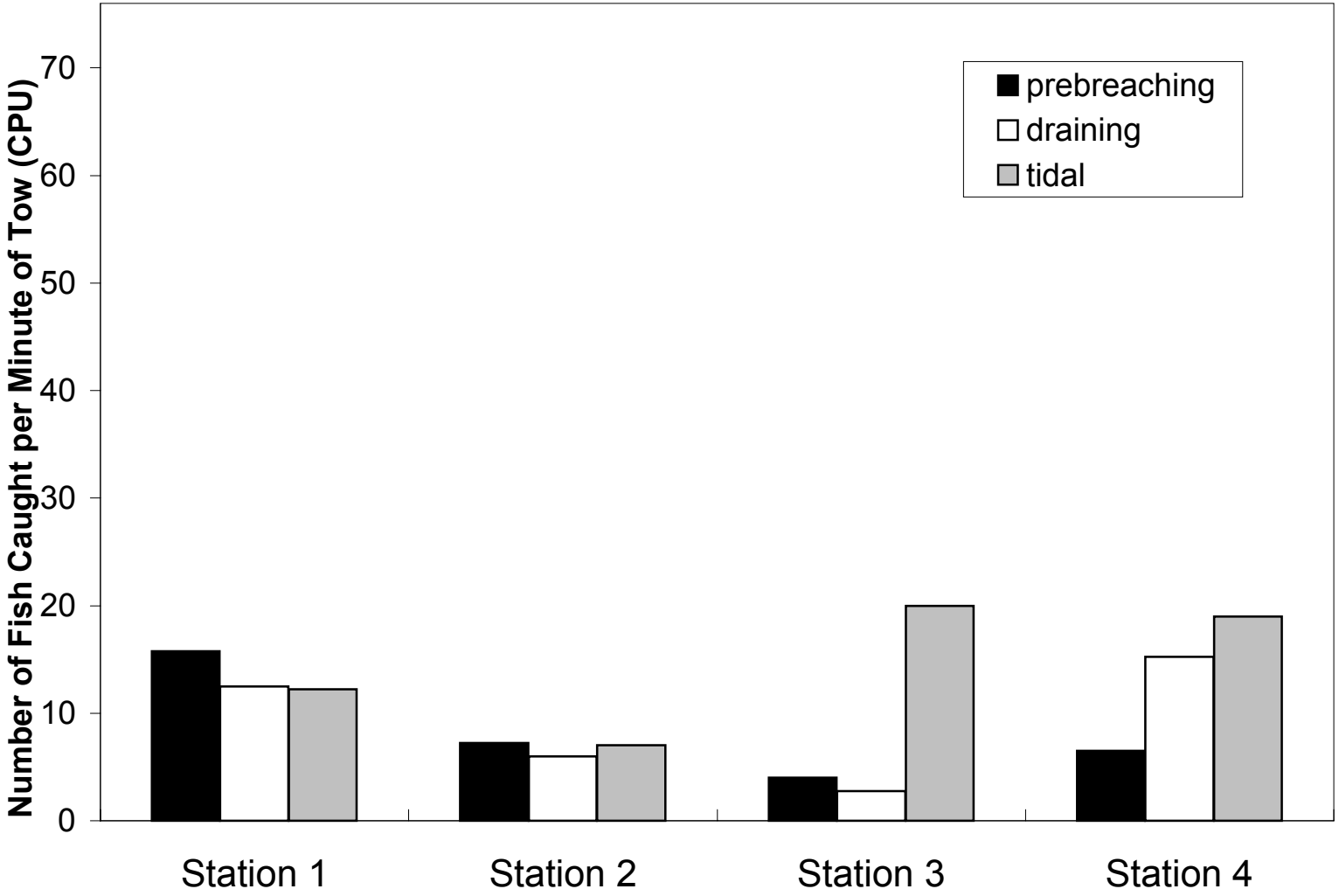
**Appendix B-23**
**Otter Trawl Catch**
**Event I--Breached 22 May 1997**



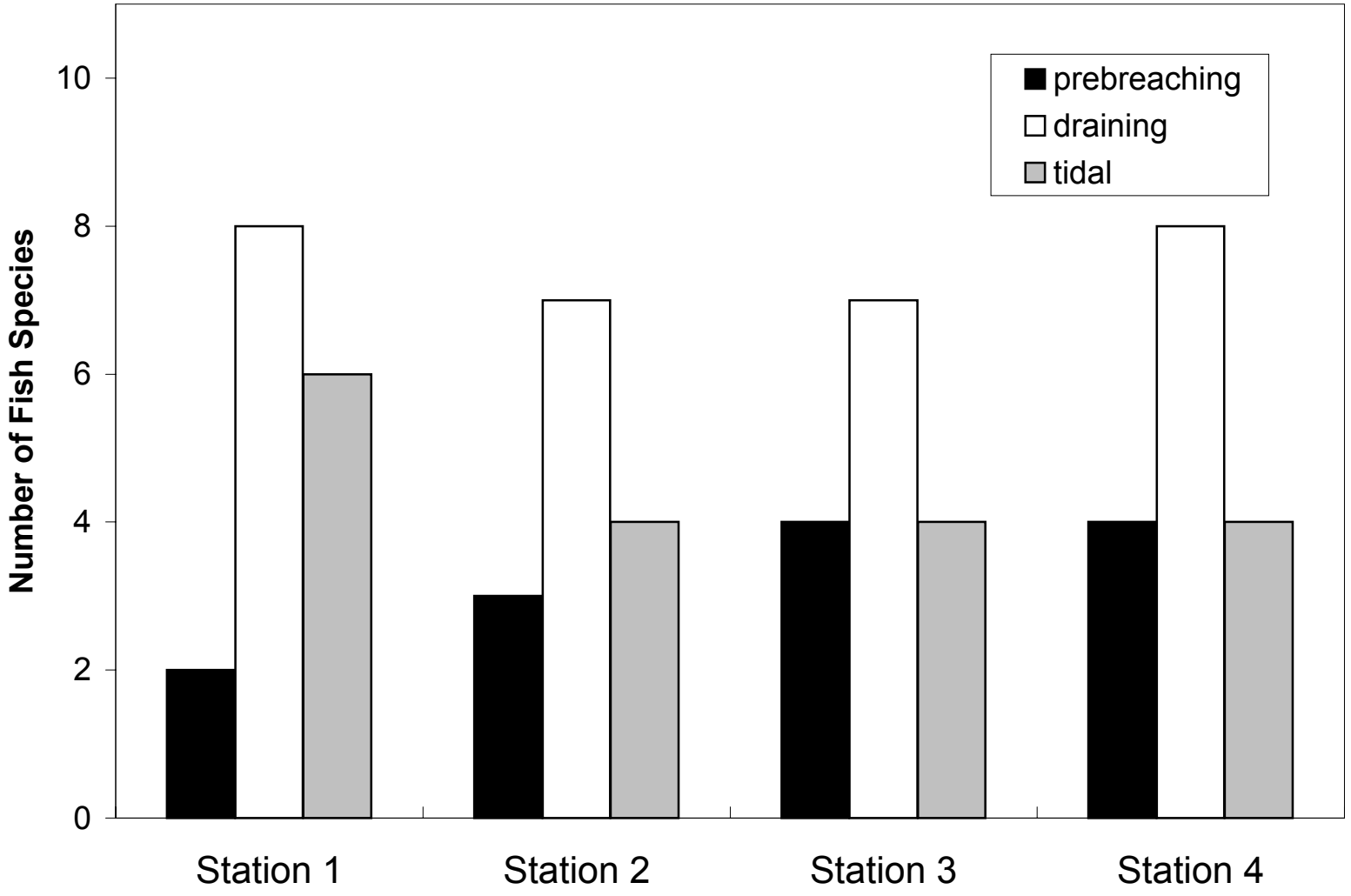
**Appendix B-24**
**Number of Fish Species in Otter Trawls**
**Event II--Breached 9 June 1997**



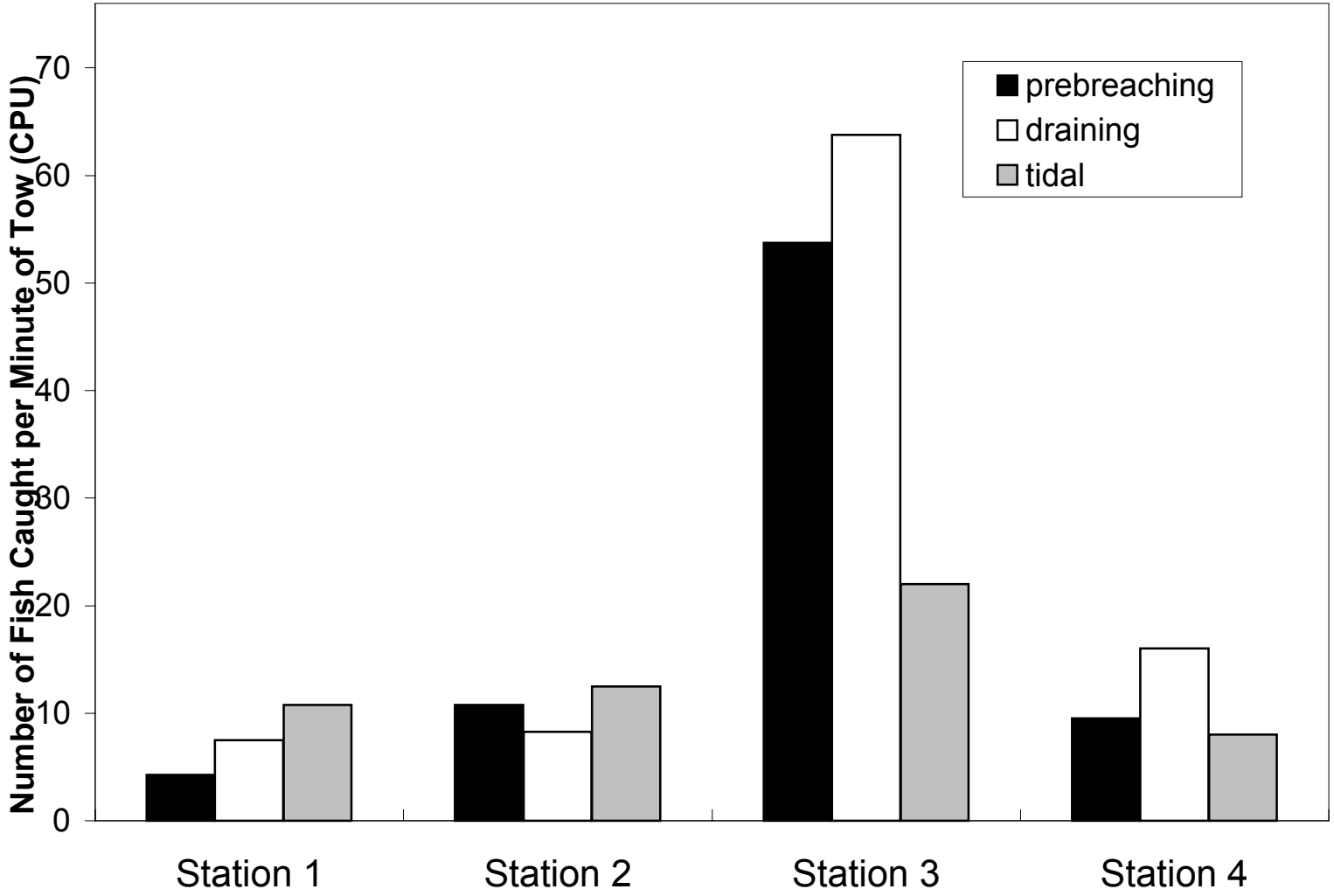
**Appendix B-25**
**Otter Trawl Catch**
**Event II--Breached 9 June 1996**



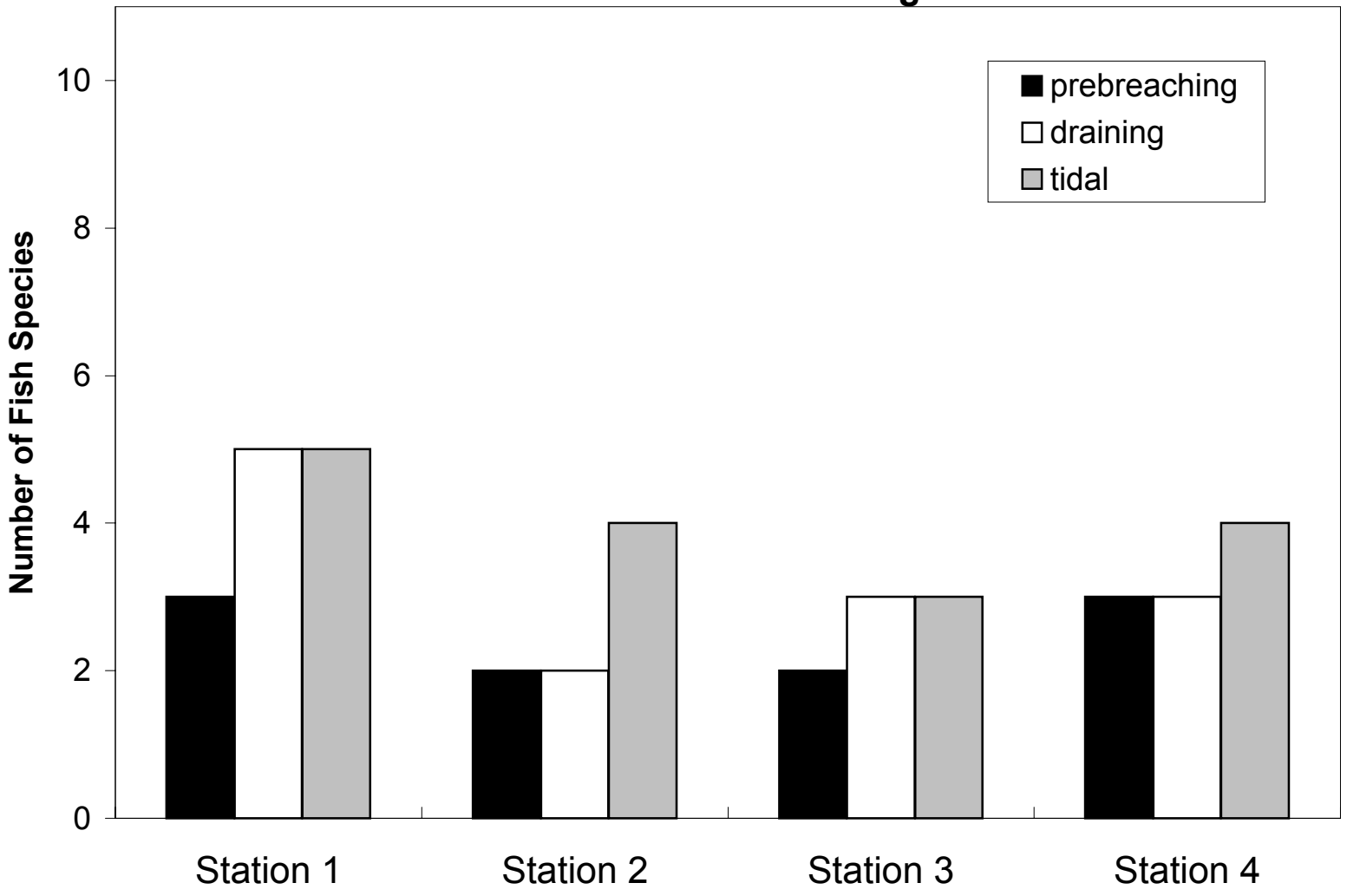
**Appendix B-26**
**Number of Fish Species in Otter Trawls**
**Event III--Breached 27 June 1997**



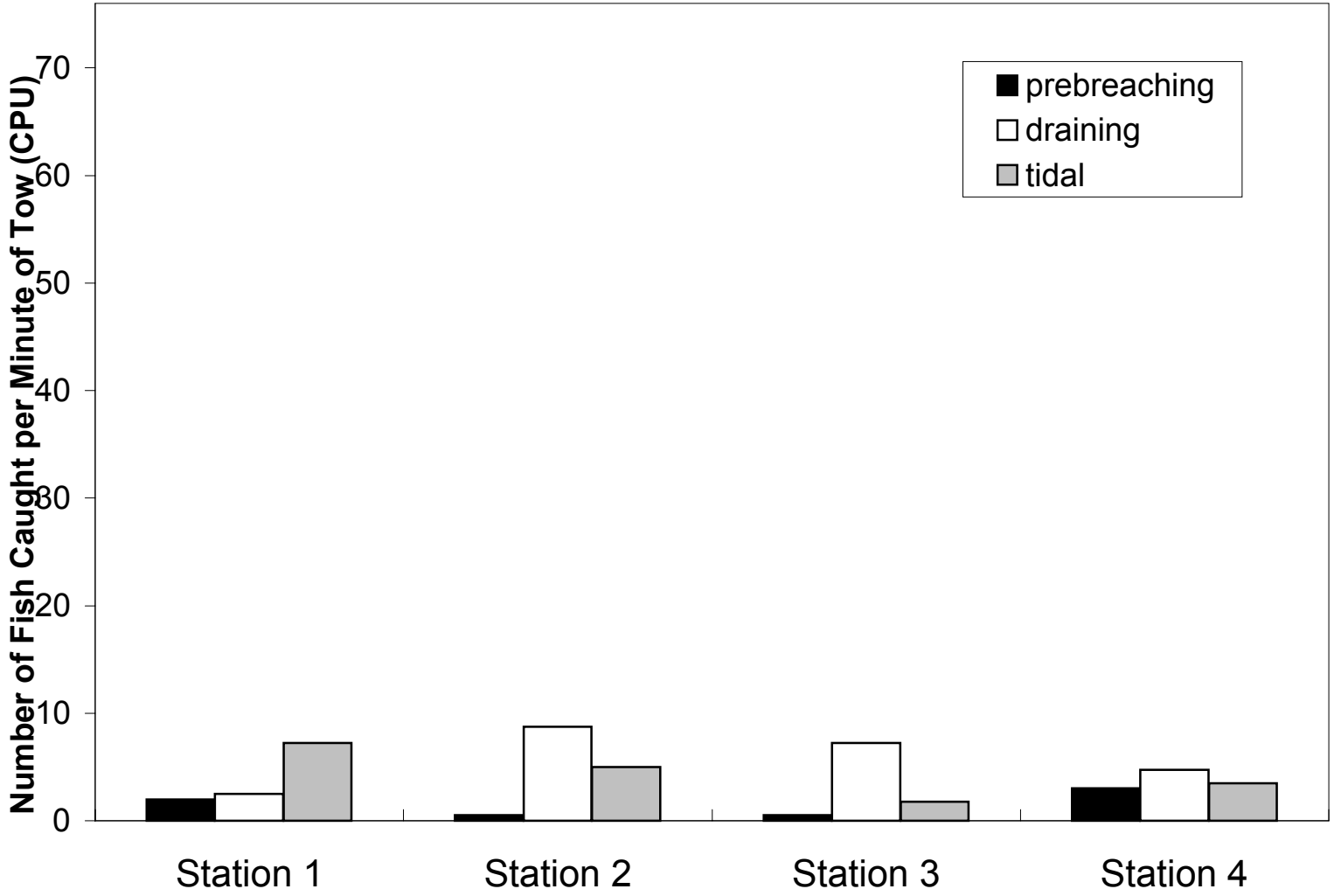
**Appendix B-27**
**Otter Trawl Catch**
**Event III--Breached 27 June 1996**



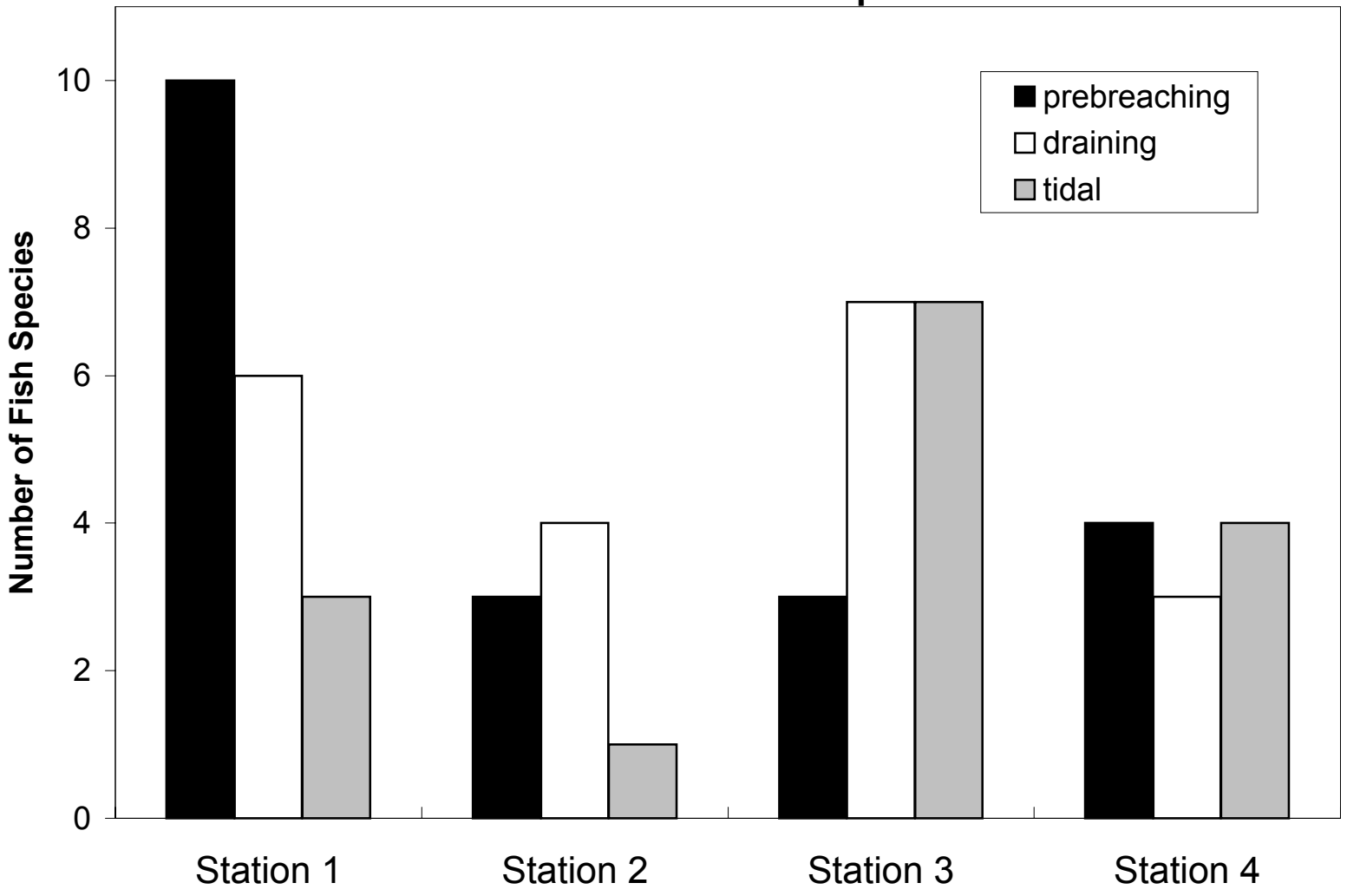
**Appendix B-28**
**Number of Fish Species in Otter Trawls**
**Event IV--Breached 20 August 1997**



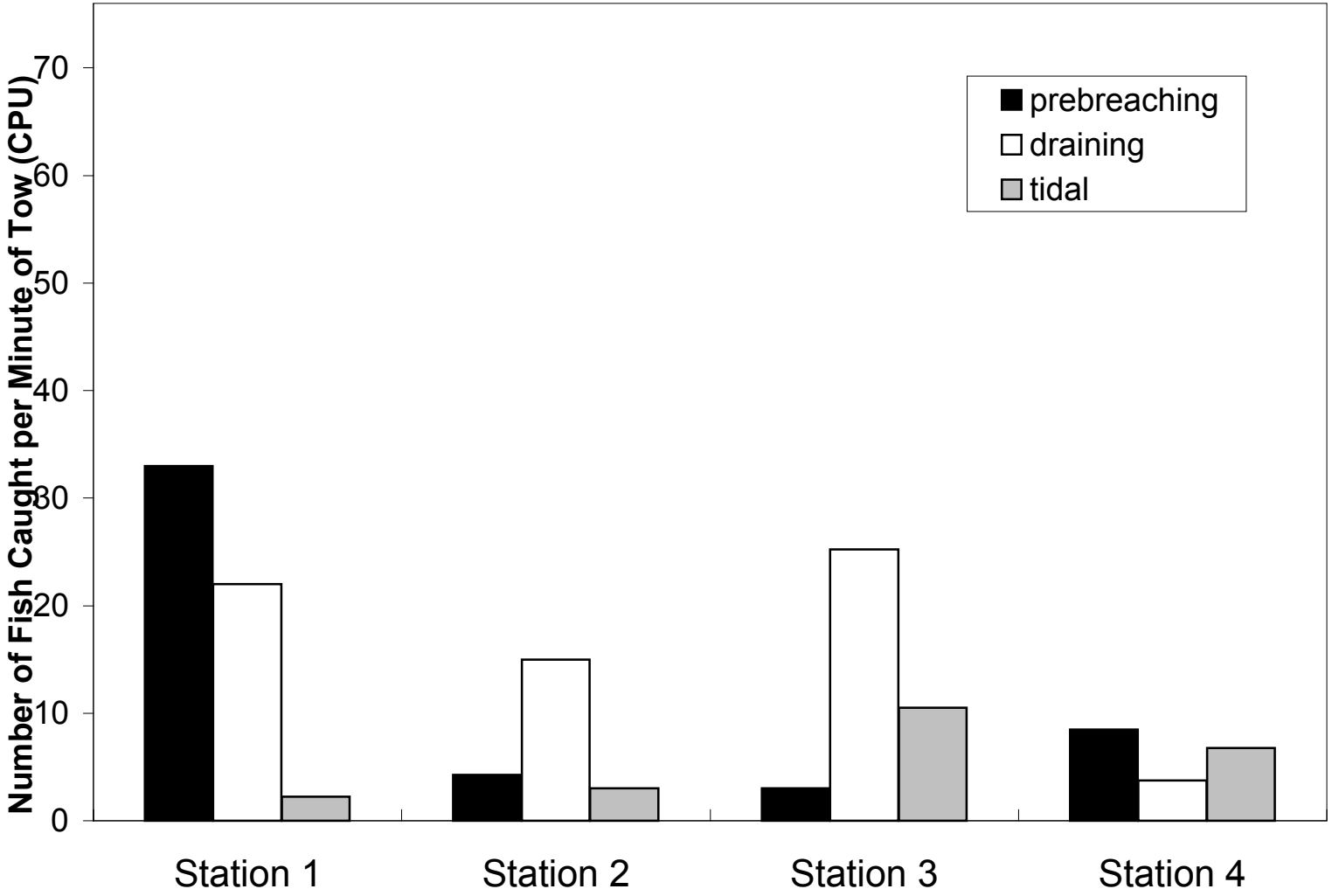
**Appendix B-29**
**Otter Trawl Catch**
**Event IV--Breached 20 August 1996**



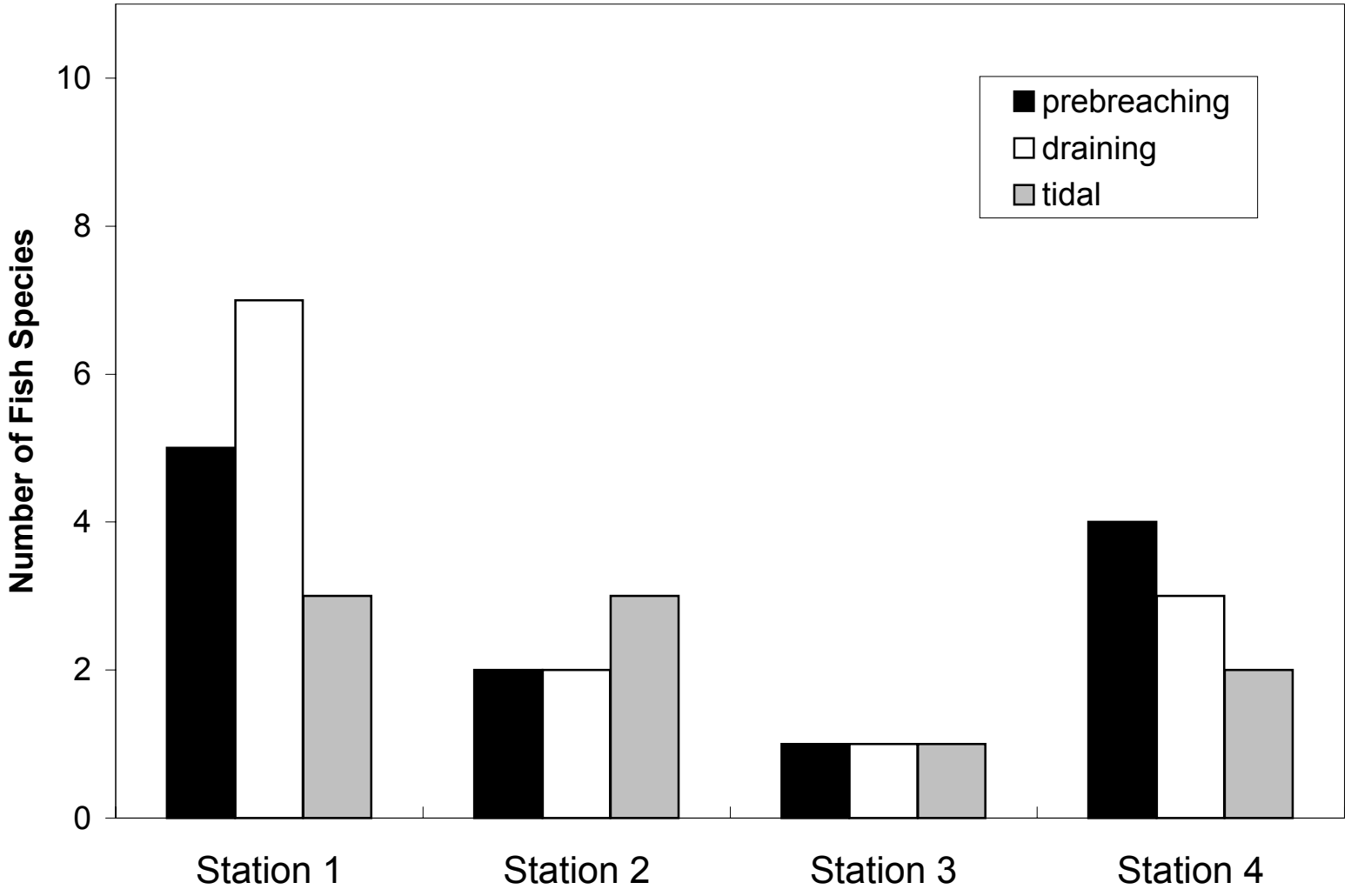
**Appendix B-30**
**Number of Fish Species in Otter Trawls**
**Event V--Breached 19 September 1997**



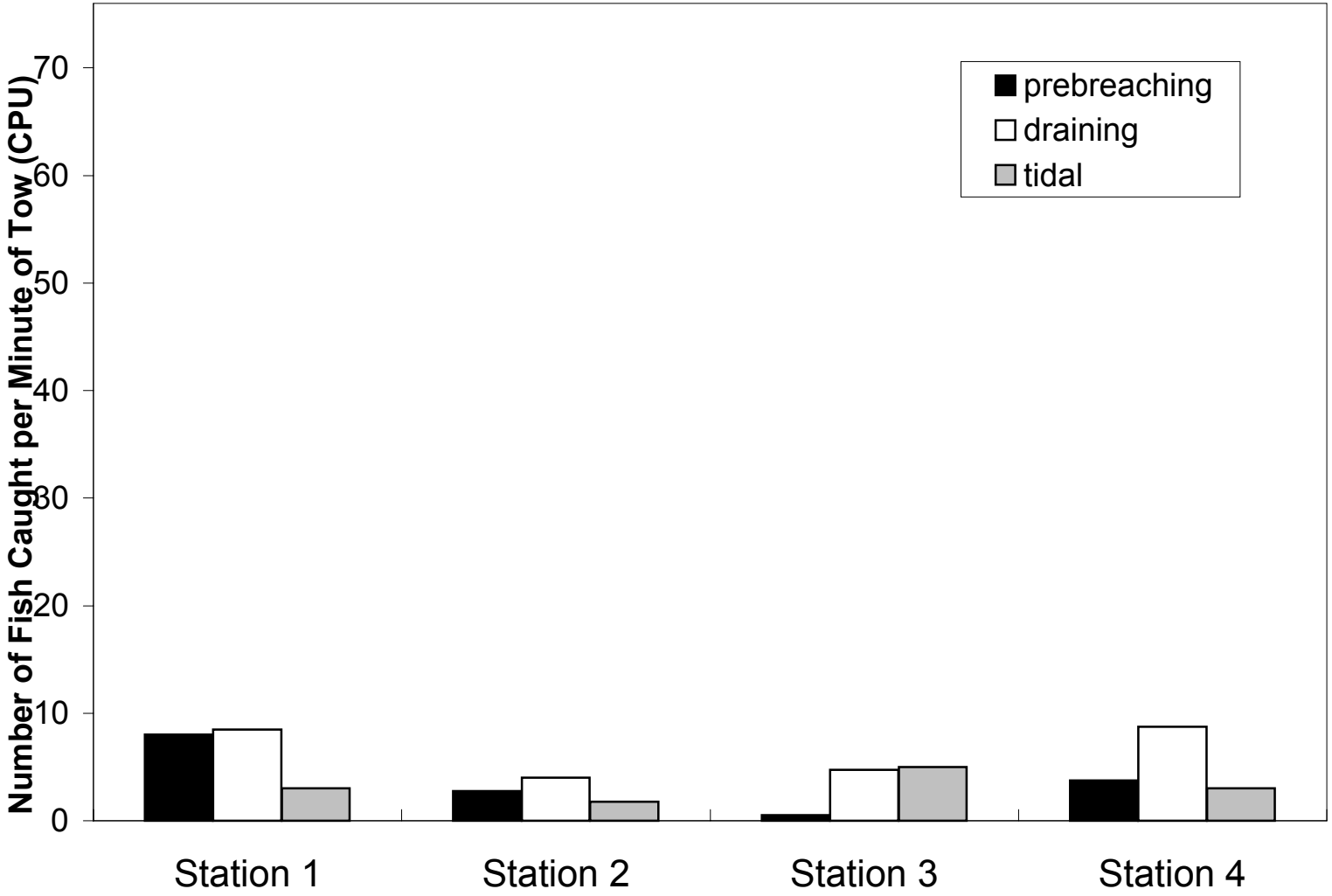
**Appendix B-31**
**Otter Trawl Catch**
**Event V--Breached 19 September 1996**



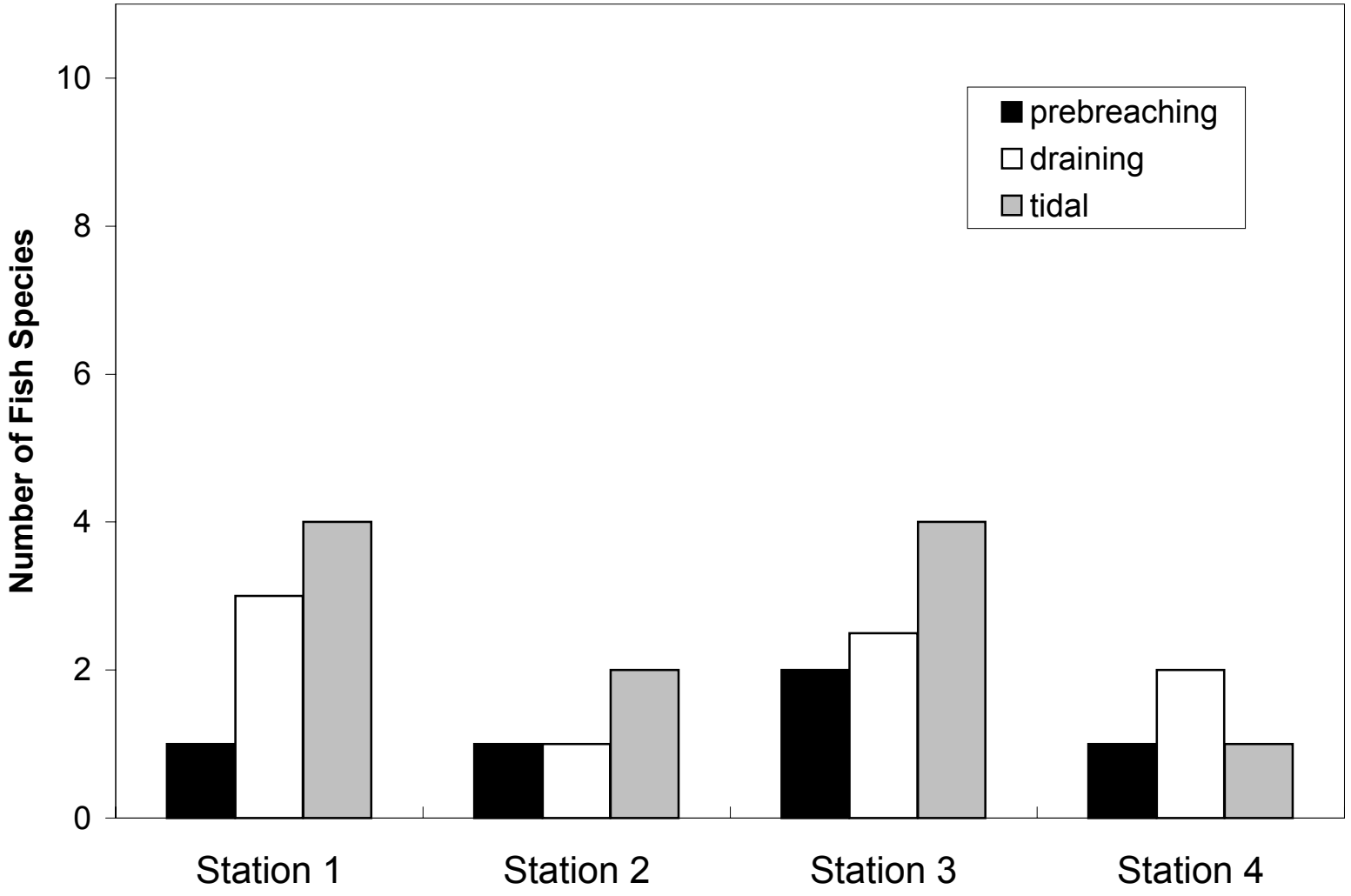
**Appendix B-32**
**Number of Fish Species in Otter Trawls**
**Event VI--Breached 11 October 1997**



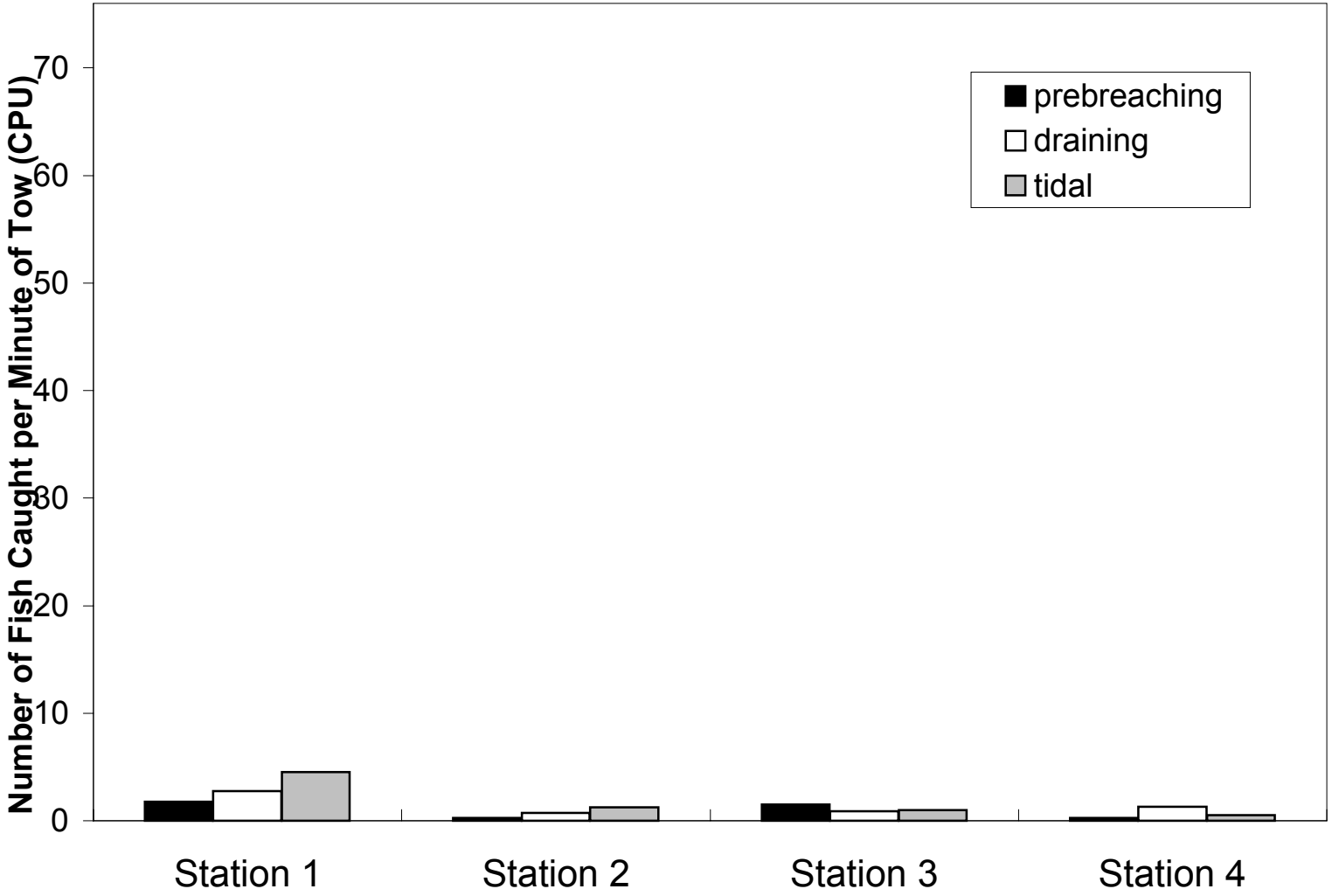
**Appendix B-33**
**Otter Trawl Catch**
**Event VI--Breached 11 October 1996**



**Appendix B-34**
**Number of Fish Species in Otter Trawls**
**Event VII--Breached 3 November 1997**



**Appendix B-35**
**Otter Trawl Catch**
**Event VII--Breached 3 November 1996**



Appendix B-36. Preliminary trials comparing beach seines with purse seines deployed along shore, 9 May 1997

| | 9-May-97 | | | |
|---|---|---|---|---|
| | Station 3 | | Station 4 | |
| Common Name | beach seine | purse seine | beach seine | purse seine |
| Topsmelt | | | | |
| Pacific sanddab | | | | 2 |
| Sacramento sucker | | | 3 | 11 |
| Smallmouth bass | | | | |
| Pacific herring | 2 | 123 | | 4 |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | 9 | 1 | 8 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | 2 | 1 |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | 5 | 8 |
| Starry flounder | | 57 | | |
| Saddleback gunnel | | | | |
| Steelhead | 3 | | 1 | |
| Coho salmon | | | 1 | |
| Bay pipefish | | 1 | | |
| | | | | |
| Number of fish species | 2 | 4 | 6 | 6 |
| Total fish | 5 | 190 | 13 | 34 |
| Salmonid species caught | 1 | 0 | 2 | 0 |

Appendix 37. Prebreaching Beach Seine Catch Summary, Event I, 20 May 1997

| | 20-May-97 | | | | | | |
|---|---|---|---|---|---|---|---|
| | Stn 1 1850 hr PDT | | Stn 2 1730 hr PDT | Stn 3 1600 hr PDT | | Stn 4 1430 hr PDT | |
| Common Name | Beach Seine | Purse Seine | Purse Seine | Beach Seine | Purse Seine | Beach Seine | Purse Seine |
| Topsmelt | | | | | | | |
| Pacific sanddab | | | | | | | |
| Sacramento sucker | | 2 | 1 | 36 | 100 | 6 | 50 |
| Smallmouth bass | | | | | | | |
| Pacific herring | | 5 | | | | | |
| Smoothhead sculpin | | | | | | | |
| Prickly sculpin | | | | | | | |
| Buffalo sculpin | | | | | | | |
| Bull sculpin | | | | | | | |
| Staghorn sculpin | | 1 | 1 | | | | |
| Cabezon | | | | | | | |
| Unknown Juv. Sebastes | | | | | | | |
| Shiner surfperch | | | | | | | |
| Spotfin surfperch | | | | | | | |
| Northern anchovy | | | | | | | |
| Pacific tomcod | | | | | | | |
| Threespine stickleback | | | | | 1 | | |
| Kelp greenling | | | | | | | |
| Lingcod | | | | | | | |
| Surf smelt | | | | | | | |
| Longfin smelt | | | | | | | |
| Hybrid sole | | | | | | | |
| English sole | | | | | | | |
| Starry flounder | | | | | 1 | | |
| Saddleback gunnel | | | | | | | |
| Steelhead | | | | 1 | | | |
| Coho salmon | | | | | | | |
| Bay pipefish | | | | | | | |
| Number of fish species | 0 | 3 | 2 | 2 | 3 | 1 | 1 |
| Total fish | 0 | 8 | 2 | 37 | 102 | 6 | 50 |
| Salmonid species caught | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

Appendix 38. Draining Beach Seine Catch Summary, Event I, 23 May 1997

| Common Name | 23-May-97 Stn 1 0850 hr PDT | Stn 2 0940 hr PDT | Stn 3 1100 hr PDT | Stn 4 1215 hr PDT |
|---|---|---|---|---|
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | 1 | 100 | 9 |
| Smallmouth bass | | | | |
| Pacific herring | 1 | 4 | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | 1 | 1 | 1 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | 1 | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | 1 | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 3 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | 3 |
| Saddleback gunnel | | | | |
| Steelhead | 2 | | | 1 |
| Coho salmon | 6 | 1 | | |
| Bay pipefish | 1 | | | |
| Number of fish species | 5 | 4 | 4 | 4 |
| Total fish | 11 | 7 | 105 | 14 |

Appendix 39. Tidal Beach Seine Catch Summary, Event I, 27 May 1997

| | 27-May-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1 0845 hr PDT | Stn 2 1000 hr PDT | Stn 3 1100 hr PDT | Stn 4 1215 hr PDT |
| Topsmelt | 74 | | 1 | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | 1 |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | 1 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | 1 |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | 2 | | | 2 |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | 2 | 4 |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | 3 | 1 | |
| Bay pipefish | | | | |
| Number of fish species | 2 | 1 | 3 | 5 |
| Total fish | 76 | 3 | 4 | 9 |

Appendix 40. Prebreaching Beach Seine Catch Summary, Event II, 6 June 1997

| | 6-Jun-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>0950 hr PDT | Stn 2<br>no tow | Stn 3<br>1330 hr PDT | Stn 4<br>1515 hr PDT |
| Topsmelt | 1 | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | 50 | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | 1 |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | - | 1 | 1 |
| Total fish | 1 | - | 50 | 1 |

Appendix 41. Draining Beach Seine Catch Summary, Event II, 10 June 1997

| Common Name | 10-Jun-97 Stn 1 1040 hr PDT | Stn 2 1200 hr PDT | Stn 3 1330 hr PDT | Stn 4 1500 hr PDT |
|---|---|---|---|---|
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | 9 | 52 | 9 |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | 1 | | | |
| Prickly sculpin | | 1 | 2 | 1 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | 4 | 2 | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | 8 | | 5 |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | 1 | |
| Saddleback gunnel | | | | |
| Steelhead | | 2 | | 4 |
| Coho salmon | 4 | | | |
| Bay pipefish | | | | |
| Number of fish species | 3 | 5 | 3 | 4 |
| Total fish | 9 | 22 | 55 | 19 |

Appendix 42. Tidal Beach Seine Catch Summary, Event II, 13 June 1997

| Common Name | 13-Jun-97 Stn 1 0900 hr PDT | Stn 2 1000 hr PDT | Stn 3 1112 hr PDT | Stn 4 1250 hr PDT |
|---|---|---|---|---|
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | 133 | 223 |
| Smallmouth bass | | | | |
| Pacific herring | 8 | | 9 | 2 |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | 1 | 2 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | 2 | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 3 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | 1 | | 5 | 1 |
| Saddleback gunnel | | | | |
| Steelhead | | 1 | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 2 | 1 | 6 | 4 |
| Total fish | 9 | 1 | 153 | 228 |

Appendix 43. Prebreaching Beach Seine Catch Summary, Event III, 22-23 June 1997

| | 22-23 June 1997 | | | |
|---|---|---|---|---|
| | Stn 1 | Stn 2 | Stn 3 | Stn 4 |
| | 0810 hr PDT | no tow | 1345 hr PDT | 1300 hr PDT |
| Common Name | 23-Jun | 22-Jun | 22-Jun | 22-Jun |
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | 47 |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | 5 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | 1 | 2 |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 0 | - | 1 | 3 |
| Total fish | 0 | - | 1 | 54 |

Appendix 44. Draining Beach Seine Catch Summary, Event III, 28 June 1997

| | 28-Jun-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1 0910 hr PDT | Stn 2 1010 hr PDT | Stn 3 1130 hr PDT | Stn 4 1400 hr PDT |
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | 14 | 2 |
| Smallmouth bass | | | | |
| Pacific herring | 3 | 5 | | |
| Smoothhead sculpin | | | | 1 |
| Prickly sculpin | | 2 | 2 | 10 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | 1 | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | 21 | 43 | 2 | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 4 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | 1 | |
| Starry flounder | | 1 | | 1 |
| Saddleback gunnel | | | | |
| Steelhead | | | | 2 |
| Coho salmon | | 1 | 1 | |
| Bay pipefish | | | | |
| Number of fish species | 3 | 5 | 6 | 5 |
| Total fish | 25 | 52 | 24 | 16 |

Appendix 45. Tidal Beach Seine Catch Summary, Event III, 1 July 1997

| | 1-Jul-97 | | | | |
|---|---|---|---|---|---|
| | Stn 1 | Stn 2 | Stn 3 | Stn 4 | |
| Common Name | 1440 hr PDT | 1415 hr PDT | 1300 hr PDT | 1215 hr PDT | 1230 hr PDT |
| Topsmelt | | 1 | | | |
| Pacific sanddab | | | | | |
| Sacramento sucker | | | 36 | 12 | 13 |
| Smallmouth bass | | | | | |
| Pacific herring | | 21 | | | |
| Smoothhead sculpin | | | | | |
| Prickly sculpin | | | | 1 | |
| Buffalo sculpin | | | | | |
| Bull sculpin | | | | | |
| Staghorn sculpin | | | 1 | | |
| Cabezon | | | | | |
| Unknown Juv. Sebastes | | | | | |
| Shiner surfperch | | | | 1 | 4 |
| Spotfin surfperch | | | | | |
| Northern anchovy | | | | | |
| Pacific tomcod | | | | | |
| Threespine stickleback | | | | 1 | 1 |
| Kelp greenling | | | | | |
| Lingcod | | | | | |
| Surf smelt | | | | | |
| Longfin smelt | | | | | |
| Hybrid sole | | | | | |
| English sole | | | | | |
| Starry flounder | | | | | |
| Saddleback gunnel | | | | | |
| Steelhead | | | 1 | | |
| Coho salmon | | | | | |
| Bay pipefish | | | | | |
| Number of fish species | 0 | 2 | 3 | 4 | 3 |
| Total fish | 0 | 22 | 38 | 15 | 18 |

Appendix 46. Prebreaching Beach Seine Catch Summary, Event IV, 18 August 1997

| | 18-Aug-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>1050 hr PDT | Stn 2<br>no tow | Stn 3<br>1420 hr PDT | Stn 4<br>1315 hr PDT |
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | 1 |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 0 | - | 0 | 1 |
| Total fish | 0 | - | 0 | 1 |

Appendix 47. Draining Beach Seine Catch Summary, Event IV, 21 August 1997

| | 21-Aug-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1 1010 hr PDT | Stn 2 1050 hr PDT | Stn 3 1150 hr PDT | Stn 4 1335 hr PDT |
| Topsmelt | | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | 1 | | 5 |
| Smallmouth bass | | | | |
| Pacific herring | | | 1 | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | 5 | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | 3 | | 14 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | 2 | 2 | 1 |
| Total fish | 3 | 6 | 15 | 5 |

Appendix 48. Tidal Beach Seine Catch Summary, Event IV, 26 August 1997

| | 26-Aug-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>0945 hr PDT | Stn 2<br>1010 hr PDT | Stn 3<br>1105 hr PDT | Stn 4<br>1210 hr PDT |
| Topsmelt | 25 | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | 2 | 3 | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 2 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | 1 | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | 1 | |
| Number of fish species | 1 | 2 | 3 | 0 |
| Total fish | 25 | 3 | 6 | 0 |

Appendix 49. Prebreaching Beach Seine Catch Summary, Event V, 16 September 1997

| | 16-Sep-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>1225 hr PDT | Stn 2<br>no tow | Stn 3<br>1445 hr PDT | Stn 4<br>1550 hr PDT |
| Topsmelt | 1 | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | - | 0 | 0 |
| Total fish | 1 | - | 0 | 0 |

Appendix 50. Draining Beach Seine Catch Summary, Event V, 20 September 1997

| | 20-Sep-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1 1115 hr PDT | Stn 2 1135 hr PDT | Stn 3 1230 hr PDT | Stn 4 1300 hr PDT |
| Topsmelt | 54 | 2 | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | 1 | |
| Smallmouth bass | | 1 | | |
| Pacific herring | 1 | | | 7 |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 3 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | 2 | |
| Saddleback gunnel | | | | |
| Steelhead | | 1 | 1 | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 2 | 3 | 4 | 1 |
| Total fish | 55 | 4 | 7 | 7 |

Appendix 51. Tidal Beach Seine Catch Summary, Event V, 23 September 1997

| | 23-Sep-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>1010 hr PDT | Stn 2<br>1035 hr PDT | Stn 3<br>1140 hr PDT | Stn 4<br>1220 hr PDT |
| Topsmelt | 900 | 2 | 102 | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | 1 | 2 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | 1 |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | 1 |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | 1 | 2 | 3 |
| Total fish | 900 | 2 | 103 | 4 |

Appendix 52. Prebreaching Beach Seine Catch Summary, Event VI, 10 October 1997

| | 10-Oct-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>0945 hr PDT | Stn 2<br>no tow | Stn 3<br>1220 hr PDT | Stn 4<br>1255 hr PDT |
| Topsmelt | 15 | | | 1 |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | 1 | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | 4 | 1 |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 2 | - | 1 | 2 |
| Total fish | 16 | - | 4 | 2 |

Appendix 53. Draining Beach Seine Catch Summary, Event VI, 12 October 1997

| | 12-Oct-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1 1040 hr PDT | Stn 2 1120 hr PDT | Stn 3 1215 hr PDT | Stn 4 1305 hr PDT |
| Topsmelt | 350 | 47 | 71 | 9 |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | 1 | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 10 | 1 |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | 1 |
| Number of fish species | 1 | 2 | 2 | 3 |
| Total fish | 350 | 48 | 81 | 11 |

Appendix 54. Tidal Beach Seine Catch Summary, Event VI, 15 October 1997

| Common Name | 15-Oct-97 Stn 1 1145 hr PDT | Stn 2 1550 hr PDT | Stn 3 1425 hr PDT | Stn 4 1400 hr PDT |
|---|---|---|---|---|
| Topsmelt | 385 | 135 | 420 | 227 |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | 1 |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | 8 | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | 20 | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | 1 | 3 | 2 |
| Total fish | 385 | 135 | 448 | 228 |

Appendix 55. Prebreaching Beach Seine Catch Summary, Event VII, 31 October 1997

| | 31-Oct-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>1400 hr PST | Stn 2<br>no tow | Stn 3<br>1445 hr PST | Stn 4<br>1535 hr PST |
| Topsmelt | 30 | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | | | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | 1 | | 1 | |
| Saddleback gunnel | | | | |
| Steelhead | | | 2 | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 2 | - | 2 | 0 |
| Total fish | 31 | - | 3 | 0 |

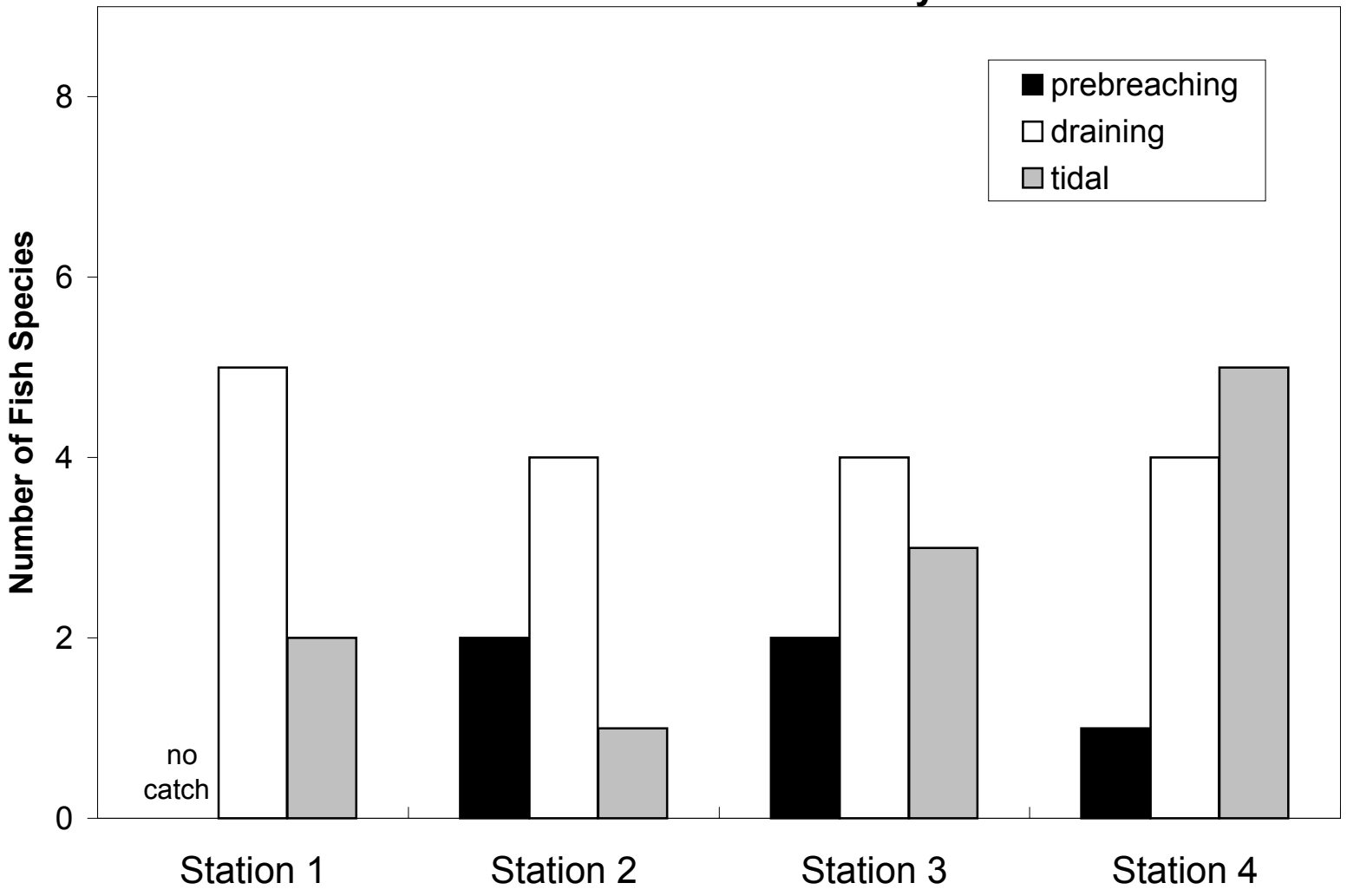
Appendix 56. Draining Beach Seine Catch Summary, Event VII, 4 November 1997

| Common Name | 4-Nov-97 Stn 1 0940 hr PST | Stn 2 1010 hr PST | Stn 3 1120 hr PST | Stn 4 1205 hr PST |
|---|---|---|---|---|
| Topsmelt | 22 | | | |
| Pacific sanddab | | | | |
| Sacramento sucker | | 1 | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | 14 | 26 | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | 1 | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | 2 | 2 | 0 |
| Total fish | 22 | 15 | 27 | 0 |

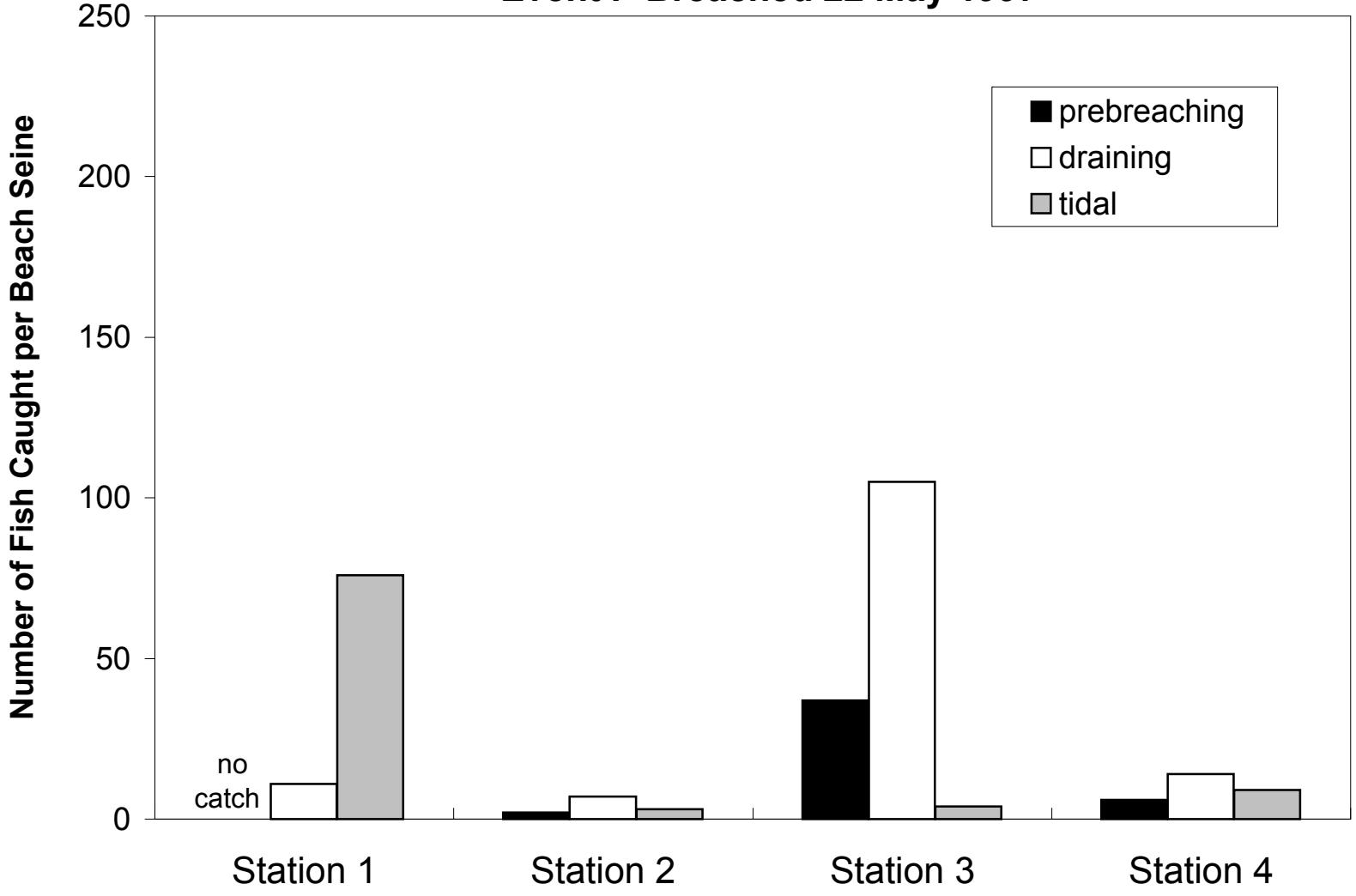
Appendix 57. Tidal Beach Seine Catch Summary, Event VII, 7 November 1997

| | 7-Nov-97 | | | |
|---|---|---|---|---|
| Common Name | Stn 1<br>1115 hr PST | Stn 2<br>1145 hr PST | Stn 3<br>1330 hr PST | Stn 4<br>1420 hr PST |
| Topsmelt | 34 | 38 | 500 | 9 |
| Pacific sanddab | | | | |
| Sacramento sucker | | | | |
| Smallmouth bass | | | | |
| Pacific herring | | | | |
| Smoothhead sculpin | | | | |
| Prickly sculpin | | 1 | | |
| Buffalo sculpin | | | | |
| Bull sculpin | | | | |
| Staghorn sculpin | | | | |
| Cabezon | | | | |
| Unknown Juv. Sebastes | | | | |
| Shiner surfperch | | | | |
| Spotfin surfperch | | | | |
| Northern anchovy | | | | |
| Pacific tomcod | | | | |
| Threespine stickleback | | | | |
| Kelp greenling | | | | |
| Lingcod | | | | |
| Surf smelt | | 2 | 10 | |
| Longfin smelt | | | | |
| Hybrid sole | | | | |
| English sole | | | | |
| Starry flounder | | | | |
| Saddleback gunnel | | | | |
| Steelhead | | | 3 | |
| Coho salmon | | | | |
| Bay pipefish | | | | |
| Number of fish species | 1 | 3 | 3 | 1 |
| Total fish | 34 | 41 | 513 | 9 |

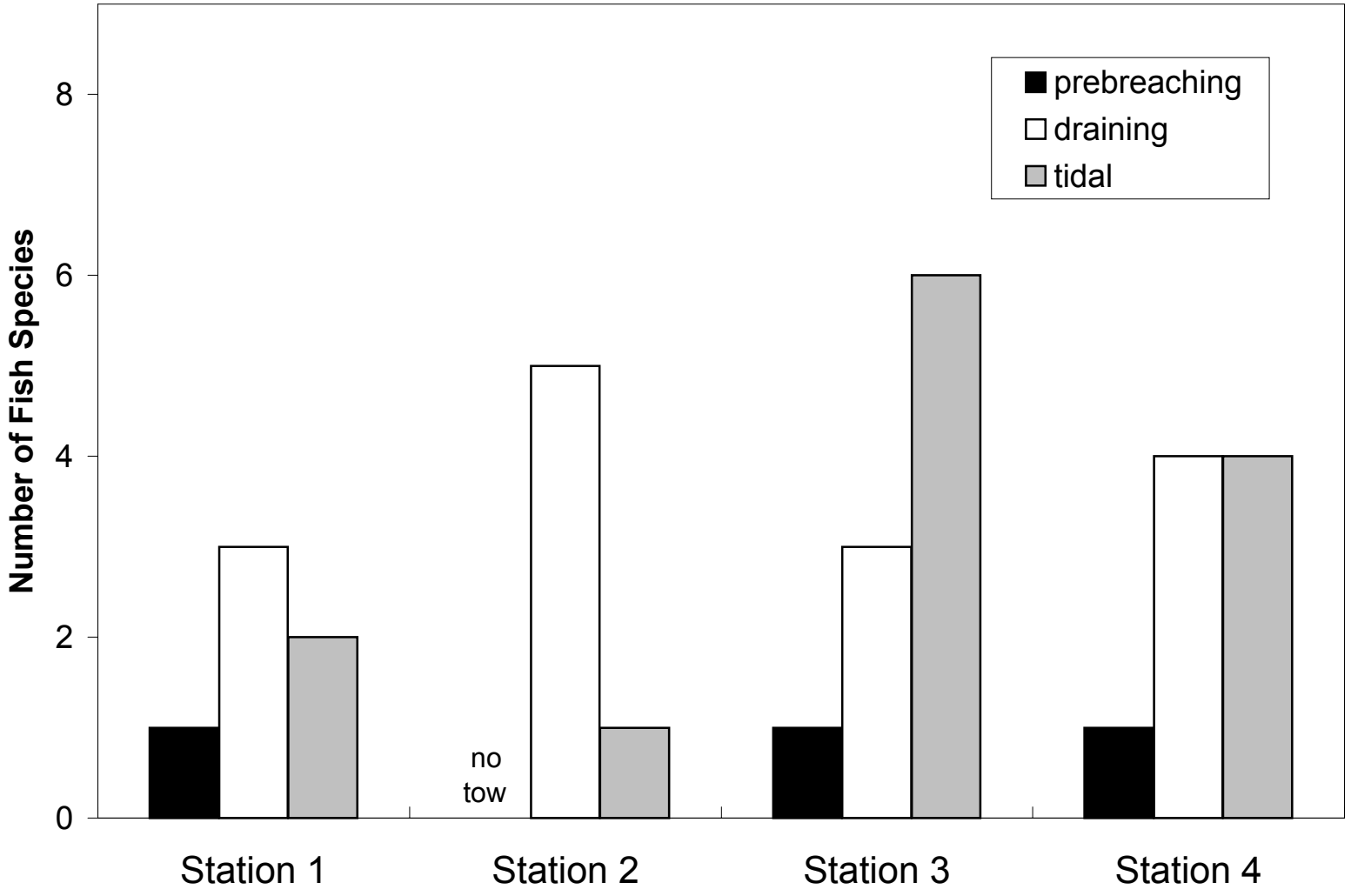
**Appendix B-58**
**Number of Fish Species in Beach Seines**
**Event I--Breached 22 May 1997**



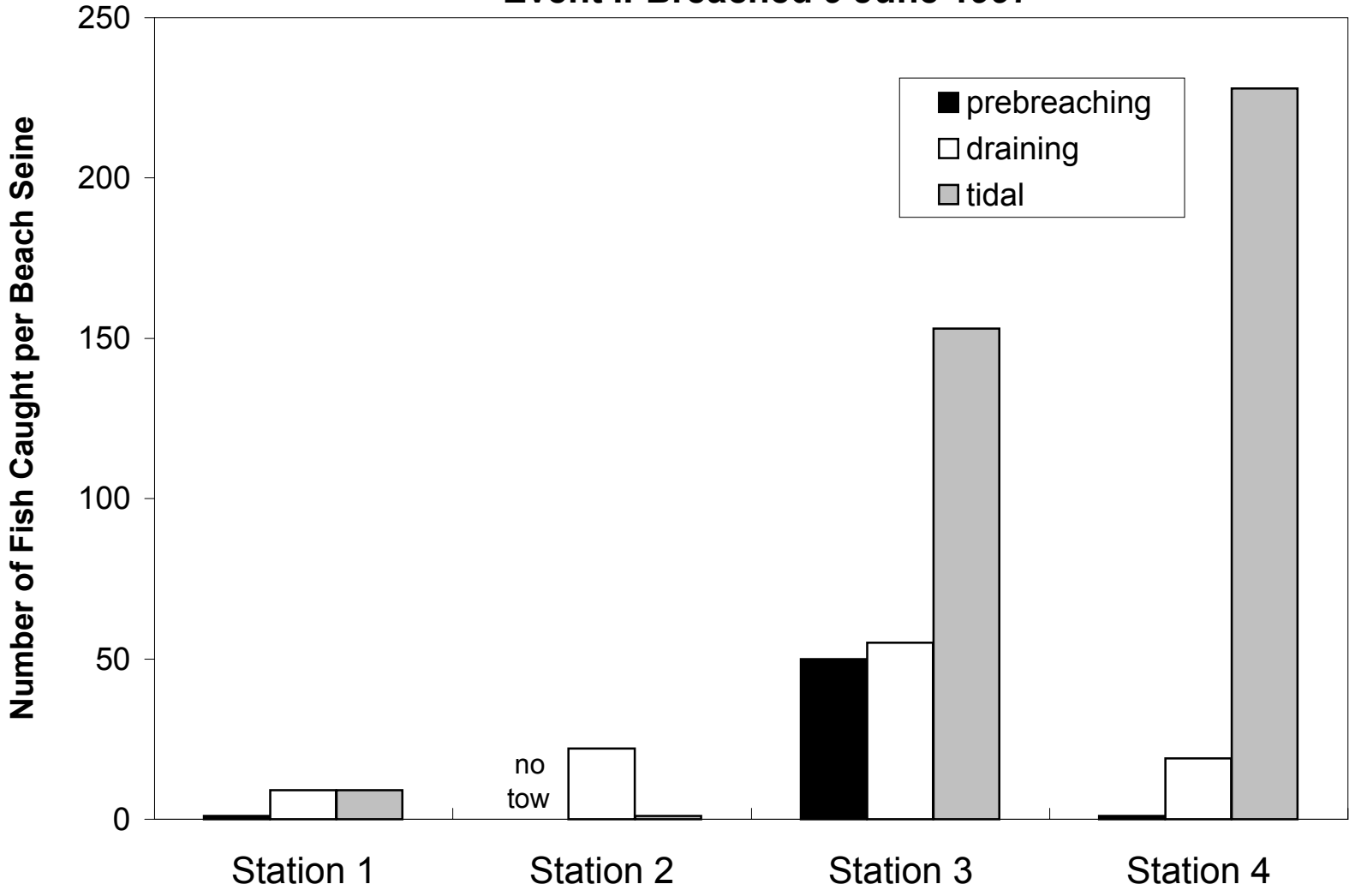
**Appendix B-59**
**Beach Seine Catch**
**Event I--Breached 22 May 1997**



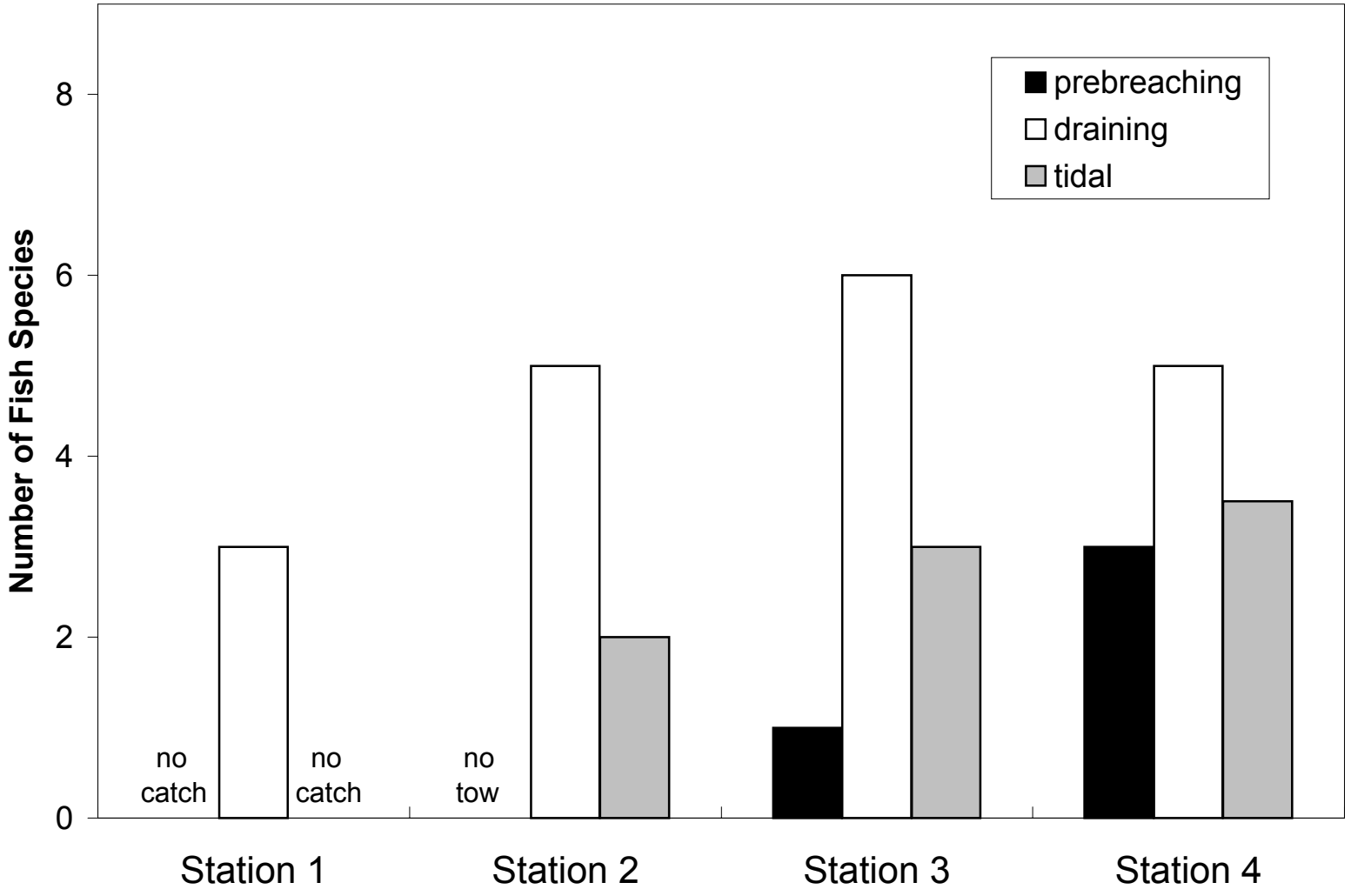
**Appendix B-60**
**Number of Fish Species in Beach Seines**
**Event II--Breached 9 June 1997**



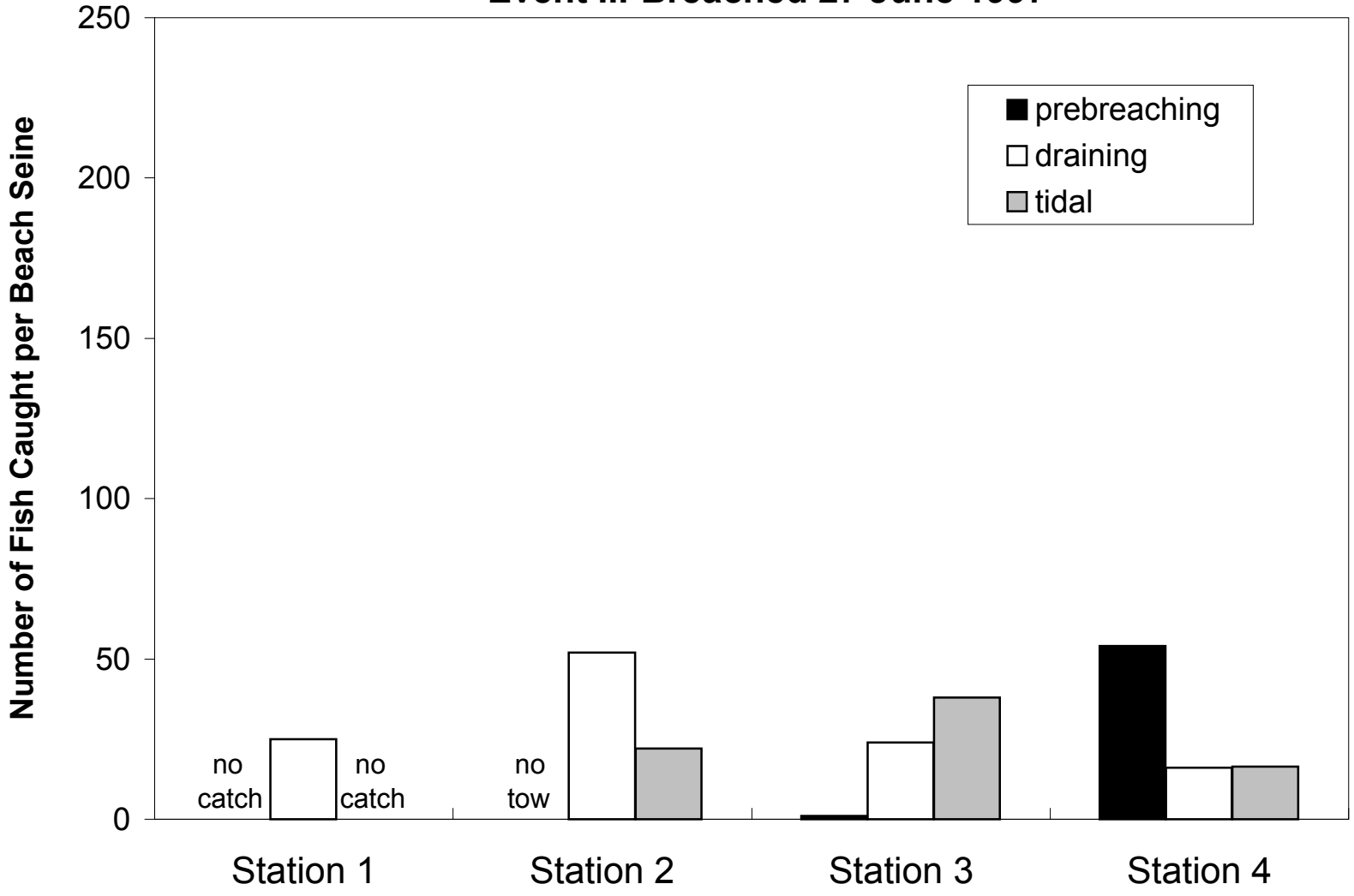
**Appendix B-61**
**Beach Seine Catch**
**Event II-Breached 9 June 1997**



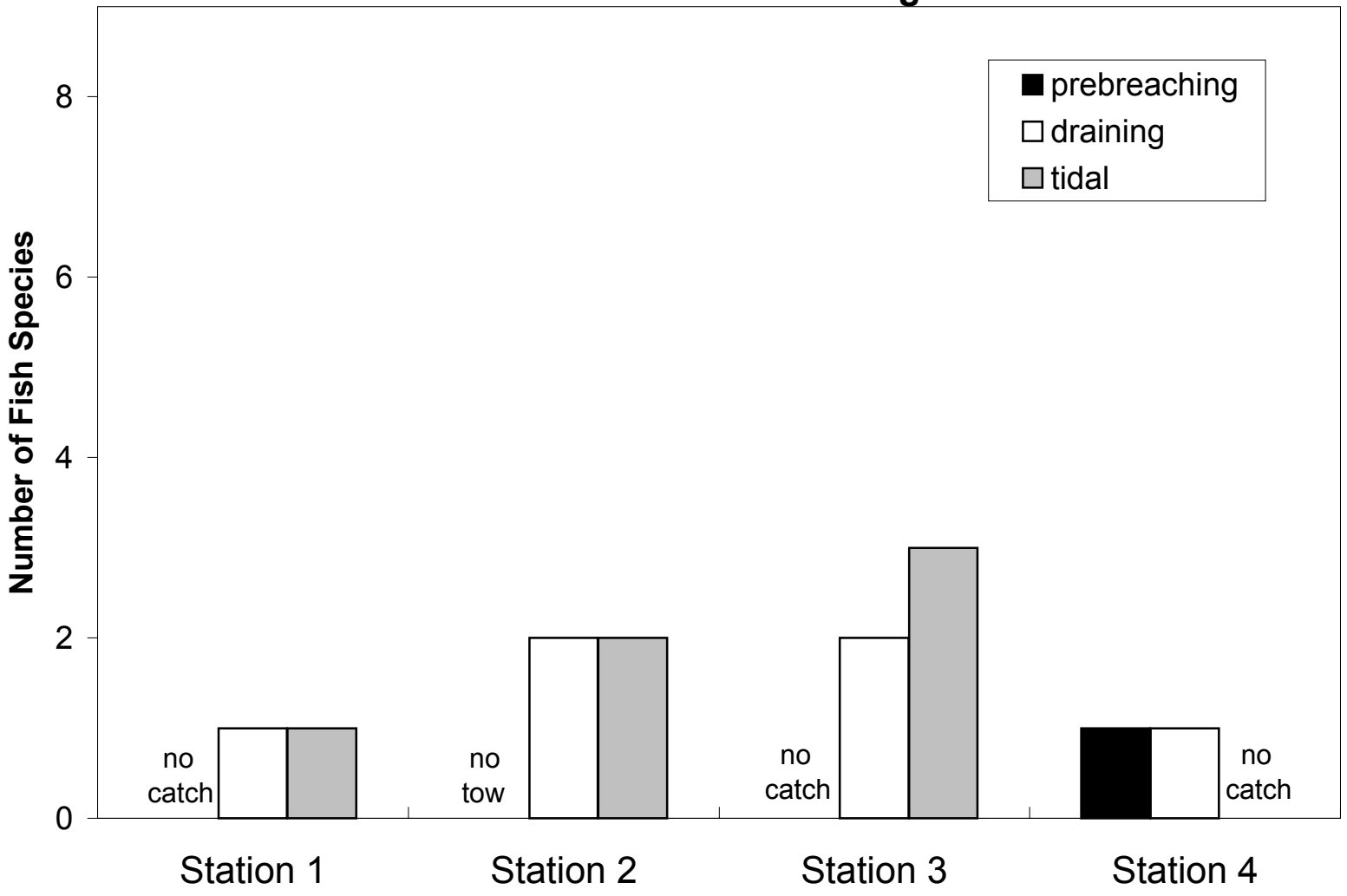
**Appendix B-62**
**Number of Fish Species in Beach Seines**
**Event III--Breached 27 June 1997**



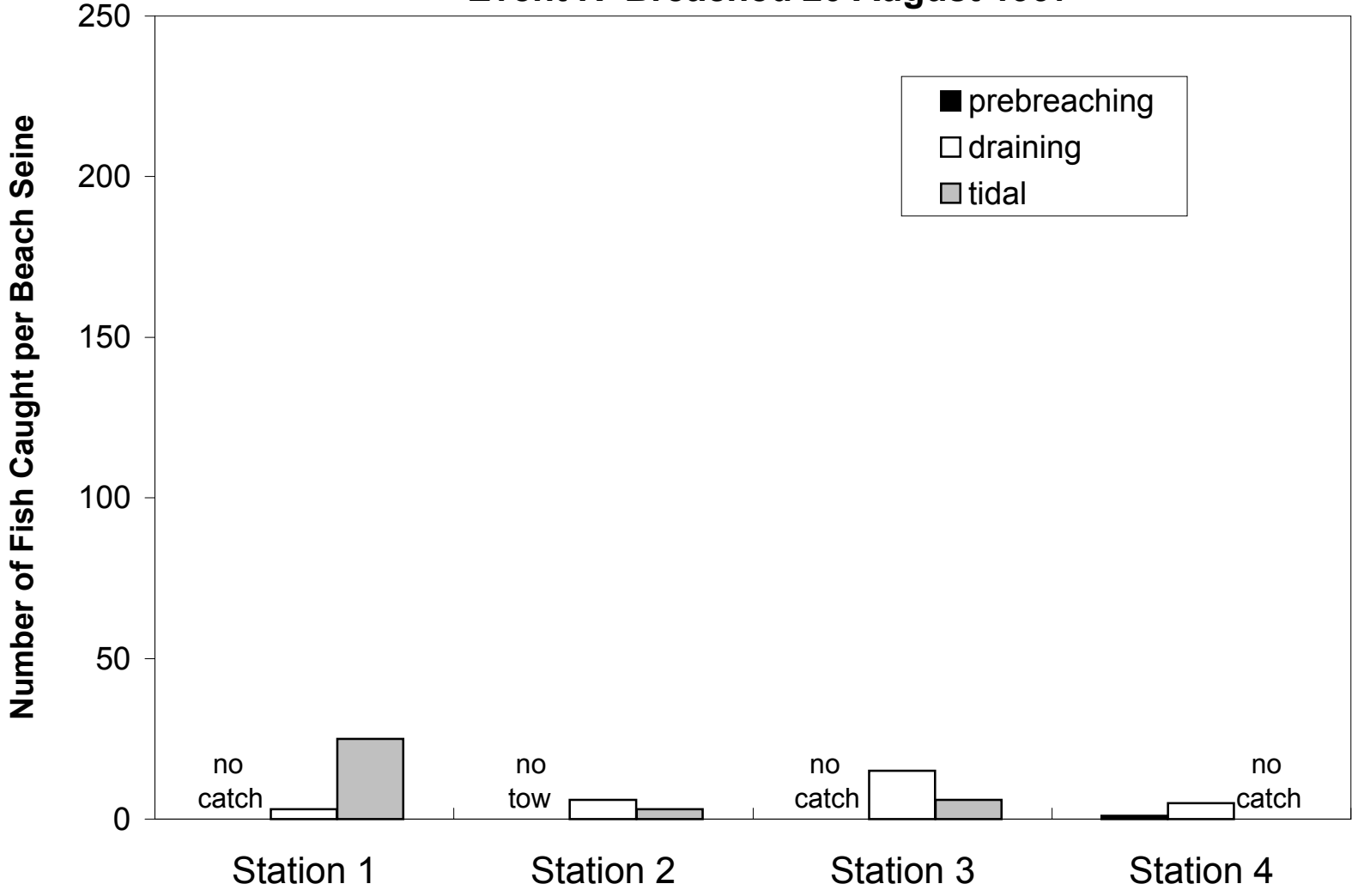
**Appendix B-63**
**Beach Seine Catch**
**Event III-Breached 27 June 1997**



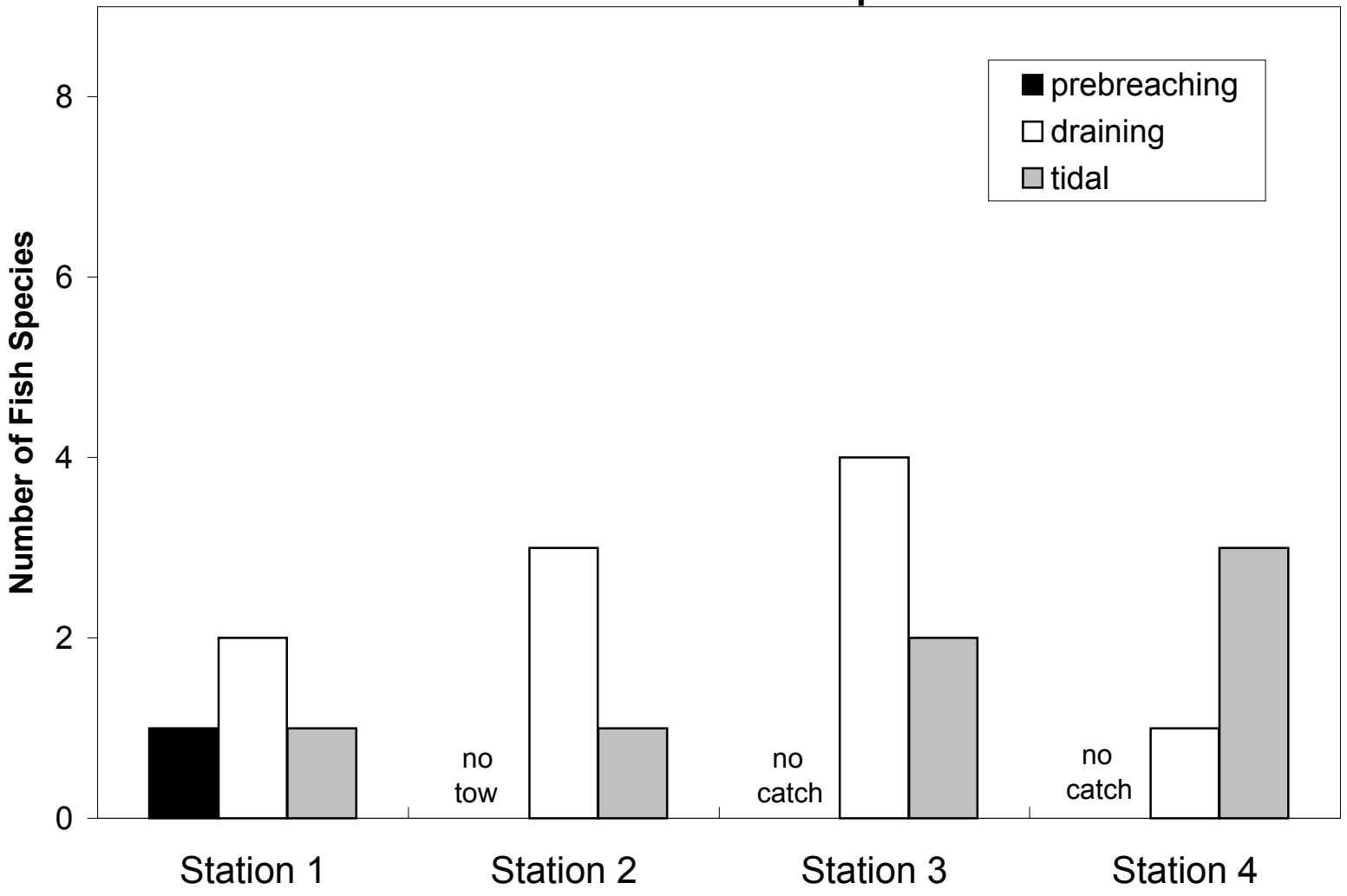
**Appendix B-64**
**Number of Fish Species in Beach Seines**
**Event IV--Breached 20 August 1997**



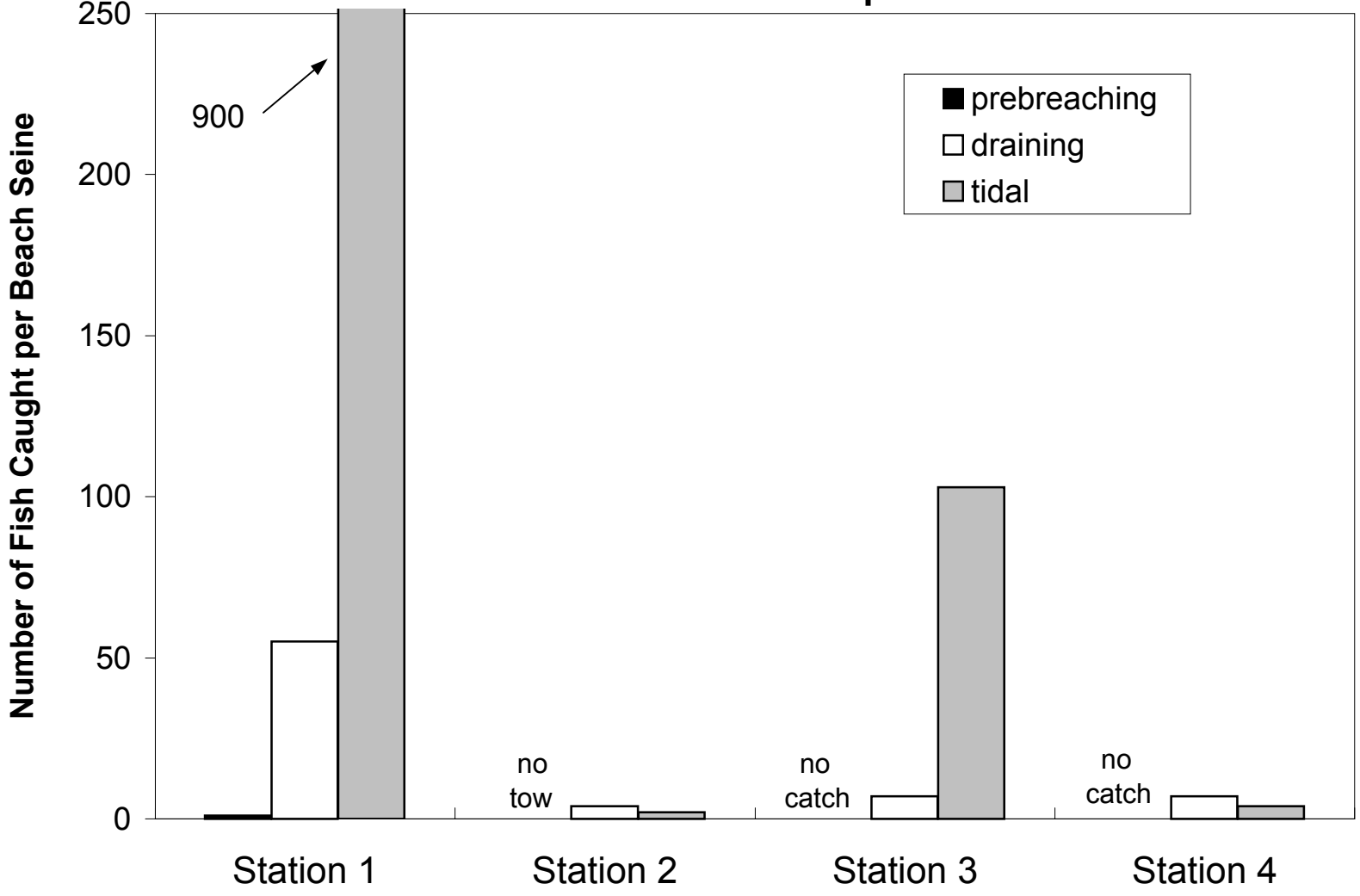
**Appendix B-65**
**Beach Seine Catch**
**Event IV-Breached 20 August 1997**



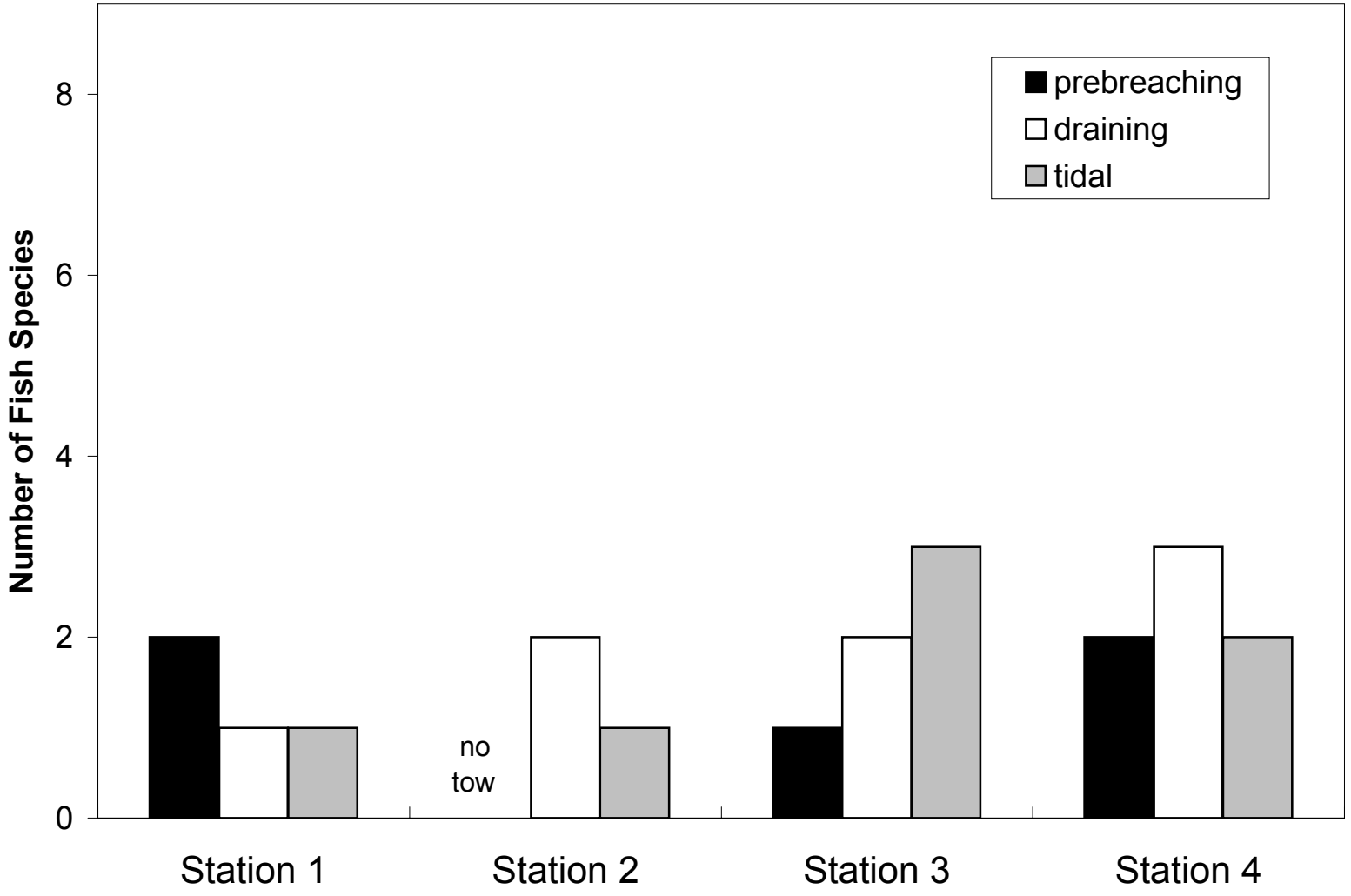
**Appendix B-66**
**Number of Fish Species in Beach Seines**
**Event V--Breached 19 September 1997**



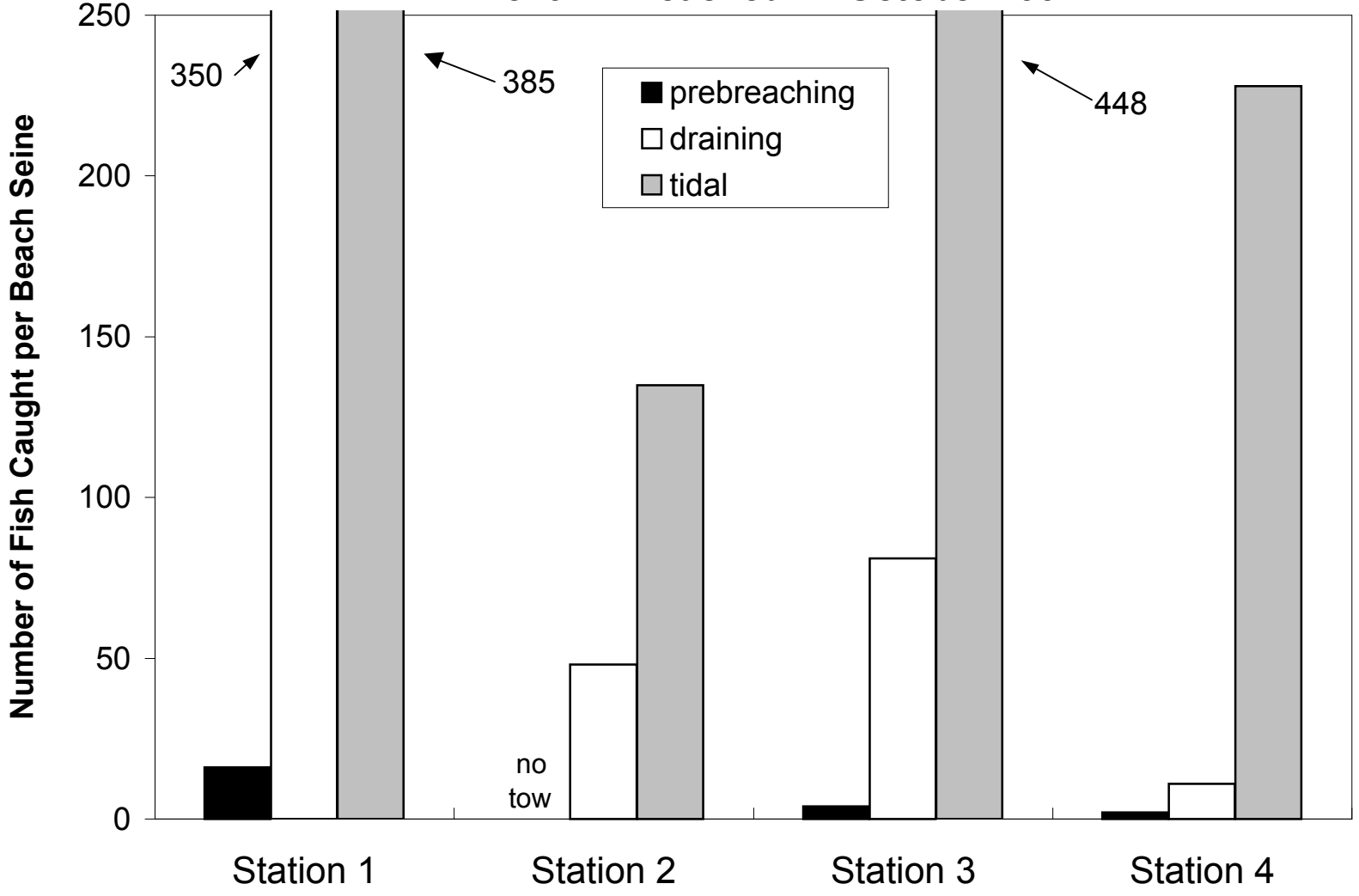
**Appendix B-67**
**Beach Seine Catch**
**Event V-Breached 19 September 1997**



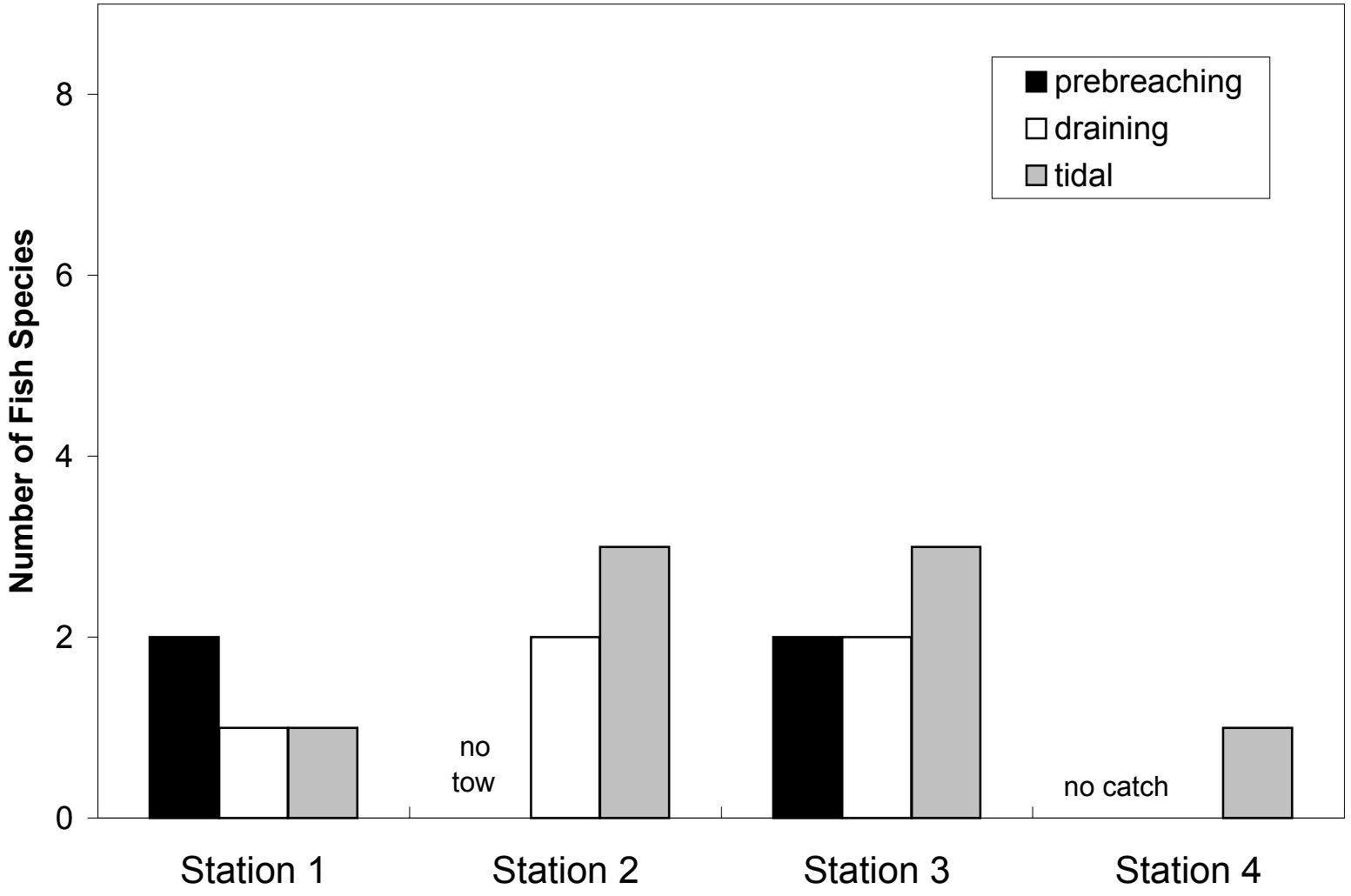
**Appendix B-68**
**Number of Fish Species in Beach Seines**
**Event VI--Breached 11 October 1997**



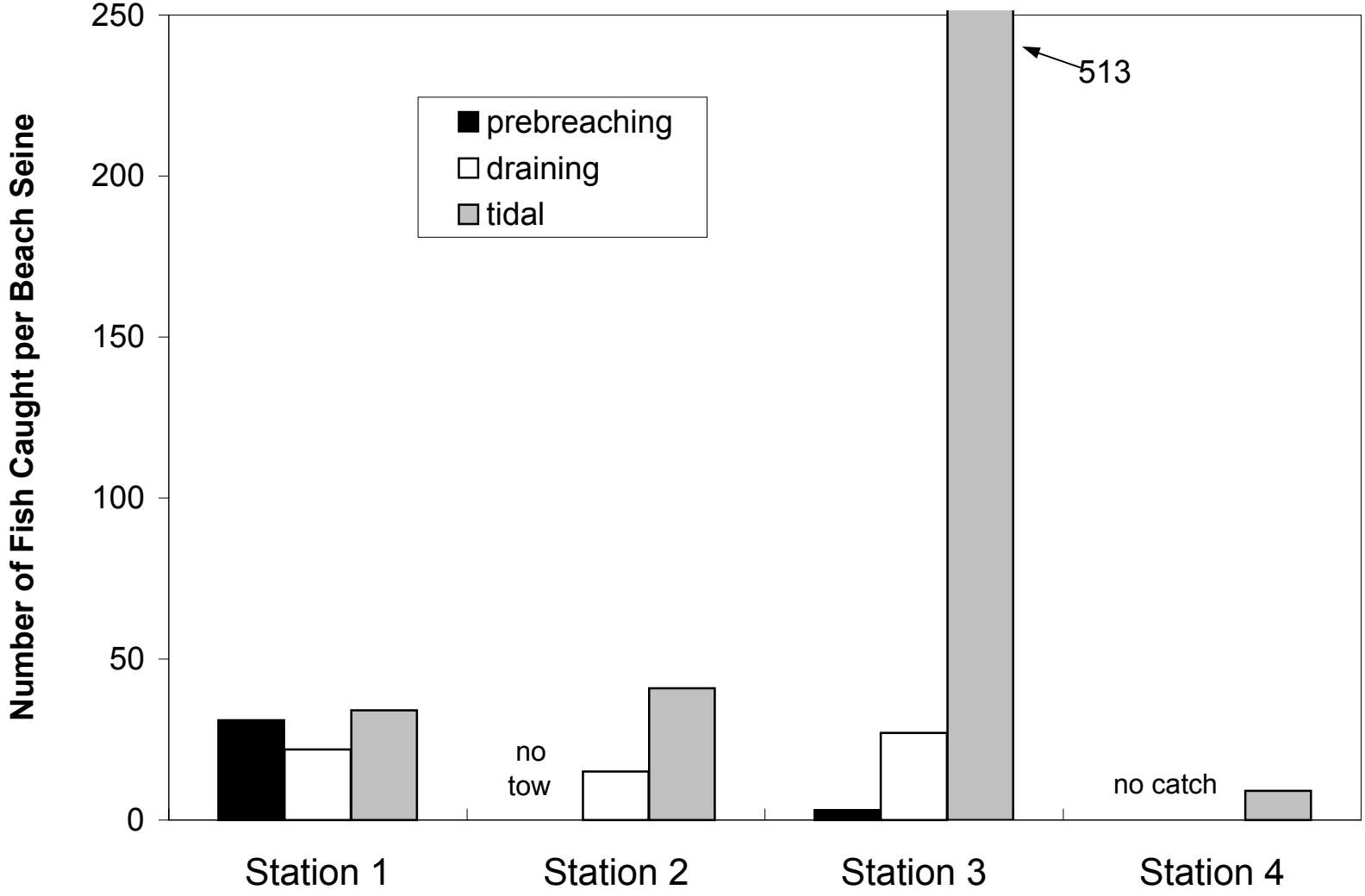
**Appendix B-69**
**Beach Seine Catch**
**Event VI-Breached 11 October 1997**



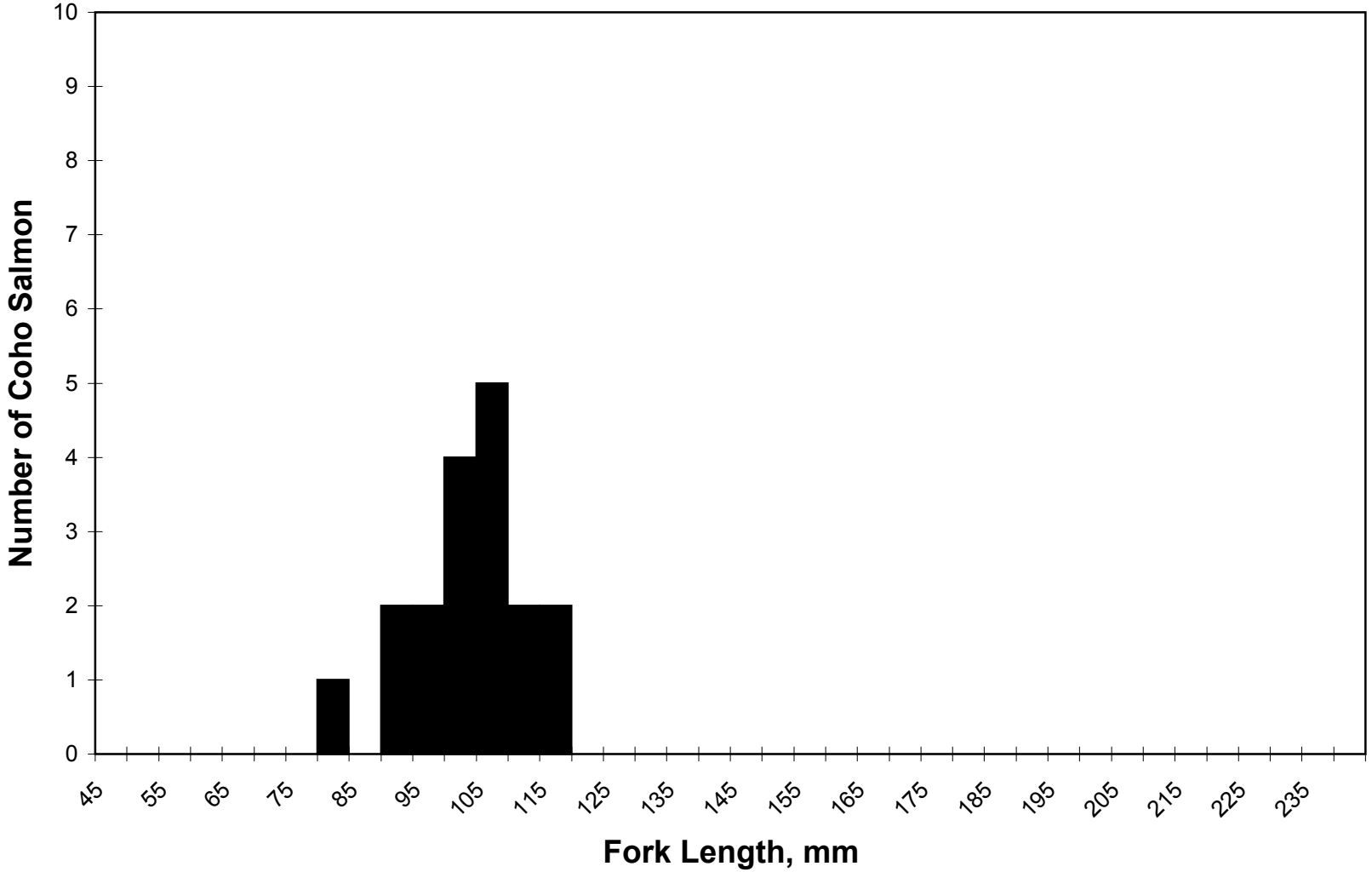
**Appendix B-70**
**Number of Fish Species in Beach Seines**
**Event VII--Breached 3 November 1997**



**Appendix B-71**
**Beach Seine Catch**
**Event VII-Breached 3 November 1997**



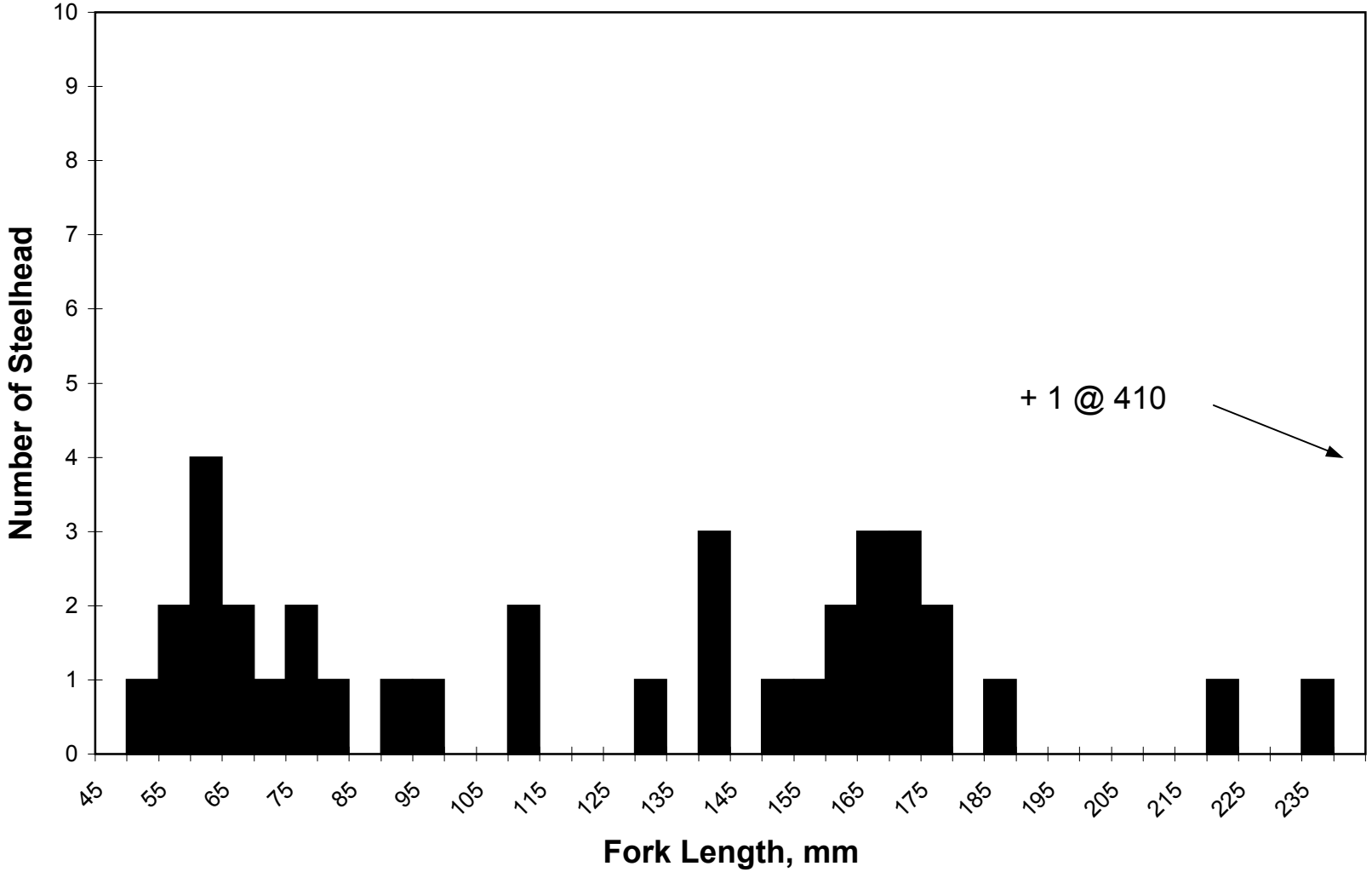
## Coho Salmon captured in the Russian River Estuary, 1997



Appendix B-73. Fork Lengths (millimeters) of coho salmon smolts captured in beach seines in the Russian River Estuary, 1997

| | Station Number | | | |
|---|---|---|---|---|
| date | stn 1 | stn 2 | stn 3 | stn 4 |
| 9-May-97 | | | | 93 |
| 23-May-97 | 112<br>106<br>118<br>100<br>114<br>105 | 105 | | |
| 27-May-97 | | 93<br>103<br>106 | 102 | |
| 10-Jun-97 | 105<br>104<br>84<br>98 | | | |
| 28-Jun-97 | | 115 | 98 | |

## Steelhead captured in the Russian River Estuary, 1997



Appendix B-72. Fork Lengths (millimiters) of Steelhead captured in the Russian River Estuary, 1997. *denotes fish caught in otter trawls; all others were caught in beach seines.

| | Station Number | | | |
|---|---|---|---|---|
| date | stn 1 | stn 2 | stn 3 | stn 4 |
| 9-May-97 | | | 175<br>164<br>188 | 69p |
| 20-May-97 | | | 114 | |
| 23-May-97 | 168<br>168 | | | 112 |
| 10-Jun-97 | 160?* | 75<br>57 | | 131<br>68p<br>63p<br>63p<br>51p* |
| 13-Jun-97 | | 58p | | |
| 22-Jun-97 | | | 76sp*<br>92sp | 71p<br>62p |
| 28-Jun-97 | | | | 82p<br>63p |
| 1-Jul-97 | | | 95sp | |
| 20-Sep-97 | | 410h | 171 | |
| 10-Oct-97 | | | 150<br>165<br>158<br>172 | 173 |
| 31-Oct-97 | | | 144<br>141 | |
| 4-Nov-97 | | | 235 | |
| 7-Nov-97 | | | 224<br>179<br>142 | |

p = parr marks present
sp = silvery but parr marks still visible
h = half-pounder
all others typical silvery smolts

Appendix C-1. Summary of Organisms Caught in Plankton Tows in the Russian River Near Willow Creek, 1997.
up = upstream of creek mouth
down = downstream of creek mouth

| | Event I | | | | Event II | | | | Event III | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prebreaching 20-May-97 | | Draining 23-May-97 | | Prebreaching 6-Jun-97 | | Draining 10-Jun-97 | | Prebreaching 22-Jun-97 | | Draining 28-Jun-97 | |
| | up | down | up | down | up | down | up | down | up | down | up | down |
| Mysidacea (mysids) | | | | | | | | | | | | |
| *Neomysis mercedis* | 1 | | 87 | | | | | 1 | | | 11 | 2 |
| Isopoda (sowbugs) | | | | | | | | | | | | |
| sphaeromatid sp. | 4 | | 105 | 26 | | | | 20 | | 1 | 76 | 8 |
| Amphipoda (scuds) | | | | | | | | | | | | |
| *Eogammarus* confervicoluous* | | | 24 | 4 | | | | 20 | | | 1 | 2 |
| *Corophium sp.* | | | 17 | | | | 1 | 278 | | | 2 | 8 |
| Insecta (insects) | | | | | | | | | | | | |
| Hemiptera (true bugs) | | | | | | | | | | | | |
| corixid sp. | | 3 | 185 | | | | | 1 | | | 15 | |
| Coleoptera (beetles) | | | | | | | | | | | | |
| hydrophilid sp. | 1 | | | | | | | | | | | |
| Diptera (flies) | | | | | | | | | | | | |
| chironomid sp. | | | | | | | | | | | | |
| Fish | | | | | | | | | | | | |
| 3-spine stickleback larva | | | 1 | | | | | | | | | |
| prickly sculpin juvenile | | | 1 | | | | | | | | | |
| bay pipefish larva | | | 1 | | | | | | | | | |
| number of taxa | 3 | 1 | 8 | 2 | 0 | 0 | 1 | 5 | 0 | 1 | 5 | 4 |
| number of individuals | 6 | 3 | 421 | 30 | 0 | 0 | 1 | 320 | 0 | 1 | 105 | 20 |
| flowmeter initial | 759151 | 762436 | 765697 | 775115 | - | - | - | - | 778446 | 781916 | 785225 | 788155 |
| flowmeter final | 762436 | 765696 | 769163 | 778673 | - | - | - | - | 781916 | 785252 | 788153 | 791743 |
| volume filtered, cubic meters | 18.17 | 18.03 | 19.17 | 19.68 | 18.23** | 18.23** | 18.23** | 18.23** | 19.19 | 18.45 | 16.19 | 19.84 |
| total individuals per cubic meter | 0.33 | 0.17 | 21.96 | 1.52 | 0.00 | 0.00 | 0.05 | 17.55 | 0.00 | 0.05 | 6.48 | 1.01 |

* =Anisogammarus

Appendix C-1. Summary of Organisms Caught in Plankton Tows in the Russian River Near Willow Creek, 1997.
up = upstream of creek mouth
down = downstream of creek mouth

| | Event IV | | | | Event V | | | | Event VI | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prebreaching 18-Aug-97 | | Draining 21-Aug-97 | | Prebreaching 16-Sep-97 | | Draining 20-Sep-97 | | Prebreaching 10-Oct-97 | | Draining 12-Oct-97 | |
| | up | down | up | down | up | down | up | down | up | down | up | down |
| Mysidacea (mysids) | | | | | | | | | | | | |
| *Neomysis mercedis* | | | | | | | 2 | 9 | 4 | | 3 | |
| Isopoda (sowbugs) | | | | | | | | | | | | |
| sphaeromatid sp. | 1 | 4 | 9 | 7 | 70 | 2 | 87 | 27 | 185 | 12 | 6 | |
| Amphipoda (scuds) | | | | | | | | | | | | |
| *Eogammarus* confervicoluous* | 2 | | 14 | 2 | 2 | | 2 | 1 | | | | |
| *Corophium sp.* | | | 2 | 17 | | | 8 | 7 | 1 | | | |
| Insecta (insects) | | | | | | | | | | | | |
| Hemiptera (true bugs) | | | | | | | | | | | | |
| corixid sp. | | | | | | | | | | | | |
| Coleoptera (beetles) | | | | | | | | | | | | |
| hydrophilid sp. | | | | | | | | | | | | |
| Diptera (flies) | | | | | | | | | | | | |
| chironomid sp. | | | | | | | | | | | | |
| Fish | | | | | | | | | | | | |
| 3-spine stickleback larva | | | | | | | | | | | | |
| prickly sculpin juvenile | | | | | | | | | | | | |
| bay pipefish larva | | | | | | | | | | | | |
| number of taxa | 2 | 1 | 3 | 3 | 2 | 1 | 4 | 4 | 3 | 1 | 2 | 0 |
| number of individuals | 3 | 4 | 25 | 26 | 72 | 2 | 99 | 44 | 190 | 12 | 9 | 0 |
| flowmeter initial | 792621 | 796647 | 799994 | 804189 | 811008 | 808104 | 814348 | 817027 | 820603 | 822800 | 825386 | 831376 |
| flowmeter final | 796640 | 799887 | 803868 | 807601 | 814247 | 811008 | 817025 | 820270 | 822800 | 825354 | 828320 | 834505 |
| volume filtered, cubic meters | 22.23 | 17.92 | 21.42 | 18.87 | 17.91 | 16.06 | 14.80 | 17.93 | 12.15 | 14.12 | 16.23 | 17.30 |
| total individuals per cubic meter | 0.13 | 0.22 | 1.17 | 1.38 | 4.02 | 0.12 | 6.69 | 2.45 | 15.64 | 0.85 | 0.55 | 0.00 |

* =Anisogammarus

Appendix C-1. Summary of Organisms Caught in Plankton Tows in the Russian River Near Willow Creek, 1997.
up = upstream of creek mouth
down = downstream of creek mouth

| | Event VII | | | |
|---|---|---|---|---|
| | Prebreaching 31-Oct-97 | | Draining 4-Nov-97 | |
| | up | down | up | down |
| Mysidacea (mysids) | | | | |
| *Neomysis mercedis* | | | 1 | |
| Isopoda (sowbugs) | | | | |
| sphaeromatid sp. | | 1 | 662 | 25 |
| Amphipoda (scuds) | | | | |
| *Eogammarus* confervicoluous* | | | 12 | 2 |
| *Corophium sp.* | | | 24 | |
| Insecta (insects) | | | | |
| Hemiptera (true bugs) | | | | |
| corixid sp. | | | | |
| Coleoptera (beetles) | | | | |
| hydrophilid sp. | | | | |
| Diptera (flies) | | | | |
| chironomid sp. | | | | 1 |
| Fish | | | | |
| 3-spine stickleback larva | | | | |
| prickly sculpin juvenile | | | | |
| bay pipefish larva | | | | |
| number of taxa | 0 | 1 | 4 | 3 |
| number of individuals | 0 | 1 | 699 | 28 |
| flowmeter initial | 834017 | 838292 | 842063 | 844841 |
| flowmeter final | 838282 | 841893 | 844838 | 849001 |
| volume filtered, cubic meters | 23.59 | 19.91 | 15.35 | 23.00 |
| total individuals per cubic meter | 0.00 | 0.05 | 45.55 | 1.22 |

* =Anisogammarus