Santa Rosa Subregional Long-Term Wastewater Project

ENVIRONMENTAL CONDITIONS IN WEST COUNTY WATERWAYS

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

Prepared for

City of Santa Rosa
and
U.S. Army Corps of Engineers

APRIL 1996

Prepared by:

Merritt Smith Consulting
Environmental Science and Communication
3675 Mt. Diablo Blvd. #120 Lafayette, CA 94549

For

HARLAND BARTHOLOMEW & ASSOCIATES, INC.

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1.0 PURPOSE

The purpose of this technical memorandum is to present previously un-reported water quality and aquatic life information that was collected in the West County project area in 1990 and compare it to previously reported data. Consultants to the City of Santa Rosa collected water quality and aquatic life information in Americano Creek, Estero Americano, Stemple Creek and Estero de San Antonio, as summarized in Table 1, for the purpose of evaluating the effects of irrigation with reclaimed water. The information was collected from February 1988 through September 1990, but only the data from February 1988 through September 1989 has appeared in previous reports (Technical Memoranda No. 1, E5, E8, E8A). This memorandum assembles in one document the water quality and invertebrate data collected from February 1988 through September 1990 and in May 1994. Fish data are given for November 1989 through September 1990. This report is intended to provide a summary of relevant data describing existing environmental conditions. This technical memorandum is intended to provide the basis for evaluating potential impacts of the proposed components of the West County Alternative. Potential project impacts are assessed in the *Water Quality Impact Analysis* and *Aquatic Biological Resources Impacts Assessment* Technical Reports (MSC 1996).

Table 1.

Year in Which Each Type of Data were Collected in Each Waterway

Parameters	Americano Creek	Estero Americano	Stemple Creek	Estero de San Antonio
Water Quality	‘88, ‘89, ‘90, ‘94	‘88, ‘89, ‘90, ‘94	‘88,‘89, ‘90, ‘94	‘88, ‘89, ‘90, ‘94
Zooplankton	‘88, ‘89, ‘90	‘88, ‘89, ‘90	‘89, ‘90	‘89, ‘90
Epibenthos	‘88, ‘89, ‘90	‘88, ‘89, ‘90	‘89, ‘90	‘89, ‘90
Benthos	‘88, ‘89, ‘90	‘88, ‘89, ‘90	‘89, ‘90	‘89, ‘90
Fish	‘88, ‘89, ‘90	‘88, ‘89, ‘90	‘89, ‘90	‘89, ‘90

2.0 FINDINGS

2.1 BACKGROUND

Americano Creek is about 16 kilometers (km) long and drains a 125 square kilometer (km^2) watershed in which the predominant land use is dairy and dairy pasture. Americano Creek discharges to Estero Americano, a 12 km long tidal embayment extending inland from Bodega Bay. The Estero is relatively narrow (1 meter to 200 meters) and shallow (depth at mean higher high water varies from 0.6 meters to 2.3 meters). Important features of Estero Americano include a sand bar at the mouth that somewhat restricts tidal exchange with the ocean, and a mud flat in the middle reach of the Estero that strongly limits exchange between the upper and lower Estero. Stemple Creek is a larger but otherwise similar watershed located immediately south of the Americano Creek watershed. Estero de San Antonio, the estero associated with Stemple Creek, also has a sand bar at the mouth but has no hydraulic equivalent to the Estero Americano mud flat.

The connection to Bodega Bay controls water quality and water movement in each Estero. Sand can accumulate in the inlet as a result of wind-induced turbulence in Bodega Bay. During spring tide conditions, ebb tide flows are typically sufficient to erode the accumulated sand. If sand accumulates during a neap (low amplitude) tide condition, outflow may be insufficient to erode the accumulated sand, and the inlet is blocked. Sand can continue to accumulate, hydraulically isolating the Esteros from Bodega Bay. The sand bar may remain until rainfall runoff accumulates in the Esteros behind the sand bar, and then overtops and quickly cuts through the sand bar. This process occurs most years in the Esteros, but not every year. Alternatively, local landowners report cutting through the sand bar to alleviate flooding of their land. The accumulation of sediment in the Esteros during the past 100 or so years has reduced the volume of tidal water moving between Bodega Bay and the Esteros, which likely results in more frequent bar closure than occurred prior to sediment accumulation. Bar closure is described in a report by the Marin County Resource Conservation District (MCRCD 1994).

Salinity is an important factor that affects the suitability of aquatic habitat for aquatic life. Salinity in the Esteros is influenced by the amount of freshwater inflow from the creeks, the amount of tidal inflow from Bodega Bay, and evaporation. During and after a large rainfall event, freshwater inflow can flush virtually all seawater from the Esteros. As inflow decreases, seawater has increasing dominance on the Estero. During summers when the bar is open and freshwater inflow is negligible, evaporation leads to salinity levels in excess of seawater (hypersalinity). During summers when the bar is closed, salinity is determined by salinity at the time of bar closure, any continued inflow, and evaporation. Freshwater inflow can float on top of seawater, and if the bar closes during a period of stratification, wind mixing of the two layers is also a factor controlling salinity. Hypersaline conditions were observed only during bar-open conditions. Under bar-closed conditions hyper saline conditions were not observed probably because fresh water was present when the bar closed and was retained in, rather than flushed from the Esteros by

tidal action. The system remained stratified and evaporation from the surface (fresh) layer did not lead to hypersalinity.

2.2 SUMMARY OF FIELD DATA

Field data were collected at locations identified in Figure 1. The schedule for field collections is shown in Table 2. Within each watershed, station numbers were assigned beginning at the mouth and proceeding upstream. Americano watershed stations (tidally influenced stations) are designated as follows: E-l through E-5 = Estero Americano; E-6 through E-8 = Americano Creek. Stemple watershed stations are designated as follows: S-2, S-4, S-6 = Estero de San Antonio (tidally influenced stations); S-8, S-10 = Stemple Creek.

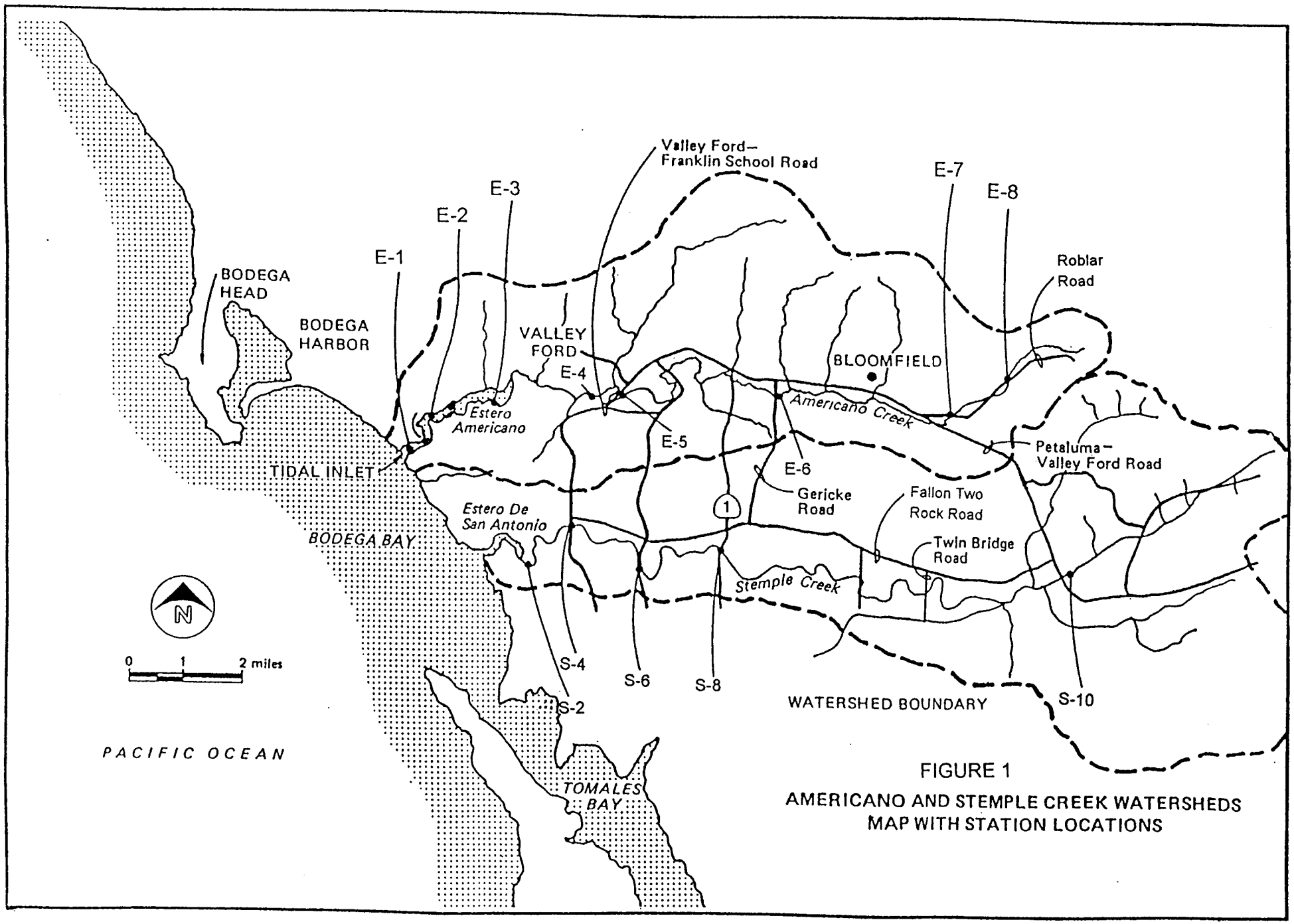

FIGURE 1

AMERICANO AND STEMPLE CREEK WATERSHEDS
MAP WITH STATION LOCATIONS

Table 2.

Sampling Effort in West County, 1988-90 (Stations Sampled)

Date	Watershed	Fish	Benthos	Zooplankton	Water Quality
29 Feb. 1988	Americano Stemple				E-1,E-3 - E-8
30 Mar. 1988	Americano Stemple	E-1,E-2,E-4			E-1 - E-8
13-14 Apr. 1988	Americano Stemple	E-1 - E-4	E-1,E-2,E-4,E-6	E-1,E-2,E-4	E-1 - E-6
15-16 May 1988	Americano Stemple				E-1-E-8 S-4,S-10
15-16 June 1988	Americano Stemple	E-1 - E-5		E-1 - E-5	E-1 - E-7 S-4,S-10
21 July 1988	Americano Stemple		E-2 - E-4,E-6		E-1 - E-6 S-4,S-10
29-30-Aug. 1988	Americano Stemple	E-1 - E-5		E-1 - E-5	E-1 - E-5 S-4,S-10
28 Sept. 1988	Americano Stemple				E-1 - E-5 S-4,S-10
25-26 Oct. 1988	Americano Stemple	E-1 - E-5	E-2 - E-4	E-1 - E-5	E-1 - E-5 S-4
22 Nov. 1988	Americano Stemple				E-1 - E-6,E-8 S-4,S-10
20-21 Dec. 1988	Americano Stemple	E-1 - E-5		E-1 - E-5	1-8 4,10
20 Jan. 1989	Americano Stemple		E-2 - E-6		E-1 - E-8 S-4,S-10
17-18 Feb. 1989	Americano Stemple	E-1 - E-5		E-1 - E-5	E-1 - E-8 S-4,S-10
2 Mar. 1989	Americano Stemple				E-1,E-2,E-4 - E-8
6-7 Mar. 1989	Americano Stemple	E-1 - E-5		E-1 - E-5	E-1 - E-8 S-4,S-10
9 Apr. 1989	Americano Stemple	E-1,E-2			E-1,E-3
4-5 May 1989	Americano Stemple	E-1 - E-5	E-2 - E-5,E-2A,E-3A	E-1 - E-5	E-1 - E-8 S-4,S-10
26 May 1989	Americano Stemple				E-1,E-3,E-5

Table 2.

Sampling Effort in West County, 1988-90 (Stations Sampled)

Date	Watershed	Fish	Benthos	Zooplankton	Water Quality
7-8 June 1989	Americano Stemple	E-1 - E-5		E-1 - E-5	E-1 - E-8 S-4,S-10
5-6 July 1989	Americano Stemple	E-1 - E-5 S-2,S- 6		E-1 - E-5	E-1 - E-6 S-2,S-4,S-6,S-10
21 Aug. 1989	Americano Stemple				E-1 - E-3
18-19 Sept. 1989	Americano Stemple	E-1 - E-5 S-2,S- 6	E-2 - E-6,E-2A,E-3A	E-1 - E-5 S-2,S- 6	E-1 - E-6 S-2,S-4,S-6
23 Oct. 1989	Americano Stemple				E-5 - E-8 S-10
28 Nov. 1989	Americano Stemple	E-1 - E-5		E-1 - E-5 S-2,S-4,S-6	E-1 - E-8 S-2,S-4,S-6, S-8,S-10
16 Jan. 1990	Americano Stemple				E-5 - E-8 S-8,S-10
7-8 Feb. 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6	E-2 - E-5,E-2A,E-3A S-2,S-4,S-6	E-1 - E-5 S-2,S-4,S-6	E-1 - E-8 S-2,S-4,S-6, S-8,S-10
9-10 Mar. 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6		E-1 - E-5 S-2,S-4,S-6	E-1 - E-8 S-2,S-4,S-6,S-8,S-10
5-6 Apr. 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6		E-1 - E-5 S-2,S-4,S-6	E-1 - E-8 S-2,S-4,S-6,S-8,S-10
24-25 May 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6	E-2 - E-5,E-2A,E-3A S-2,S-4,S-6	E-1 - E-5 S-2,S-4,S-6	E-1 - E-8 S-2,S-4,S-6,S-8,S-10
31 May 1990	Americano Stemple				E-5,E-6
25 June 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6		E-1 - E-5 S-2,S-4,S-6	E-1 - E-8 S-2,S-4,S-6,S-8,S-10
26-27 July 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6		E-1 - E-5 S-2,S-4,S-6	E-1 - E-6 S-2,S-4,S-6,S-8,S-10
10 Sept. 1990	Americano Stemple				E-3,E-5
18-19 Sept. 1990	Americano Stemple	E-1 - E-5 S-2,S-4,S-6	E-2 - E-5,E-2A, E-2B,E-3A S-2,S-4,S-6	E-1 - E-5 S-2,S-4,S-6	E-1 - E-5 S-2,S-4,S-6
15-16 Nov. 1990	Americano Stemple				E-1 - E-5 S-2,S-4,S-6

2.3 WATER QUALITY

This section describes the water quality data for Estero Americano, Americano Creek, Estero de San Antonio, and Stemple Creek between October 1989 and November 1990 only, since data from the first two years was presented in earlier reports (TM 1,5,E8). However, the complete water quality data (all three years) for Estero Americano, Americano Creek, Estero de San Antonio, and Stemple Creek are presented in Appendix WQ1 (Estero Americano and Americano Creek) and Appendix WQ2 (Estero de San Antonio and Stemple Creek) and in many of the figures presented below.

2.3.1 Methods

Water quality data were collected at five Estero Americano (E-1 through E-5) and three Americano Creek (E-6 through E-8) stations during November 1989, monthly from February - July, and in September and November 1990. Stations E-5 through E-8 were also sampled in October 1989. Temperature, conductivity and/or salinity, dissolved oxygen, and pH were measured in the field at the surface and near the bottom. Surface dip samples were collected for nutrients, metals, chlorophyll *a*, turbidity, total dissolved solids (TDS), and total suspended solids (TSS). Metals were measured only at stations E-1, E-3, E-5, E-6, and E-8. Continuously recording temperature, salinity, and dissolved oxygen meters were installed at stations E-3 and E-5 in September 1989. The mouth of Estero Americano was open during the entire study period in contrast to Estero de San Antonio which was closed during part of this time period.

Water quality samples were collected during November 1989, monthly from February - July; and September and November 1990 at 3 Estero de San Antonio (S-2, S-4, and S-6) stations and two Stemple Creek stations (S-8, and S-10). Methods used and parameters analyzed were the same as for Estero Americano and Americano Creek. Samples were collected when the mouth of Estero de San Antonio was closed (February 1990 and May through November 1990) and when it was open. A continuously recording meter (as above) was installed at station S-4 in September 1989.

2.3.2 Results

2.3.2-1 Estero Americano and Americano Creek

Salinity

Tidal influence in Estero Americano extends through station E-5. Seasonal salinity averages ranged from 35 parts per thousand (ppt) in winter at station E-2 to 0.8 ppt at station E-5 also in winter. Winter and spring salinity values were influenced by freshwater discharge as far downstream as station E-3 (Figure WQ1). In previous years of this study this influence extended as far as station E-1 during spring. Hypersalinity (salinity values in excess of normal seawater, which is 32-35 ppt) was observed during routine sampling at stations E-4 and E-5 during July and September. However, the hypersalinity observed in 1990 was not as pronounced as that found in 1989 (Figure WQ2). Hypersalinity was noted in stations E-3 and E-5 during September with the continuously recording meter

(Figure WQ3). Hypersalinity was not observed at station E-3 during routine sampling because of the strong tidal influence on salinity. Routine monitoring is usually done near the time of high tide (because of the inaccessibility of some stations in Estero Americano during low tide due to the large mudflat in the middle of the Estero), and during periods of hypersalinity, salinity is lowest at this time. This is because salinity at any particular location varies with tide, and at high tide during periods of hypersalinity, high salinity water is pushed to locations upstream of the sampling stations.

Dissolved Oxygen

Average daytime dissolved oxygen levels in Estero Americano stations E-1 through E-5 ranged from 5.3 mg/L (summer, station E-4) to 8.9 (winter, station E-1). Dissolved oxygen was much more variable in the stream stations than the estuary stations, ranging from 0.7 mg/L (summer, station E-7) to 19.5 (summer, station E-6) (Figure WQ4). This pattern is similar to that found in previous years. The high dissolved oxygen concentrations found on occasion are likely due to supersaturation since they generally occur in stream stations in summer when there is no flow and very high chlorophyll *a* concentrations. The difference in variability of dissolved oxygen between Americano Creek and Estero Americano is shown in Figure WQ5 which compares station E-3 (Estero Americano) to station E-6 (Americano Creek). The September 1990 data from the continuously recording meters indicate large diel (day-night) fluctuations in dissolved oxygen at both stations E-3 and E-5; however, these were not as large as fluctuations observed at the Americano Creek stations. Minimum dissolved oxygen concentrations from the continuously recording meter were 2.4 mg/L at station E-3 and 3.5 mg/L at station E-5. The diel dissolved oxygen minimum at station E-5 during September 1990 was higher than the minimum found in the April 1988 diel study conducted at this station. During the April 1988 diel, the minimum dissolved oxygen was 0.7 mg/L. Maximum dissolved oxygen concentrations from the continuously recording meters at stations E-3 and E-5 were 8.1 mg/L and 13.3 mg/L respectively.

Nitrogen

Mean seasonal nitrate ranged from undetectable (summer, station E-7; detection limit = 0.03 mg-N/L) to 6.15 mg-N/L (fall, station E-8). Mean values were usually lowest in summer and highest in fall (Figure WQ6). The high fall concentrations of nitrate at stations E-1, E-2, and E-8 were due to unusually high concentrations in October and November 1989 at station E-8 and in November 1989 at stations E-1 and E-2. These high concentrations were not observed in other years.

Seasonal total ammonia values ranged from undetectable (summer, fall at station E-1, and spring at station E-8; detection limit = 0.05 mg-N/L) to 49 mg-N/L (summer, station E-7) (Figure WQ7). Summer ammonia values at station E-7 were also the highest average values in previous years (Technical Memorandum E8, 1990).

Un-ionized ammonia was determined as described in Technical Memorandum E8 (1990). Mean seasonal un-ionized ammonia concentrations ranged from undetectable (summer, fall at station E-1, and spring at station E-8) to 0.610 mg-N/L at station E-6 in summer

(Figure WQ8). In Estero Americano, un-ionized ammonia was nearly always highest in the upstream stations E-4 and E-5 (Figure WQ9). Un-ionized ammonia concentrations in Americano Creek were highest at stations E-6 and E-7 (Figure WQ10). The concentrations of un-ionized ammonia in Americano Creek stations E-6 and E-7 were often one to two orders of magnitude higher than in Estero Americano. (Note scale differences for Figure WQ9 and WQ10)

The estimated un-ionized ammonia concentrations were evaluated using the methods described in Technical Memorandum E8 (1990) to determine if the EPA acute and chronic freshwater and saltwater guidelines for the protection of aquatic organisms were exceeded.

The un-ionized ammonia levels were greater than the chronic guideline, or both the chronic and acute guidelines at all times it was measured at station E-6. Un-ionized ammonia was greater than the chronic guideline, or both the chronic and acute guidelines in two of eight measurements at station E-7 and 2 of 5 measurements at station E-8. On five of the six occasions when the salinity of the water at station E-5 was less than 10 ppt, the un-ionized ammonia exceeded the EPA freshwater guideline for un-ionized ammonia. On two of the 21 occasions when the salinity at station E-5 was greater than 10 ppt, the EPA chronic saltwater guideline for un-ionized ammonia (0.035 mg/L or 0.029 mg-N/L) was exceeded. On the two occasions when the salinity at station E-4 was less than 10 ppt, the EPA chronic freshwater guidelines for ammonia were exceeded. The EPA chronic saltwater guideline for un-ionized ammonia was exceeded at station E-4 on one occasion. The EPA guidelines for un-ionized ammonia were never exceeded at stations E-1, E-2, or E-3.

Metals

In May 1995, EPA guidelines for metals toxicity were defined on a dissolved metal basis as a function of the water effect ratio and hardness. For comparisons with these guidelines, we assume a water effects ratio of 1.0 and a hardness of 100 mg/L as $CaCO_3$. A hardness of 100 was used because of lack of hardness information in Americano and Stemple Creeks. Dissolved metals were collected in Estero Americano and Americano Creek during October 1989 through May 1990 at stations E-1, E-3, E-5, E-6, and E-8. Information on total copper is also presented here to provide a basis of comparison with data presented in previous Technical Memoranda.

Dissolved copper ranged from below detection (detection limit = 0.1 µg/L) to 27 µg/L at station E-8 in October 1989 through May 1990. During this time period in Americano Creek, the EPA Critical Maximum Concentration (CMC = 17 µg/L) and Critical Continuous Concentration (CCC = 11 µg/L) were exceeded in two of seven samples from station E-6 and in one of eight samples from station E-8. The CCC only was exceeded in one of seven measurements from station E-6. In Estero Americano, the CMC and CCC (both = 2.4 µg/L) were exceeded in 2 of six measurements at station E-5. No exceedances were observed at other Estero Americano stations during this time period.

Average seasonal total copper from October 1989 through November 1990 ranged from undetectable (detection limit = 0.1 µg/L) at station E-1 in winter to 32 µg/L at station E-6 in fall. The overall average of total copper from station E-6 was 17 µg/L during the time period covered by this report (October 1990 through September 1991). This is approximately half the average total copper found at this station from May 1988 through September 1989 (33 µg/L). The cause of the reduction in copper levels is unknown, but may be related to the drought and consequent reduced runoff from the surrounding watershed.

The concentration of dissolved lead was below detection for all measurements except one made in Estero Americano and Americano Creek during October 1989 through November 1990. The one detectable dissolved lead concentration was 0.8 µg/L found at station E-5. This concentration does not exceed the EPA freshwater CCC or CMC.

The concentration of dissolved zinc in Americano Creek ranged from 5 to 80 µg/L during October 1989 through 1990. There were no exceedances of the EPA freshwater CCC or CMC (assuming a hardness of 100 mg/L as $CaCO_3$). The concentration of dissolved zinc in Estero Americano during this time period ranged from below detection (1.0 µg/L) to 50 µg/L. There were no exceedances of the EPA saltwater CCC or CMC.

Mean seasonal total zinc ranged from undetectable (detection limit = 1 µg/L) at station E-1 in summer to 161 µg/L at station E-6 in summer. Unlike the May 1988 through September 1989 period described in Technical Memorandum E8, the EPA guidelines for zinc toxicity were never exceeded at stations E-1 through E-5 or E-8 (zinc was not measured an E-7). Zinc levels exceeded the chronic or both the chronic and acute freshwater guidelines (110 µg/L and 120 µg/L, respectively, assuming hardness = 100 mg/L as $CaCO_3$) at station E-6 two times out of seven measurements. The overall average total zinc at station E-6 was 78 µg/L, similar to the previous average (May 1988 through September 1989) of 74 µg/L, but the high average was due to just one exceptionally high measurement (300 µg/L). This indicates a reduction from 1988-89 to 1989-90 in total zinc levels similar to that found with copper.

Chlorophyll a

Mean seasonal chlorophyll *a* ranged from 0.0009 mg/L at station E-8 in winter to 7.29 mg/L at station E-6 in summer (Figure WQ11). As was found in previous years, chlorophyll *a* concentrations are generally highest in the Creek stations E-6 and E-7 and lowest in the Estero stations E-1 through E-3.

2.3.2-2 Estero de San Antonio and Stemple Creek

Salinity

Tidal influence in Estero de San Antonio extends through station S-6. The mouth of the Estero de San Antonio was closed briefly in February and during May through September 1990 and the subsequent salinity in the system was brackish. Surface salinities ranged from 19.2 ppt to 30.4 ppt before the closure (i.e., on 28 November 1989) and 0.5 ppt to 18.7

.ppt afterward (Figure WQ12). Due to the closure of the mouth, the estuary exhibited strong vertical stratification during February through April 1990. By May, stratified conditions had mostly disappeared. The vertical differences in salinity, which were between 20 - 28 ppt in April, were usually less than 2 ppt from May through November. The exception to this was in June at station S-6, when surface salinity was 8.4 ppt and bottom salinity was 13 ppt. The disruption of the large salinity differences present in spring indicates a large energy input into the system, presumably from wind mixing, as well as tidal mixing during bar-open conditions.

Dissolved Oxygen

Average daytime surface dissolved oxygen levels in Estero de San Antonio and Stemple Creek ranged from 2.6 mg/L (fall, station S-6) to 17.2 mg/L (winter, station S-2) (Figure WQ13). The high winter dissolved oxygen at station S-2 is based on one sample when an annotation in the field notes read “water incredibly green”. It is not likely representative of winter dissolved oxygen at this station. Reduced dissolved oxygen levels often occurred in the bottom layer during the period of stratification. During this time (February, and May through September 1990) dissolved oxygen in the bottom layer ranged from 0.3 mg/L to 7.4 mg/L, while dissolved oxygen at the surface ranged from 6.6 mg/L to 17.2 mg/L. The surface and bottom dissolved oxygen concentrations are shown for station S-4 in Figure WQ14. Station S-6 continued to have low dissolved oxygen near the bottom through November 1990.

Nitrogen

Mean seasonal nitrate concentrations in Estero de San Antonio and Stemple Creek ranged from undetectable (stations S-4, S-6, and S-8 in summer; detection limit = 0.03 mg-N/L) to 2.15 mg-N/L at station S-8 in winter. Nitrate concentrations were usually highest in winter and early spring and usually higher in the Creek stations (stations S-8 and S-10) than in the Estero stations (Figure WQ15).

Average seasonal total ammonia ranged from 0.065 mg-N/L (summer, station S-6) to 6.05 mg-N/L (winter, station S-10). Both ammonia and nitrate were usually lowest in summer and highest in winter.

The concentration of un-ionized ammonia in the Stemple Creek stations exceeded either the chronic or both the chronic and acute freshwater EPA ammonia guidelines on one of seven occasions at station S-8 and on seven out of eight occasions at station S-10. At these stations average un-ionized ammonia ranged from below detection to 0.18 mg-N/L (station S-10, March 1990) (Figure WQ16). The concentration of un-ionized ammonia in Estero de San Antonio, when salinities were less than 10 ppt, exceeded the chronic freshwater EPA ammonia guidelines in one of one measurement at station S-2, two of three measurements at station S-4, and one of three measurements at station S-6. The concentration of un-ionized ammonia in Estero de San Antonio, when salinities were greater than 10 ppt, exceeded the chronic saltwater EPA ammonia guideline in two of seven measurements at station S-6. One of these measurements at station S-6 also exceeded the acute saltwater EPA ammonia guideline. The EPA saltwater guidelines for

ammonia were never exceeded in seven measurements at station S-4 and nine measurements at station S-6.

Metals

Dissolved copper concentrations in Estero de San Antonio and Stemple Creek during October 1989 through November 1990 ranged from 2 µg/L to 26 µg/L (the latter value found at station S-10 in November 1989). The EPA freshwater CMC and CCC were exceeded in one of ten measurements from Stemple stations S-8 and S-10. The saltwater CMC and CCC were exceeded on two of four measurements at station S-6. However, these exceedances occurred at times when salinity was only 0.5 ppt. If the freshwater guidelines are applied, no exceedances occurred at station S-6. In Estero de San Antonio, the saltwater copper CMC and CCC were exceeded on one of one measurement in station S-2 and in two of three measurements at station S-4.

Mean seasonal total copper ranged from undetectable (fall, stations S-4 and S-6; detection limit = 0.1 µg/L) to 17 µg/l (fall, station S-10). In the Stemple Creek stations, copper exceeded the EPA chronic guideline for copper toxicity (assuming a hardness of 100 mg/L as $CaCO_3$) in 2 of 14 measurements. In Estero de San Antonio copper exceeded the chronic and acute guideline (both = 2.9 µg/L) in 6 of 16 measurements.

Dissolved lead concentrations in Stemple Creek stations S-8 and S-10 during October 1989 through 1990 ranged from below detection (detection limit = 0.1 µg/L) to 5.2 µg/L. The EPA CCC of 2.5 µg/L (assuming a hardness of 100 mg/L as $CaCO_3$) was exceeded in one of seven measurements in Stemple Creek during this time period. Dissolved lead concentrations in Estero de San Antonio during this time period were all below detection (detection limit = 0.1 µg/L). This detection limit is below the saltwater CCC for dissolved lead (8.1 µg/L).

Dissolved zinc concentrations in Stemple Creek stations S-8 and S-10 during October 1989 through 1990 ranged from 13 to 80 µg/L. There were no exceedances of the EPA freshwater CCC and CMC. Dissolved zinc concentrations in Estero de San Antonio during this time period ranged from below detection (detection limit = 1.0 µg/L) to 21 µg/L. There were no exceedances of the EPA saltwater CCC and CMC.

Mean seasonal total zinc for October 1989 through November 1990 ranged from undetectable (fall, station S-4; detection limit = 1.0 µg/L) to 55 µg/L (fall, station S-10). The EPA guidelines for zinc toxicity (assuming a hardness of 100 mg/L as $CaCO_3$) were never exceeded during this segment of the study.

Chlorophyll a

Mean seasonal chlorophyll *a* during October 1989 through September 1990 ranged from 0.002 mg/L at station S-2 in fall to 0.49 in station S-10 in summer. The highest chlorophyll *a* concentrations were generally found at station S-10 (Figure WQ17). The exception to this was in February 1990 when the chlorophyll *a* concentration at station S-10 was lower than the other stations.

2.4 INVERTEBRATES

Invertebrate sampling in Esteros Americano and de San Antonio included plankton (small, free-swimming animals with limited powers of directed movement, such as copepods), nekton/epibenthos (larger, stronger-swimming invertebrates, such as shrimps and crabs), and benthos (animals which live in the sediments, such as worms and clams).

2.4.1 Zooplankton and Fish Larvae

2.4.1-1 Methods

Zooplankton and other aquatic life were collected with metered nets of two mesh sizes: 505 µm and 130 µm. The larger mesh net is designed to collect larger zooplankton, the young life stages of nekton and epibenthos, and fish larvae. The smaller net catches mostly small zooplankton and the young life stages of larger zooplankton. The adult forms of the numerically dominant species of copepods are retained by the larger mesh net, although their immature stages are probably not quantitatively collected. The following summary is based primarily on the data from the larger net, which are available for the whole 3-year study period.

2.4.1-2 Results

A description of the zooplankton and the larval fish that were collected in the zooplankton nets is given below for each Estero.

Estero Americano

Zooplankton

The invertebrate zooplankton data from the 505-mesh nets are given in Appendix P1. During the study period (1988 - 1990) the bar at the Estero mouth was maintained open continuously, and the zooplankton fauna consisted of a rather diverse assemblage of estuarine and coastal species. Figure P1 shows that the five Estero Americano stations had 10 - 20 species each, with greater diversity (up to 30 species) near the mouth. There was no clear seasonal pattern in the number of zooplankton species which occurred at the five stations.

Figure P2 shows that the 505-mesh net tows in Estero Americano usually contained around 25 individuals per m^3. Counts of smaller zooplankton, available for the first two years of the study, are typically much higher than this. Counts of up to 300,000 individuals per cubic meter (i.e., 300 per liter) have been observed at station E-5 in fall (see Technical Memorandum No. E8). The 505-mesh net counts had peaks of several hundred individuals per cubic meter in May 1989 at the upstream station, E-5, primarily due to the abundance of *Neomysis mercedis*; and at the near-mouth station, E-1, in April 1990 due to larvae (zoeae) of xanthid crabs. *Acartia clausi*, the most common copepod, and often the most common zooplankter, typically comprised at least a third of the total catch at all stations except E-5.

Fish Larvae

The larval fish collected in the 505-µm net tows are summarized in Appendix P3. There were typically only one to five kinds of larval fish present (Figure P3), and these generally were the same species whose adults frequent the Estero (see fish section). Larval fish seldom exceeded ten per cubic meter, except for brief pulses of up to 67 per cubic meter (Figure P4), due to immature gobies.

Estero de San Antonio

Zooplankton

Estero de San Antonio was studied from mid-1989 through September 1990. During this period the bar at the Estero de San Antonio mouth was allowed to open and close due to natural forces. The diversity (number of zooplankton species) was much less than in Estero Americano. Estero de San Antonio typically had 5 to 10 species (Figure P5). Total zooplankton numbers were often lower as well, except for April 1990 when a bloom of *Eurytemora affinis* occurred at all 3 stations (Figure P6). *E. affinis* was typically the dominant copepod species in Estero de San Antonio. This species is remarkably euryhaline (tolerates wide range of salinities), and so is well adapted to the salinity extremes of that environment, which ranges from fresh to hypersaline.

The composition of the macrozooplankton faunas of the two Esteros are compared in Figure P7, which shows that copepods comprised from 30 to 45 percent of the total in Estero Americano, whereas in Estero de San Antonio, copepods accounted for 85 to 90 percent of the zooplankton numbers. Epibenthic and benthic invertebrates and fish are also more diverse in Estero Americano (see below). The greater diversity in Estero Americano is very likely due to its mouth being maintained open continuously, thus assuring a continuous supply of recruitment from marine populations. However, the fauna at the stations sampled in Estero de San Antonio was not necessarily more diverse during brief bar-open conditions than when its bar was closed. This is shown in Figure P8. Closer to the mouth, the number of invertebrate species would reflect coastal populations during bar-open conditions. Total zooplankton abundance may have been higher during bar open conditions (Figure P9--note log scale), but these data are driven by the *Eurytemora* bloom which took place during a brief bar-open episode in April 1990, but which did not depend upon an influx of recruitment from the sea.

Fish Larvae

Estero de San Antonio had fewer kinds of fish larvae (Figure P10), typically only one or two on a given day. The abundance of fish larvae was also much lower in Estero de San Antonio (Figure P11). These plots (and also the invertebrate plots P5 and P6) show which days the bar was open or closed. There is no obvious relationship between diversity or abundance of fish or invertebrates and whether the bar was open.

2.4.1-3 Comparison With Other Data

The biology of the Esteros was summarized in DFG (1977). However, that review did not provide information about zooplankton. No other studies of Estero biology have been identified.

2.4.2 Nekton / Epibenthic Invertebrates

2.4.2-1 Methods

Shrimps, crabs, and other free-swimming macroinvertebrates were collected in bottom trawls and gillnets used in fish sampling (see fish methods).

2.4.2-2 Results

Estero Americano

Catches of nektonic and epibenthic invertebrates in fish trawls and gill nets are listed in Appendix E1. These data are only semi-quantitative. Small invertebrates such as *Neomysis* are retained only when they become entangled in macrophytes or other debris in the trawl cod-end, or when they are so abundant as to clog the cod-end. Only large invertebrates such as *Cancer* crabs are caught in gill nets.

Forty-five invertebrate species were collected during the three years, twelve of which were collected for the first time during the second year and ten more of which were not seen until the third year. It is typical that the number of species collected increases as the number of collections increases. Several of the Estero Americano epibenthic invertebrates are primarily associated with macrophytes. As was the case with zooplankton, the number of epibenthic invertebrate species collected was greatest near the mouth of the Estero and decreased upstream (Figure E1). Appendix E2 summarizes the invertebrate distributions in the Estero by the number of occurrences of each species at each station. Mysids, shrimps, and crabs, often species of economic importance, comprised the most numerous invertebrate groups represented.

Four mysid species were found, but of these only *Neomysis mercedis* occurred throughout the Estero. It was often found in great abundance. The other three species were found only at stations E-1 and/or E-2, the most seaward stations, and only in low numbers.

Nine caridian shrimp species were collected, three of which (*Crangon franciscorum*, *C. nigricauda*, and *Heptacarpus pictus*) were widely distributed in the estuary. *Crangon franciscorum* is the common shrimp species in San Francisco Bay.

Twelve species of crabs were found, six of which were *Cancer* species. Of these, only *C. magister*, the Dungeness crab, occurred at all Estero stations. Larger Dungeness crabs were often caught in gillnets.

Hemigrapsis oregonensis, the yellow shore crab, was abundant throughout the Estero, and was an important forage organism.

A single individual of *Carcinus maenas*, the green shore crab, was caught in a gillnet at station E-2 on 8 June 1989. This is a common European species which has been introduced along the Atlantic coast of North America, but up until that time rarely occurred on the Pacific coast. This specimen was examined by Dr. James T. Carleton, who commented that *Carcinus* had been reported from this coast only one other time during this century (a single specimen from Willapa Bay, Washington, in 1961). The estero specimen proved to be a harbinger, as the species has since become common in both San Francisco Bay and in Bodega Bay.

Two amphipod species, *Ampithoe lacertosa* and *Anisogammarus confervicolus* were widely distributed within the estuary wherever macrophytes were collected.

The number of invertebrate species collected in otter trawls was greatest in fall and winter, and fewest in summer; this was true both near the mouth and in the upper part of the Estero (Figure E1). Few epibenthic invertebrates were caught in the upper Estero (stations E-4 and E-5) during high freshwater runoff during March and April, 1989. No such catch decrease in the number of invertebrate species occurred at Estero stations nearer to the mouth nor did such a decrease occur in 1990, which had less rain. However, many of the epibenthic invertebrates collected in the upper estero during the runoff event in March 1990 were in poor condition, as is discussed in the fish section below.

Table 3 lists numerically dominant epibenthic invertebrate species found at each station in the two Esteros.

Table 3.

Estero Americano Nektonic/Epibenthic Invertebrate Summary

Station	Total Species Collected	Mean individ./m^2	Dominant Species		% of Total
E-1	35	9.2	*Crangon nigricauda*	Black-tail shrimp	33.9
			Heptacarpus pictus	Broken-back shrimp	14.5
			Pugettia producta	Kelp crab	8.0
			Heptacarpus brevirostris	Broken-back shrimp	6.0
			Hemigrapsis oregonensi	Yellow shore crab	4.2
			Cancer magister	Dungeness crab	3.6
E-2	30	7.5	*Neomysis mercedis*	Opossum shrimp	93.8
			Lacuna sp.	Chink snail	3.3
			Heptacarpus pictus	Broken-back shrimp	1.0
E-3	14	3.9	*Neomysis mercedis*	Opossum shrimp	64.2
			Hemigrapsis oregonensis	Yellow shore crab	21.8
			Crangon nigricauda	Black-tail shrimp	6.5
			Crangon franciscorum	San Francisco Bay shrimp	5.3
E-4	18	3.9	*Neomysis mercedis*	Opossum shrimp	98.9
			Hemigrapsis oregonensis	Yellow shore crab	0.8
			Crangon franciscorum	San Francisco Bay shrimp	0.1
E-5	14	2.8	*Neomysis mercedis*	Opossum shrimp	92.3
			Hemigrapsis oregonensis	Yellow shore crab	6.1
			Crangon franciscoru	San Francisco Bay shrimp	0.8

Estero de San Antonio

Catches of nektonic and epibenthic invertebrates in fish trawls and gill nets are listed in Appendix E3. Sampling effort in Estero de San Antonio was less than in Estero Americano, but the invertebrates collected from Estero de San Antonio are species also common in Estero Americano. These include *Neomysis mercedis, Crangon franciscorum*, *Corophium spinicorne*, and *Anisogammarus confervicolus* (Table 4). One specimen of *Cancer jordani*, a small *Cancer* crab, was collected at station S-2 near the mouth in September 1989. This species was collected in Estero Americano on several occasions, always near the Estero mouth.

Table 4.

Estero de San Antonio Nektonic/Epibenthic Invertebrate Summary

Station	Total Species Collected	Mean individuals/m^2	Dominant Species		% of Total
S-2	8	3.3	*Neomysis mercedis*	Opossum shrimp	61.1
			Corophium spinicorne	Scud	33.3
			Anisogammarus confervicolus	Scud	5.2
S-4	6	2.3	*Corophium spinicorne*	Scud	70.9
			Neomysis mercedis	Opossum shrimp	22.4
			Anisogammarus confervicolus	Scud	6.6
S-6	8	2.1	*Corophium spinicorn*	Scud	88.8
			Anisogammarus confervicolus	Scud	8.4
			Cenocorixa blaisdelli	Water boatman	2.4

Appendices E3 and E4 show that far fewer epibenthic species were found in Estero de San Antonio than in Estero Americano; this is due in some part to the fewer number of sampling dates, but also reflects that no samples were collected in eelgrass beds close to the Estero mouth, as was the case with Estero Americano.

There may have been more of an impact of runoff in 1990 on the number of epibenthic invertebrate species than in Estero Americano (Figure E2), but so few species were found before the rain that it is difficult to be certain.

Both Esteros were dominated by estuarine species, but unlike Estero Americano, Estero de San Antonio had few coastal species represented at the stations sampled.

2.4.2-3 Comparison with Earlier Data

DFG (1977) included a list of invertebrates from various habitats in the two esteros. Included are 12 species of mysids, shrimps, and crabs. All of these species were also found in the 1988-1990 study. The DFG list attributed most of the invertebrate species to Estero de San Antonio, with only a few indicated as also occurring in Estero Americano. It is likely that most or all of these species occurred in both esteros, and that the longer list reflects the greater study effort expended in Estero de San Antonio in the 1970's (see reports cited in DFG, 1977). No quantitative data on invertebrates was presented in the 1977 review.

2.4.3 Benthic Invertebrates

2.4.3-1 Methods

Sediment samples were collected with a 15.2 x 15.2 cm ("petite") PONAR grab and screened in the field through a 0.5 mm screen. Benthic invertebrates were preserved in formalin to which rose Bengal stain had been added. Samples were transferred to 70 percent ethanol after 48 hours. Benthic samples were collected approximately quarterly. Data were collected nine times during the three-year study period (1988, 1989, 1990) in Estero Americano/Americano Creek stations. In Estero de San Antonio benthic invertebrate samples were collected three times during 1990.

Beginning in May, 1989, two intertidal mudflat stations were added to the sampling schedule in Estero Americano. The first (station 2A) is located in the shallow embayment on the south side of the Estero approximately midway between stations E-1 and E-2. The second (station 3A) is located a few meters north of station E-3. A third intertidal station (2B, located on the opposite side of the channel from 2A) was sampled only in September 1990.

2.4.3-2 Results

Estero Americano

Qualitative Aspects

Over 110 invertebrate taxa have been identified to date from Estero Americano benthic samples (Appendix B1). Of these, 46 are polychaete species, 27 are crustaceans, and 19 are molluscs. The remaining taxa represent other groups, and these were usually not identified to species.

The abundance and composition of benthic invertebrate animals is highly dependent on the substrate type. The benthic environment at Estero Americano station E-1 is composed of coarse sand and gravel, reflecting the relatively high energy of currents near the mouth. This station was sampled only on the first and the last survey. It contained only a few nemerteans and a population of *Hesionura* sp., a polychaete characteristic of coarse sand habitats. Since the sediments at stations E-2 to E-5 are silts and sandy silts, it was decided not to include station E-1 in subsequent surveys. The number of benthic species was highest at station E-2, and diminished farther upstream (Figure B1). Station E-2 had 17 - 40 species, often over twice as many as any of the stations further upstream. The proximity to the sea (the source of invertebrate larvae as well as relatively constant salinity) and the presence of eelgrass at station E-2 undoubtedly contributed to the greater diversity of benthic invertebrates found there. Station E-3 had 6 -19 benthic invertebrate species, while station E-4 had 5 - 8 species. Only 3-5 species were collected at station E-5.

The benthic invertebrate fauna was dominated by a few small species (Table 5). The polychaete *Streblospio benedicti* and the amphipod *Corophium spinicorne* were the numerically dominant benthic species at most stations and seasons. Other species which occasionally occurred in sizable numbers were the polychaetes *Pseudopolydora kempi*, *Capitella capitata* complex, another capitellid, designated species A; the amphipods *Grandidierella japonica* and *Ampelisca abdita* [=*A. milleri*]; and *Cumella vulgaris*, a cumacean. Most of the other species occurred in low numbers. Molluscs in these samples were represented only by tiny juveniles of various bivalves whose adults, although well represented in Estero Americano mudflats, are not effectively sampled with the PONAR grab. These include the heart cockle, *Clinocardium nuttalii*, the Baltic macoma, *Macoma balthica*, the bent-nosed clam, *Macoma nasuta*, the littleneck clam, *Protothaca staminea*, and the Japanese littleneck, *Tapes japonica*. The bivalves in intertidal mudflats in Estero Americano were quantitatively surveyed in July 1990, and these data were reported in a separate report (Technical Memorandum No. E8A).

PONAR samples at the intertidal mudflat stations 2A, 2B, and 3A yielded qualitatively similar benthic faunas to nearby channel sites.

The number of polychaete species found at stations E-2 and E-3 decreased dramatically between January 1989 and the next sampling, in May 1989 (Appendix B1). This may be a reflection of the high freshwater runoff following heavy rains in March 1989 (the most significant runoff event during the study period). No such decrease in benthic crustacean species occurred, but the Estero Americano amphipods are known to be euryhaline species. The benthic invertebrate data base is too scanty to draw definitive conclusions, however.

Table 5.

Estero Americano Benthic Invertebrate Summary

Station	Total Species Collected	Mean individuals / m^2	Dominant Species		% of Total
E-2	71	37.2K	*Ampelisca abdita*	Scud	46.4
			Streblospio benedicti	Polychaete worm	13.4
			Corophium spinicorne	Scud	19.4
E-3	33	35.1K	*Corophium spinicorne*	Scud	60.4
			Pseudopolydora kempi	Polychaete worm	10.2
			Streblospio benedicti	Polychaete worm	9.0
E-4	18	26.14K	*Streblospio benedicti*	Polychaete worm	78.5
			Corophium spinicorne	Scud	10.3
E-5	12	29.1	*Streblospio benedicti*	Polychaete worm	66.4
			Oligochaeta	Aquatic earthworms	27.1
			Corophium spinicorne	Scud	6.0

Quantitative Aspects

The abundance of benthic invertebrates in Estero Americano ranged from 1,000 (station E-5 in September, 1989) to over 122,000 (station E-3 in May 1989) individuals per square meter of bottom. Station E-2, which had the maximum number of benthic invertebrate species, sometimes had the highest numbers of individuals as well, although the maximum abundance often occurred at station E-3, which averaged 35,000 individuals/m^2 over all

seasons (Figure B2). Average abundance at stations E-4 and E-5 was only slightly less than that at station E-3. Between-date variability in benthic invertebrate abundance at each station was large, so that the between-station differences are probably not statistically significant.

The decrease in the number of polychaete species between January and May 1989 was accompanied by a decrease in polychaete abundance, from over 28,000 to less than 775 individuals/m^2 (average for stations E-2 - E-5). Crustacean numbers increased at those stations over the same interval, from ca. 25,000 to over 36,000 individuals/m^2. This was due to increased abundance of *Corophium spinicorne*, a species that is tolerant of very low salinity.

Americano Creek

Americano Creek was sampled for benthic invertebrates at station E-6 (Gericke Road crossing). The creek here is freshwater and intermittent. Mean monthly flows in winter and spring are often several tens of cfs, but by late spring or summer the creek is reduced to a series of standing pools which were used as cattle wallows (cattle have since been fenced out of the creek at this site). Later the site is dry. Technical Memorandum E6 provided a summary of monthly estimated streamflows at this station for the years 1958 through 1985.

In April 1988 benthic invertebrates at station E-6 consisted of oligochaetes (over 90,000/m^2) and *Chironomus* larvae (ca. 2000/m^2), as well as a few tiny *Corophium spinicorne*. A conspicuous population of free-swimming entomostracans--consisting primarily of *Daphnia magna*, but also including other cladocerans and copepods--attested to the fact that flow rates were low. Very few animals were found in July 1988, and the site was dry on the next survey date (26 October 1988). No benthic animals were found in the sample collected at station E-6 on 20 January 1989. Another sample was collected on 18 September, by which time the site was nearly dry. A few oligochaetes were found, along with semi-aquatic species (muscoid maggots) associated with manure.

Estero de San Antonio and Stemple Creek

Benthic invertebrate data is available for three dates in 1990 at each of three stations S-2, S-4, and Ss-6 (Appendix B2). Only about twenty species were found, although the dominant species were often the same species that were most abundant in Estero Americano. Total numerical abundances were similar in the two Esteros (Table 6, Figure B3). There was no apparent effect of runoff on benthic invertebrates in Estero de San Antonio, but the data is scanty (Figure B4). The shorter list of benthic species in Estero de San Antonio relative to Estero Americano also reflects that Estero de San Antonio was not sampled as close to the mouth, where coastal species mostly occurred in Estero Americano.

Table 6.

Estero de San Antonio Benthic Invertebrate Summary

Station	Total Species Collected	Mean individuals / m^2	Dominant Species		% of Total
S-2	17	31.4K	*Corophium spinicorne*	Scud	35.6
			Oligochaeta	Aquatic earthworms	25.6
			Streblospio benedicti	Polychaete worm	19.3
			Capitella capitata	Polychaete worm	8.3
S-4	13	44.0K	Oligochaeta	Aquatic earthworms	40.5
			Corophium spinicorne	Scud	34.9
			Streblospio benedicti	Polychaete worm	13.8
S-6	9	1.8K	Ostracoda	Seed shrimps	66.4
			Corophium spinicorne	Scud	13.8
			Oligochaeta	Aquatic earthworms	10.3

2.4.3-3 Comparison with Earlier Data

The list of invertebrates in the 1977 review of the esteros (DFG, 1977) is much shorter than lists based on the 1988-1990 collections. Species found in the 1970's were still present in the later collections. The earlier list is shorter because only a few of the polychaetes were identified to species, and because sampling effort was probably not focused on the areas near the estero mouths where the most diverse assemblages occur. As was the case with swimming invertebrates, the 1977 list attributed most of the species to Estero de San Antonio, with only a few indicated as also occurring in Estero Americano. This is almost certainly a reflection of the sampling effort being mostly focused on Estero de San Antonio in the earlier report.

2.5 FISH

2.5.1 Methods

Fish were collected in the esteros by otter trawl (8 ft. wide opening, ¼ in. mesh bag) and gillnet (variable mesh, ¾-5 in., stretched). The trawl was slowly dragged once at each

station, parallel to the channel, usually for 4 minutes in Estero Americano (except station E-5, 2 min.), and 2 minutes at Estero de San Antonio stations (a longer interval would cause the bag to become clogged with mud). The otter trawl is effective at capturing bottom-dwelling, slow-moving fishes, as well as epibenthic invertebrates such as crabs, shrimp, and mysids. The gillnets were used to capture more active, faster-moving, benthic and mid-water fishes which would avoid the trawls. Crabs were also routinely captured in the gillnets. Gillnets were set overnight at each station, parallel to the main channel and direction of tidal current. Fish were sampled on 21 occasions from 1988 through 1990 in Estero Americano, and on 10 occasions from 1989 through 1990 in Estero de San Antonio (Table 2).

2.5.2 Results

Detailed results of the fish sampling conducted through October 1989 were presented in Technical Memoranda No. E5 and E8. Results from November 1989 through September 1990 are presented here, except in the cases of species lists, and bar-open vs. bar-closed comparisons in Estero de San Antonio, where data from all years (1988 - 1990) are combined.

2.5.2-1 Estero Americano

A total of 46 fish species representing 22 families were collected during the entire sampling period in Estero Americano (Table 7). Many of the species listed in Table 7 are typically marine species that may wander into the mouths of estuaries at high tide to feed (e.g., cabezon, ling cod, buffalo sculpin, opaleye), and were mainly captured at the marine-like lower stations E-1, E-2, or E-3 (sampling effort and catch results are summarized in Appendices F1-F6; complete data for every trawl and gillnet set are provided in Appendices F7 and F8). Others species found in Estero Americano are either typically estuarine dwellers throughout their lives (e.g., shiner surfperch, tidewater goby, longjaw mudsucker), species that are common in both marine and estuarine areas (e.g., leopard shark, starry flounder, English sole), or species that either spawn in estuaries (topsmelt, jacksmelt, Pacific herring) or whose larvae or juveniles move into estuaries to spend the early part of their lives (plainfin midshipman). Only two anadromous fishes (striped bass and steelhead trout) are listed in Table 7. The striped bass are occasional visitors feeding in the Estero, but unlikely to spawn there, because the whole system is much too small for their reproductive strategy. The two steelhead adults captured in the Estero were probably strays from other watersheds (one was definitely a hatchery-reared fish--see Technical Memorandum No. E8), as there is essentially no salmonid spawning habitat remaining in the Estero Americano watershed (*Aquatic Habitat Survey Results* Technical Memorandum, MSC 1996). Both steelhead trout and coho salmon are thought to have had spawning runs in the Americano watershed historically (DFG 1977, CSCC 1987, Buell 1988).

Table 7.

Fish Species Caught in Estero Americano, 1988 - 1990

Family	Scientific Name	Common Name
Atherinidae	*Atherinops affinis*	Topsmelt
	Atherinopsis californiensis	Jacksmelt
Batrachoididae	*Porichthys notatus*	Plainfin midshipman
Bothidae	*Citharichthys sordidus*	Pacific sanddab
	Citharichthys stigmaeus	Speckled sanddab
Carcharhinidae	*Triakis semifasciata*	Leopard shark
Clinidaey	*Gobbonsia montereyensis*	Crevice kelpfish
Clupeidae	*Clupea harengus*	Pacific herring
Cottidae	*Leptocottus armatus*	Staghorn sculpin
	Oligocottus maculosus	Tidepool sculpin
	Cottus asper	Prickly sculpin
	Enophrys biso	Buffalo sculpin
	Scorpaenichthys marmoratus	Cabezon
	Unidentified sculpin	
Embiotocidae	*Phanerodon furcatus*	White Surfperch
	Damalichythys vacca	Pile surfperch
	Brachyistius frenatus	Kelp surfperch
	Amphistichus argenteus	Barred surfperch
	Cymatogaster aggregata	Shiner surfperch
	Micrometrus minimus	Dwarf surfperch
	Embiotoca jacksoni	Black surfperch
Engraulididae	*Engraulis mordax*	Northern anchovy
Gadidae	*Microgadus proximus*	Pacific tomcod
Gasterosteidae	*Aulorhynchus flavidus*	Tubesnout
	Gasterosteus aculeatus	Threespine stickleback
Gobiidae	*Clevelandia ios*	Arrow goby
	Eucyclogobius newberryi	Tidewater goby
	Gillichthys mirabilis	Longjaw mudsucker
	Ilypnus gilberti	Cheekspot goby
	Goby larvae	
Hexagrammidae	*Hexagrammos decagrammus*	Kelp greenling

Table 7.

Fish Species Caught in Estero Americano, 1988 - 1990

Family	Scientific Name	Common Name
	Ophiodon elongatus	Lingcod
	Unidentified greenling	
Kyphosidae	*Girella nigricans*	Opaleye
Osmeridae	*Hypomesus pretiosus*	Surf smelt
	Spirinchus thaleichthys	Longfin smelt
	Unidentified smelt	
Percichthyidae	*Morone saxatilis*	Striped bass
Pholididae	*Apodichthys flavidus*	Penpoint gunnel
Pleuronectidae	*Hypsopsetta guttulata*	Diamond turbot
	Parophrys vetulus	English sole
	Platichthys stellatus	Starry flounder
	Psettichthys melanostictus	Sand sole
	Unidentified larval flatfish	
Salmonidae	*Onchorhynchus mykiss*	Steelhead trout
Scorpaenidae	*Sebastes jordani*	Shortbelly rockfish
	Sebastes sp.	Juvenile rockfish A
	Sebastes sp.	Juvenile rockfish B
	Sebastes sp.	"Black" juvenile rockfish
	Unidentified juvenile rockfish	
Squalidae	*Squalus acanthias*	Spiny dogfish
Syngnathidae	*Syngnathus leptorhynchus*	Bay pipefish

Seasonal variations in trawl and gillnet catches are shown in Figures F1 and F2, and parallel the results obtained in 1988-1989 (Technical Memorandum No. E8): fish numbers were low in the winter months, increasing in spring and summer. The high values shown in trawl catches for July and September 1990 samples are mainly due to an influx of fingerling plainfin midshipman (Appendices F3 and F4), which was also observed in the late summer samples in 1989. After plainfin midshipman, the species most commonly caught in trawls (Appendix F3) were staghorn sculpin, arrow goby, shiner surfperch, topsmelt, northern anchovy, and threespine stickleback, all of which are common estuarine species in this region. Gillnet catches (Appendix F5) were dominated by topsmelt (54 percent of total), followed by jacksmelt, shiner surfperch, staghorn sculpin, Pacific herring, and surfsmelt.

2.5.2-2 Estero de San Antonio

In Estero de San Antonio, thirteen fish species were captured by trawl and gillnet (Table 8). Twelve of the thirteen species were also captured in Estero Americano--Bay goby was the only species caught only in Estero de San Antonio. The sampling effort is shown in Appendices F9 and F10, for trawls and gillnets, respectively. Total catch by each method is presented in Appendices F11- F14, and is displayed in Figures F3 and F4. Complete data for each trawl and gillnet set are provided in Appendices F15 and F16. The selectiveness of the two sampling methods for different fish species can be readily seen by comparing Appendix F11 (otter trawls) with Appendix F13 (gillnets). The results show that threespine stickleback and tidewater goby were relatively abundant at stations S-2 and S-4 and very abundant at S-6, but were not vulnerable to capture by gillnet (adults of both of these species are quite small, less than about 2 inches total length, and pass through the smallest mesh on the gillnets). Staghorn sculpin were common throughout the estuary and were vulnerable to capture by both methods; their sluggishness and demersal lifestyle makes them vulnerable to trawls, and their prominent barbed spines are easily entangled by gillnets. On the other hand, Pacific herring, topsmelt, and striped bass are all good swimmers that usually avoid trawls, but are readily captured in gillnets. Most of the Pacific herring were spawning adults captured at S-2 in March (Appendices F13-F14, Figure F4). The high value shown for March in Figure F4 is mainly due to these herring, which spawn in late winter in estuaries and shallow coastal areas.

Tidewater goby, a federally endangered species, was abundant in Estero de San Antonio, particularly at the uppermost station, S-6. Minimizing incidental mortality to this species was a major part of the reason for reducing the trawl interval from 4 to 2 minutes in this Estero--at times, hundreds were captured in a single trawl, forcing the team to hurriedly sort and release them to avoid injury or suffocation. The trawls at station S-6 invariably collected massive quantities of manure along with the gobies. The large numbers of tidewater gobies in the presence of the manure is in contrast to reports that the species is sensitive to "nutrient enrichment from agricultural and sewage effluents" and requires "clean, coarse sand" for breeding (Swift et al. 1989).

Table 8.

Fish Species Caught In de Esstero de San Antonio 1989-90

Family	Scientific Name	Common Name
Atherinidae	*Atherinops affinis*	Topsmelt
Clupeidae	*Clupea harengus*	Pacific Herring
Cottidae	*Leptocottus armatus*	Staghorn sculpin
	Cottus asper	Prickly sculpin
Gasterosteidae	*Gasterosteus aculeatus*	Threespine stickleback
Gobiidae	*Lepidogobius lepidus*	Bay goby
	Clevelandia ios	Arrow goby
	Ilypnus gilberti	Cheekspot goby
	Eucyclogobius newberryi	Tidewater goby
Percichthyidae	*Morone saxatilis*	Striped bass
Pleuronectidae	*Parophyrys vetulus*	English sole
	Platichthys stellatus	Starry flounder
Syngnathidae	*Sygnathus leptorhynchus*	Bay pipefish

2.5.2-3 Comparison of Esteros

The list of fish species captured in Estero de San Antonio (Table 8) is much shorter than the list for Estero Americano (Table 7), so a few explanatory remarks may be in order. First, all of the species captured in Estero de San Antonio are generally regarded as typically estuarine species, although some may be equally abundant in nearshore coastal waters (e.g., English sole), or may spend much of their adult life at sea (striped bass). All of these same species except Bay goby were also collected in Estero Americano, as were many of the invertebrates (discussed in previous sections, above), which suggests that the two estuaries are basically similar, at least in the functional, ecosystem sense. The longer species list for Estero Americano is probably a result of a combination of three factors:

- the "species-area relationship";
- types of habitat sampled; and
- sampling effort/frequency.

The "species-area relationship" (Macarthur 1972) is an well-known concept in ecology which says that, as the size of an area increases (e.g., one island compared to another), so does the number of species living within that area. A corollary to this concept is that as the size of the area *sampled* increases, so does the number of species collected. Estero

Americano is considerably larger than Estero de San Antonio (approximately 300 acres open water and 400 acres wetlands vs. 90 acres open water and 200 acres wetlands, respectively--DFG, 1977). Thus, on that basis alone, Estero Americano would be expected to harbor more aquatic species than Estero de San Antonio.

The types of habitat sampled in the two esteros differed significantly--the primarily marine portion of Estero Americano represented by stations E-1, E-2, and to some extent, E-3, had no equivalent in the sampling program conducted in Estero de San Antonio. The marine area near the mouth of Estero de San Antonio is very small relative to the equivalent portion of Estero Americano, and is also very shallow, with swift tidal currents, making boating impossible most of the time, and ruling out use of either trawls or gillnets. Approximately two thirds of the fish species listed in Table 7 for Estero Americano are regarded as marine species, and most of those were captured at stations E-1 and E-2 (Appendices F7- F8, and Technical Memorandum No. E8).

Finally, the sampling effort was greater in Estero Americano than in Estero de San Antonio, in terms of time (21 occasions over 2½ years vs. 9 occasions over 15 months), number of stations sampled (5 in Americano vs. 3 in de San Antonio), and duration of trawls (4 minutes in Americano vs. 2 in de San Antonio, on average, which means twice as much area sampled), all of which lead to the expectation that more species would be found in Estero Americano than in Estero de San Antonio.

The sampling on 7-8 February 1990 was conducted immediately after a rainstorm, and both esteros were experiencing a large influx of freshwater combined with runoff containing manure. The observable effects on the biota in the two esteros were quite different. Estero Americano was open at its mouth, and being unstratified, fresh water totally displaced salt water at upper stations. Trawl samples at stations E-4 and E-5 had a foul odor and contained many recently killed mysids, Dungeness crabs, and shore crabs (*Hemigrapsus*), and the few live specimens were moribund. Very few fish were collected. In contrast, the mouth of Estero de San Antonio was closed at this time, and stratification persisted within the estero. The water level at S-2 was approximately 8 to 10 feet higher than normal. No fish were caught in gillnets (sampling mainly the freshwater layer), but a few gobies, sticklebacks, and sculpins were collected in trawls (Appendices F12, F15). This suggests that the lower, saline layer provided a refuge from the lethal effects of freshwater on this date.

Although Estero de San Antonio was sampled over only a 15-month period, the trends in seasonal catch variation appear similar to those in Estero Americano; greater catches in spring and summer, lower numbers in fall and winter (Figures F3 and F4).

Possible reasons for the disparity in the density of tidewater goby in the two esteros are discussed in some detail in Technical Memoranda No. E5 and E8. The likely reason for the low abundance of tidewater goby in Estero Americano relative to Estero de San Antonio is poor water quality conditions (mainly lack of summer freshwater input and resulting spates of hypersalinity in the upper Estero) and/or habitat conditions in Estero Americano (C. Swift, Los Angeles Natural History Museum, *pers. comm.* to Michael Fawcett, MSC).

2.5.2-4 Bar-open vs. Bar-closed Conditions

Figures F5 and F6 show trawl data plotted so as to distinguish total catches and number of species caught during bar-open and bar-closed periods in Estero de San Antonio, and include the July and September 1990 catches (reported in Technical Memorandum No. E8). No obvious trends related to bar condition are apparent. However, the bar-closed condition during summer and fall 1990 may have prevented an influx of juvenile plainfin midshipman during that period, when large numbers were moving into Estero Americano (Appendices F4, F5, F7). These midshipman fingerlings probably provide a large boost of food to the Esteros' foodweb during their summer invasions.

3.0 CONCLUSIONS

The two esteros show many biological similarities, but they differ physically. Each consists of a downstream estuary-like section with eelgrass beds, and a narrow upper section with riverine properties. The downstream section in Estero Americano is much larger, and provides far more habitat for marine species when the bar is open. In contrast, the downstream section in Estero de San Antonio is very small, and most of the estero (including all of the part sampled regularly in 1989-1990) is narrow and riverine.

Both esteros were allowed to open and close "naturally" in the 1970's, and data gathered then indicate few differences in the biology of the systems between that time and the 1988-1990 period. During the later period, Estero Americano was artificially kept open, and biological sampling made near the mouth showed greater faunal diversity in the marine-influenced sections. Keeping the bar open also increases the likelihood of the occurrence of hypersaline conditions in the upper part of the tidal system. Estero de San Antonio was not kept open during this period. The stations sampled there did not differ much biologically between bar-open and bar-closed dates, but areas near the mouth (where tidal exchange would occur) were not sampled.

The current management of the Gulf of the Farallones National Marine Sanctuary is not to issue any permits to keep the bar open artificially. Therefore, the bar is likely to be closed during some times in the future. The data at hand provide an indication of the distribution of biota in Estero Americano when the bar is closed. Observations made in 1989-1990 in Estero de San Antonio would suggest that the upper riverine parts of Estero Americano will be less saline but probably not be much different biologically, since the dominant species in the upper parts are euryhaline. When the Estero Americano bar is closed, biota in the lower Estero will be similar to that in the upper Estero. Changes in the biota of the lower part of Estero Americano during bar-closed conditions will probably be related both to lowered salinity and lack of recruitment from coastal populations. Both of these factors can be expected to reduce, at least temporarily, the diversity of the biota there.

4.0 REFERENCES

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5.0 APPENDICES

WATER QUALITY FIGURES

Figure WQ1. Seasonal Average Salinity
Estero Americano October 1989 through November 1990

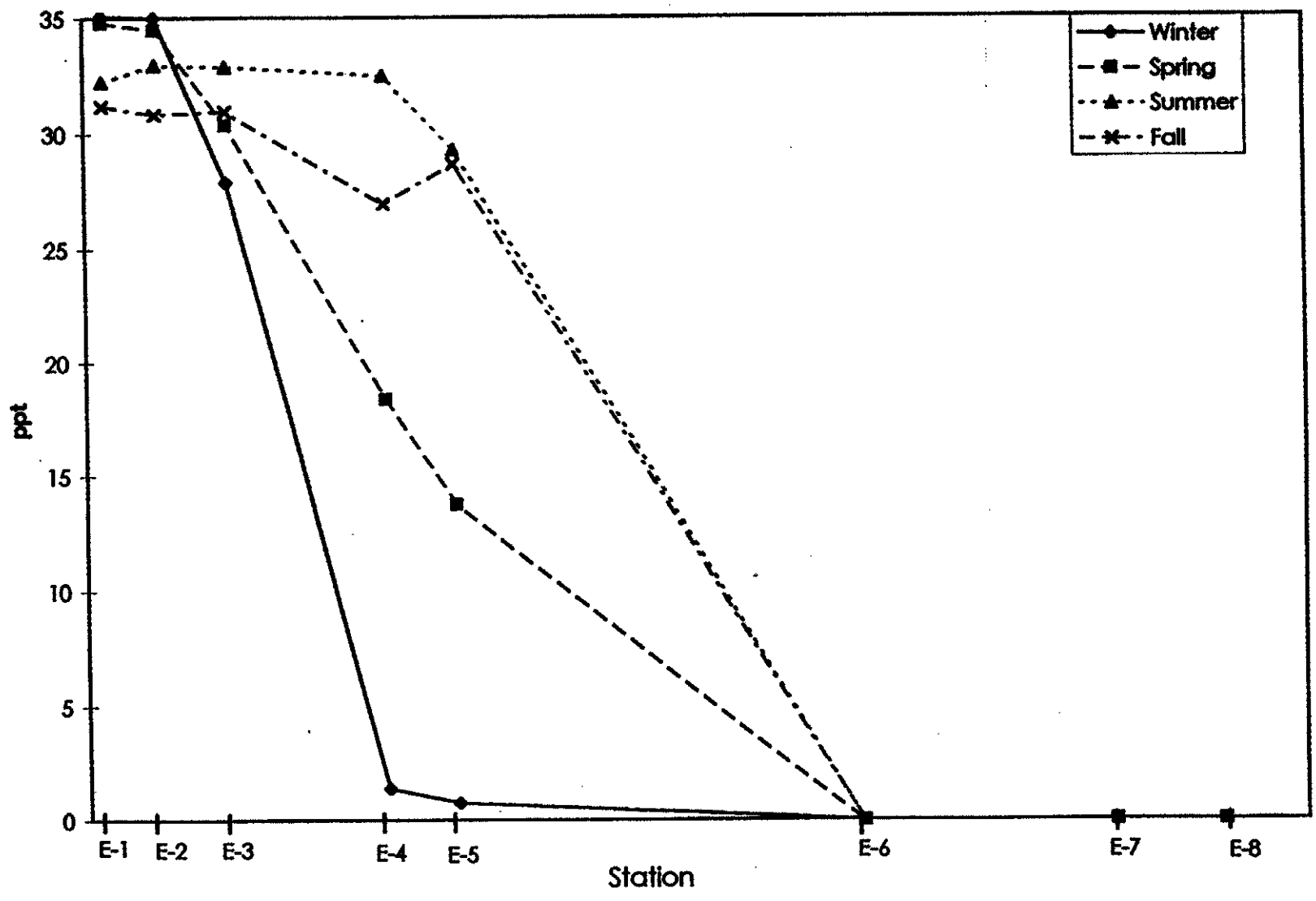


Figure WQ2. Salinity
Estero Americano

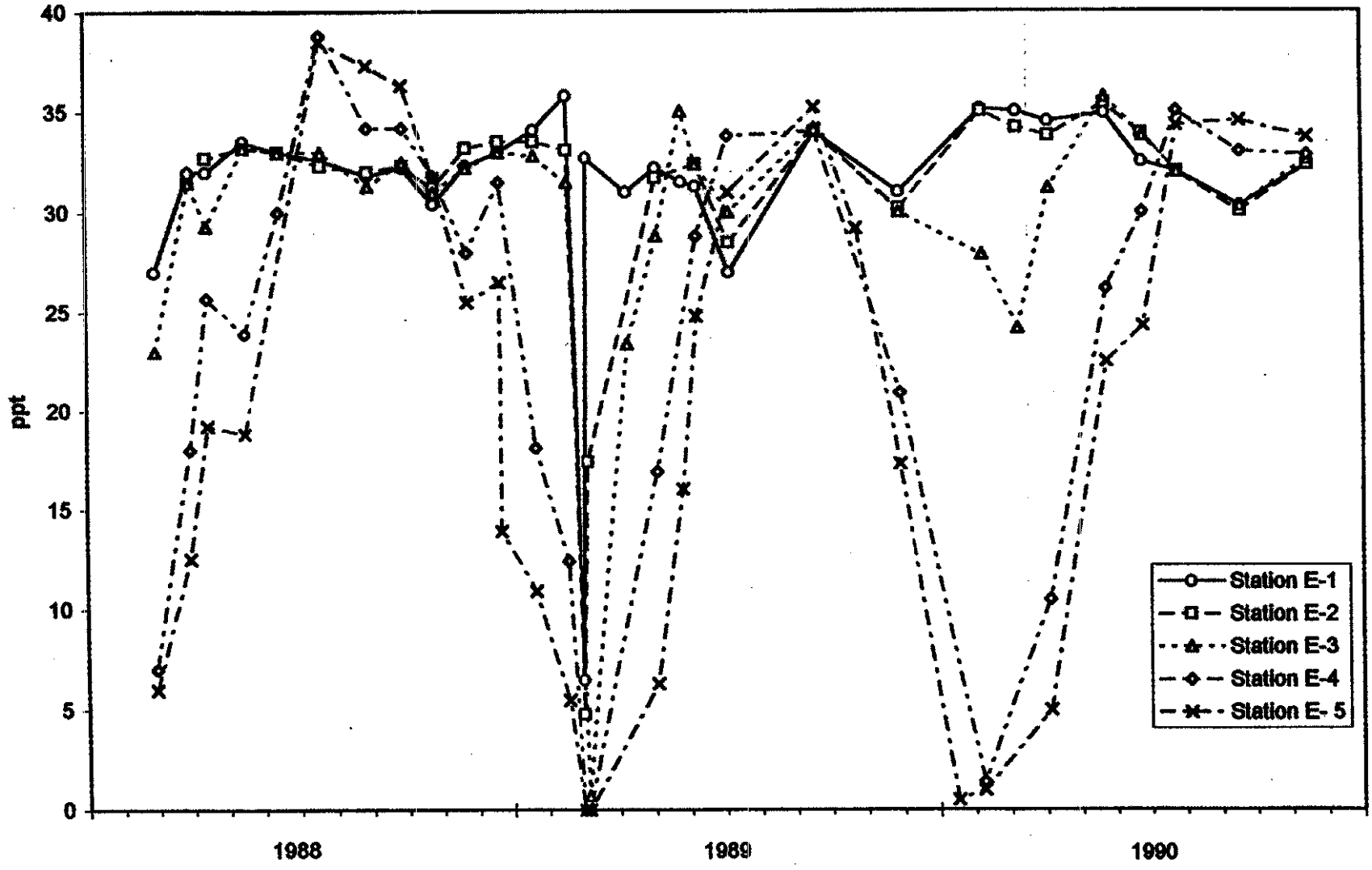


Figure WQ3. Salinity in Estero Americano Stations E-3 and E-5 (September 1990)

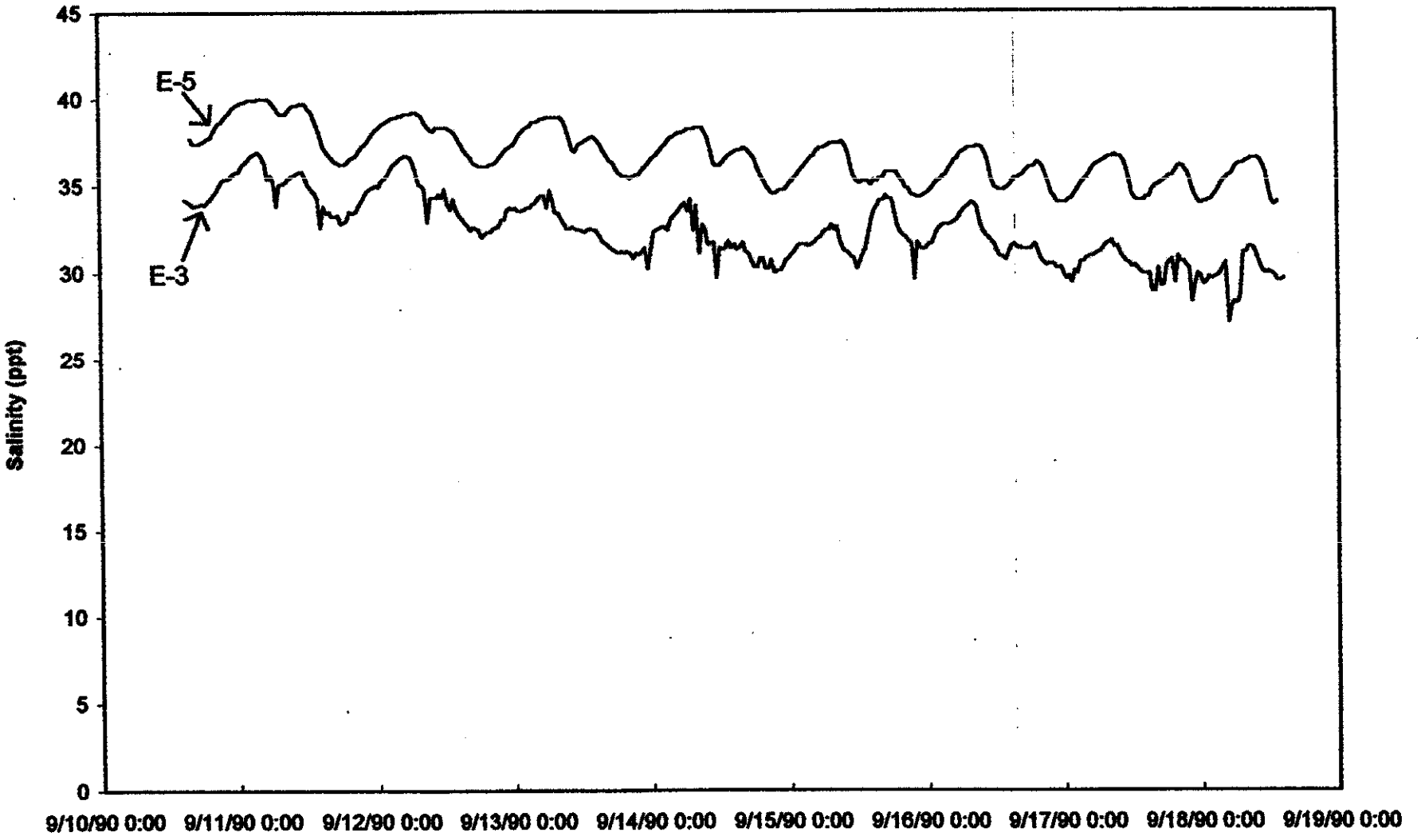


Figure WQ4. Seasonal Average Dissolved Oxygen
Estero Americano October 1989 through November 1990

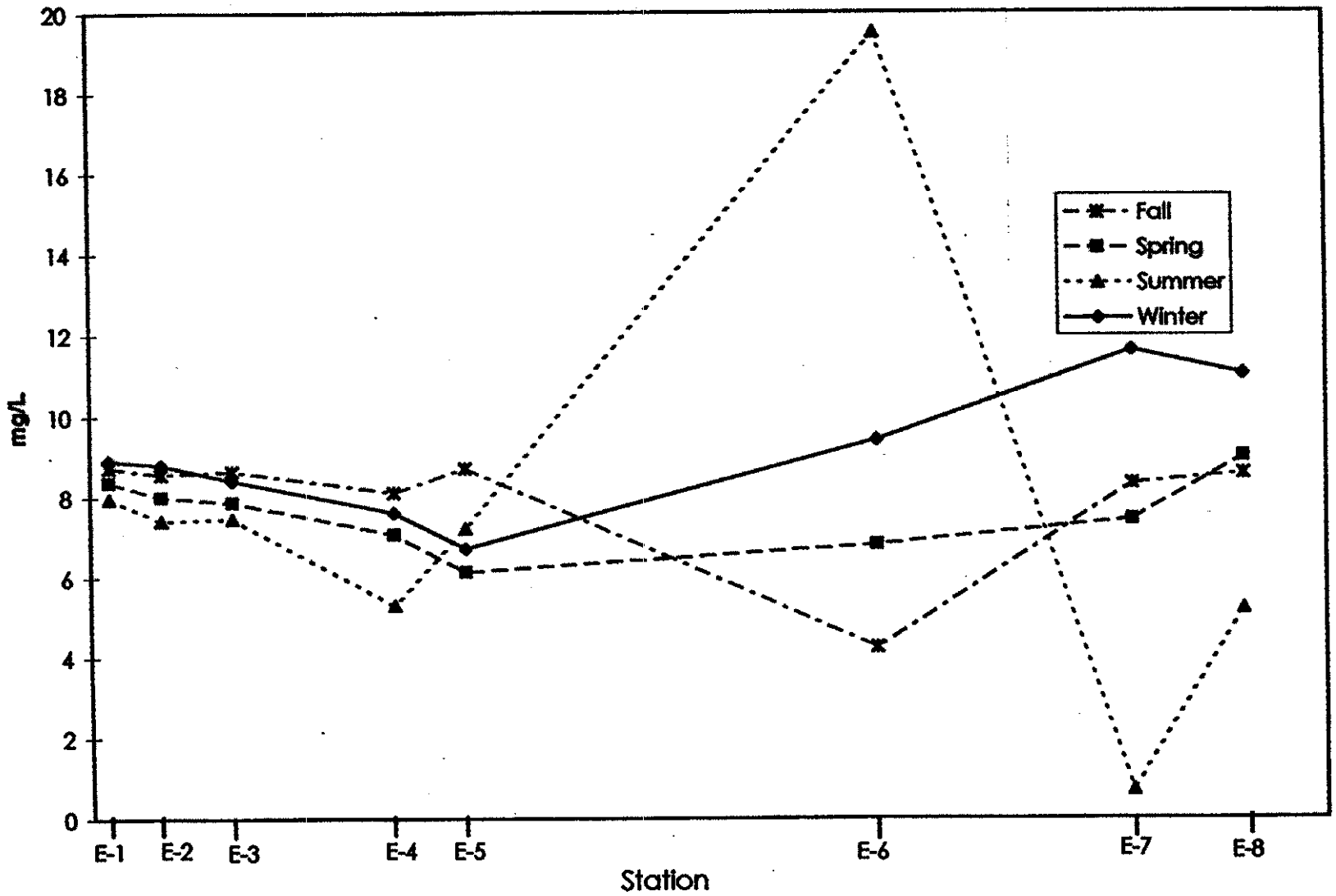


Figure WQ5. Dissolved Oxygen
Estero Americano (Station E-3) versus Americano Creek (Station E-6)

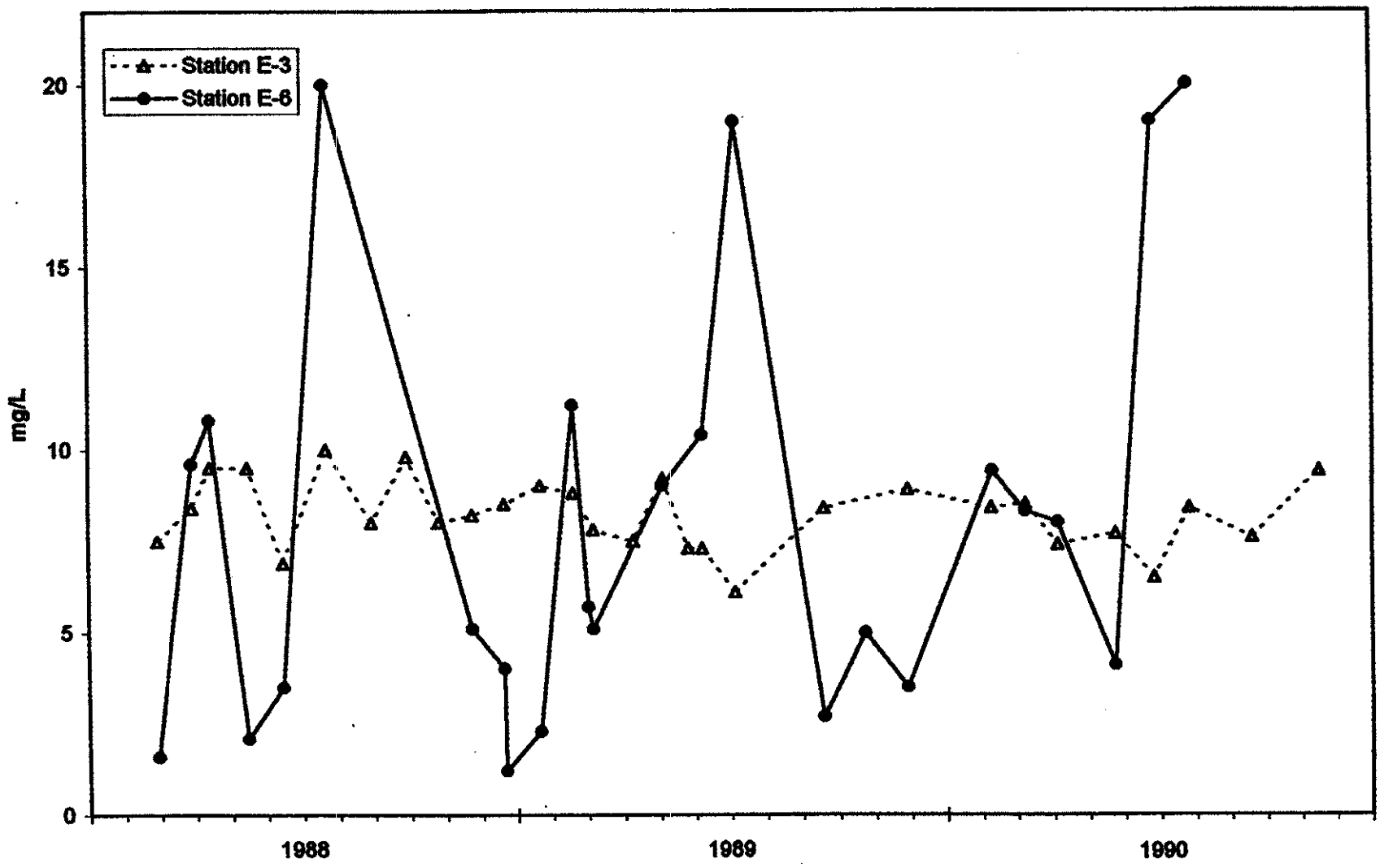


Figure WQ6. Seasonal Average Nitrate
Estero Americano and Americano Creek
October 1989 through November 1990

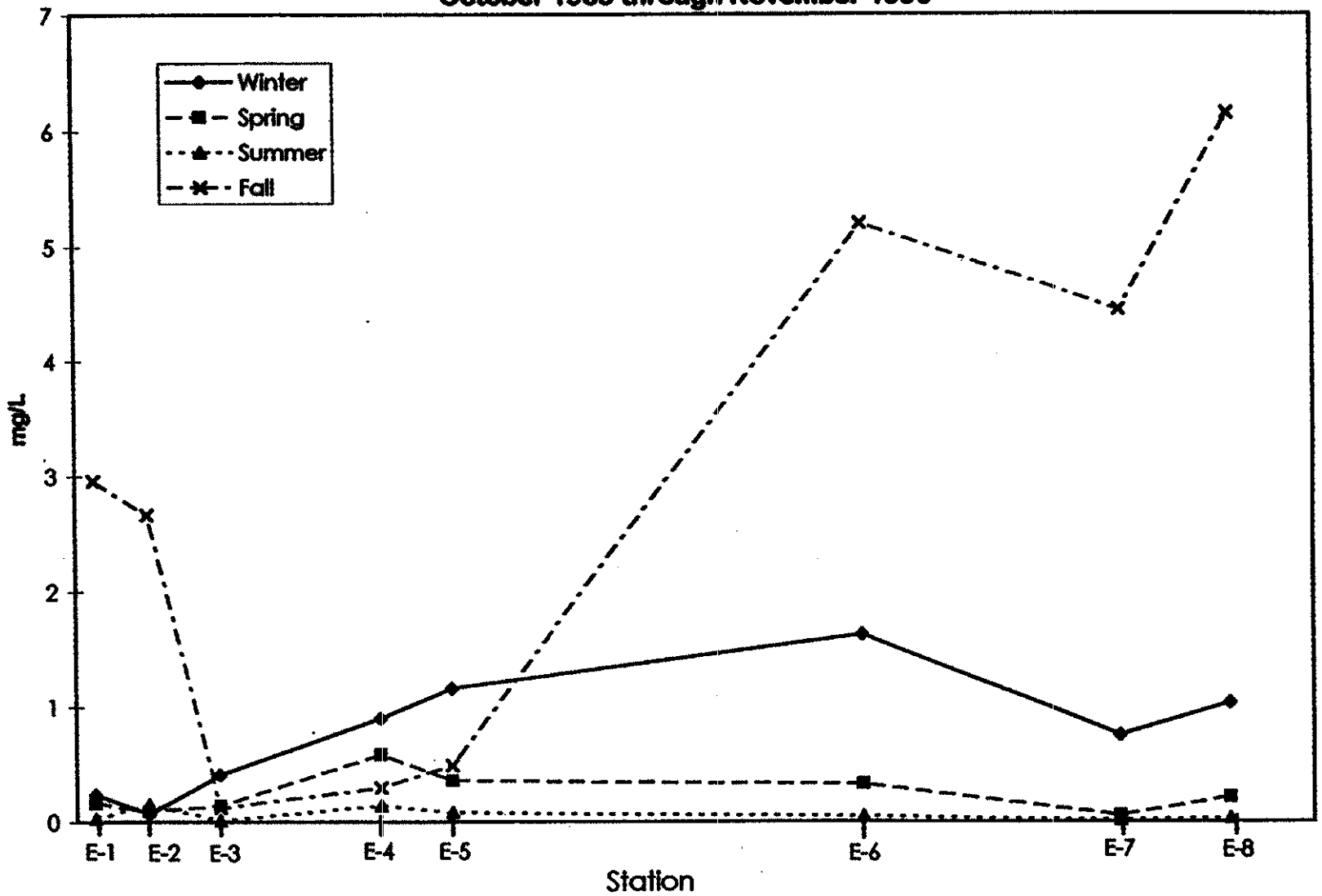


Figure WQ7. Seasonal Average Ammonia
Estero Americano October 1989 through November 1990

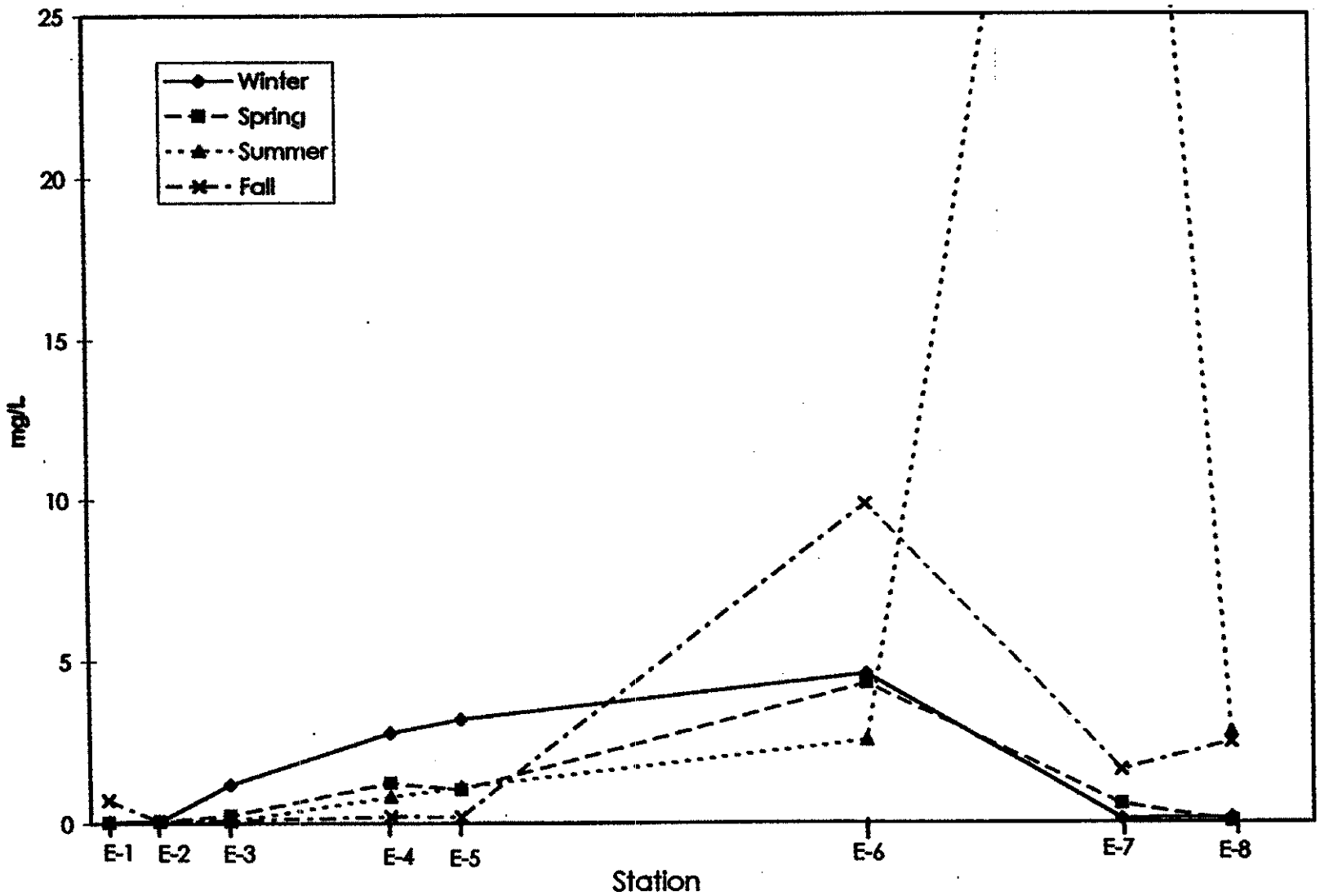


Figure WQ7. Seasonal Average Ammonia
Estero Americano October 1989 through November 1990

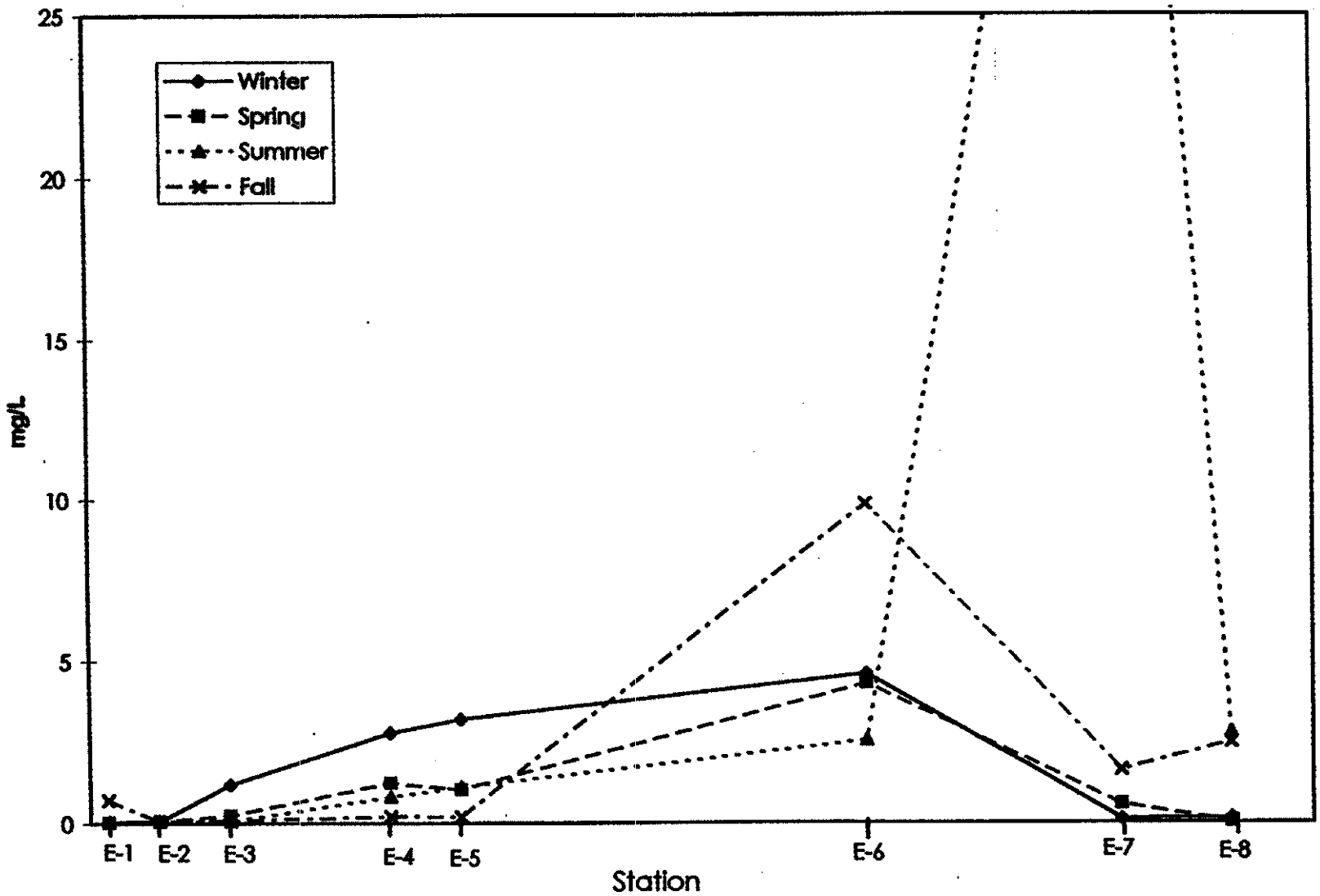


Figure WQ8. Seasonal Un-ionized Ammonia
Estero Americano and Americano Creek
October 1989 through November 1990

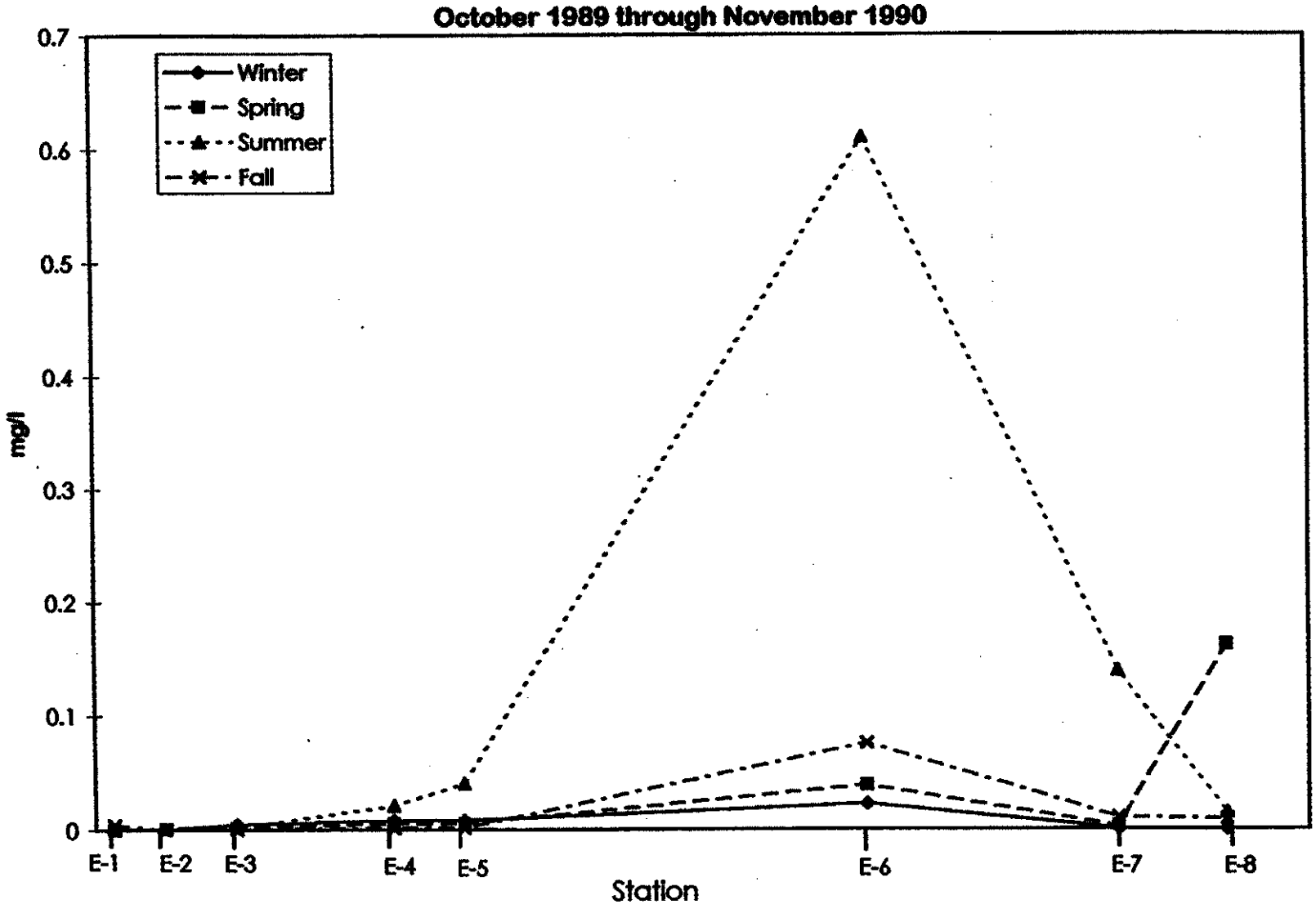


Figure WQ9. Un-ionized Ammonia
Estero Americano

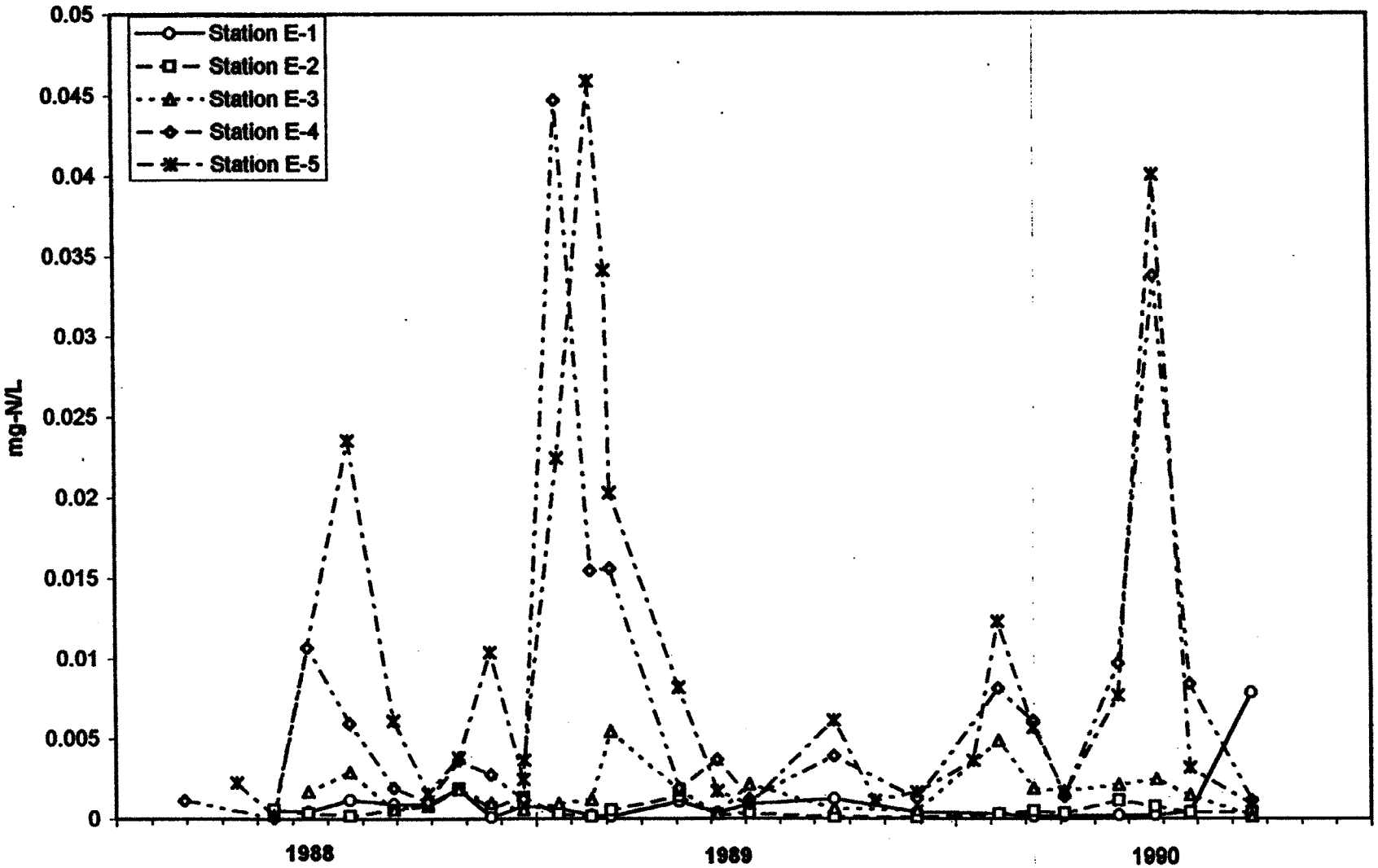
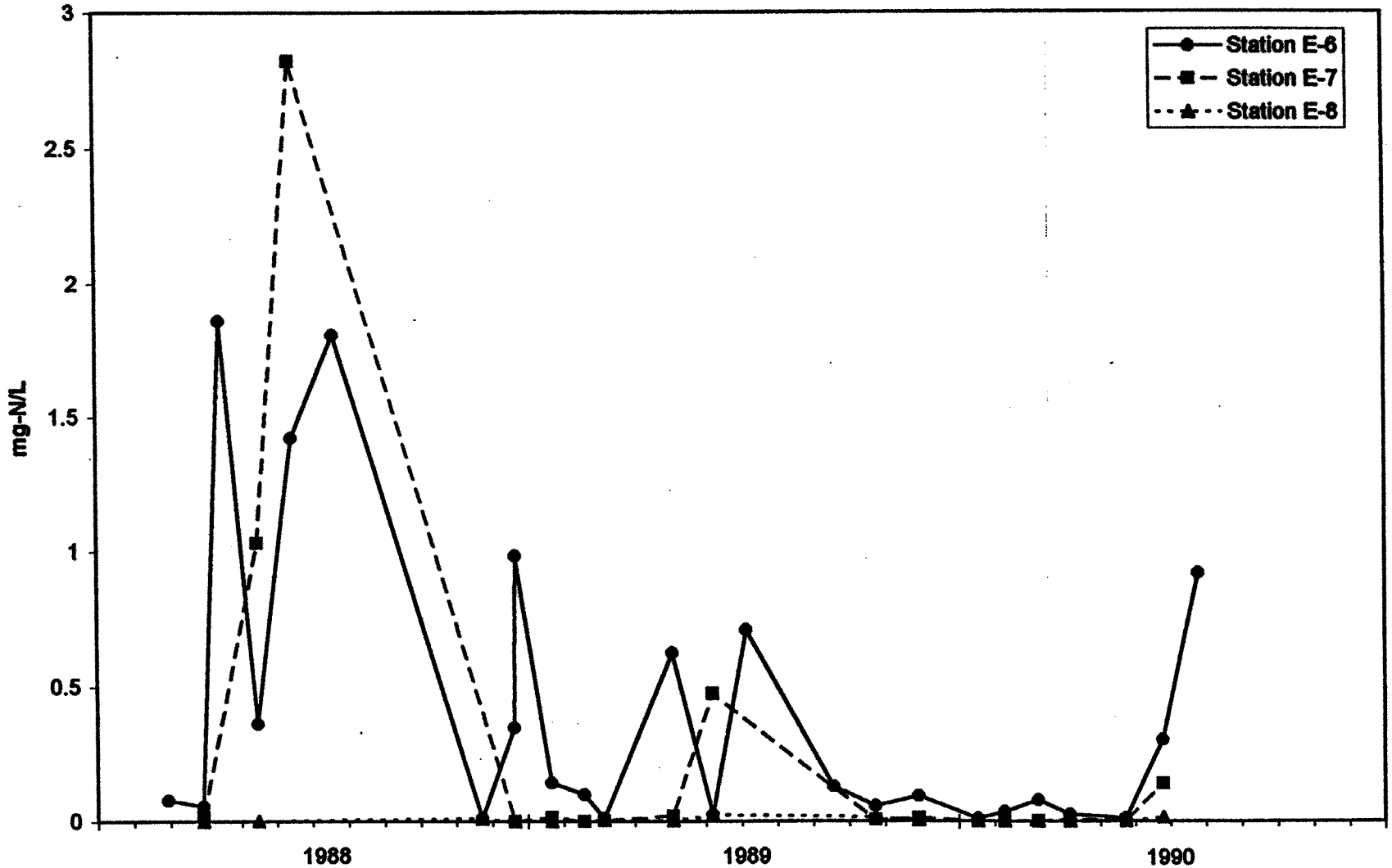


Figure WQ10. Un-ionized Ammonia
Americano Creek



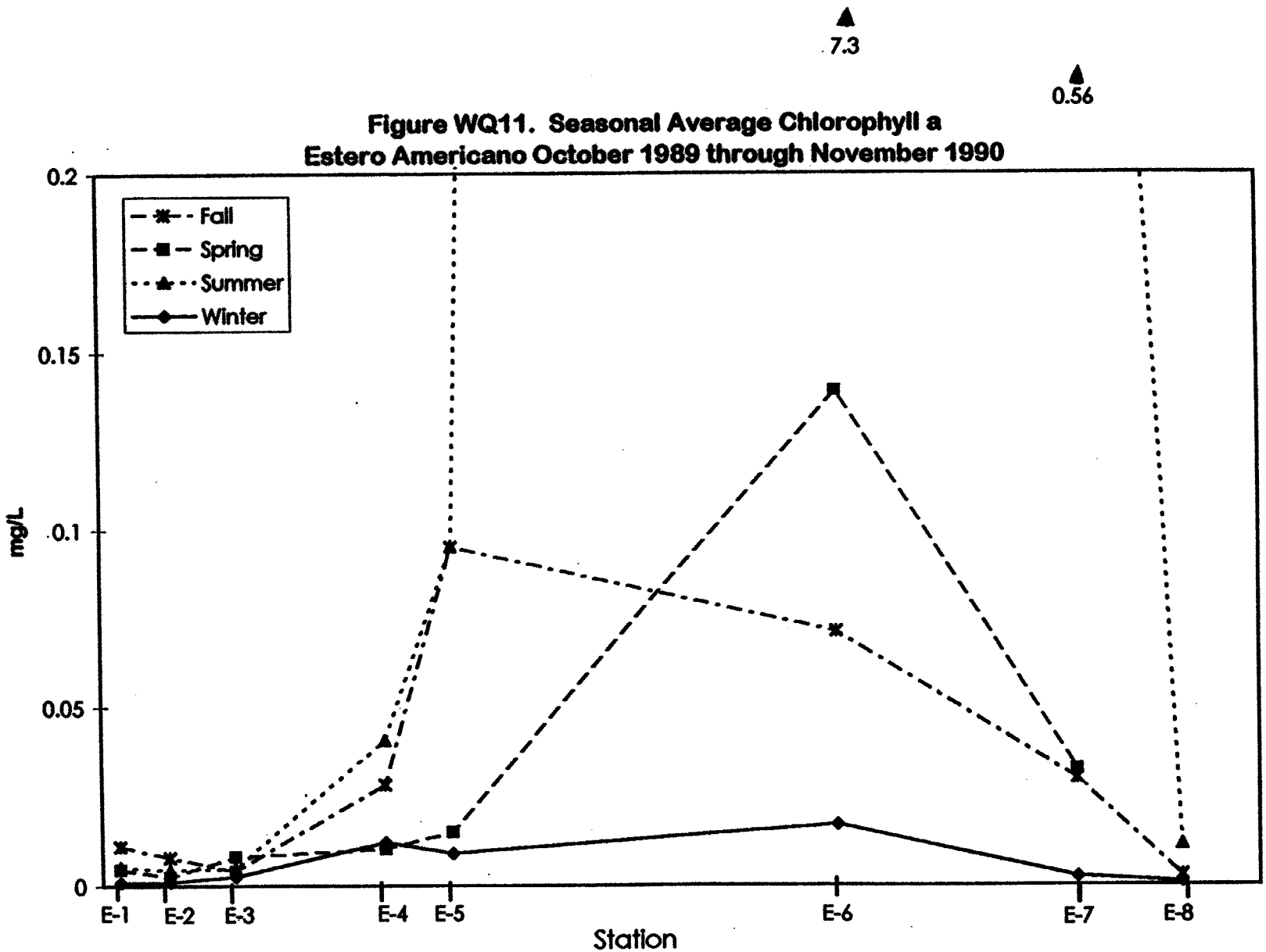


Figure WQ11. Seasonal Average Chlorophyll a
Estero Americano October 1989 through November 1990

Figure WQ12. Salinity
Estero de San Antonio

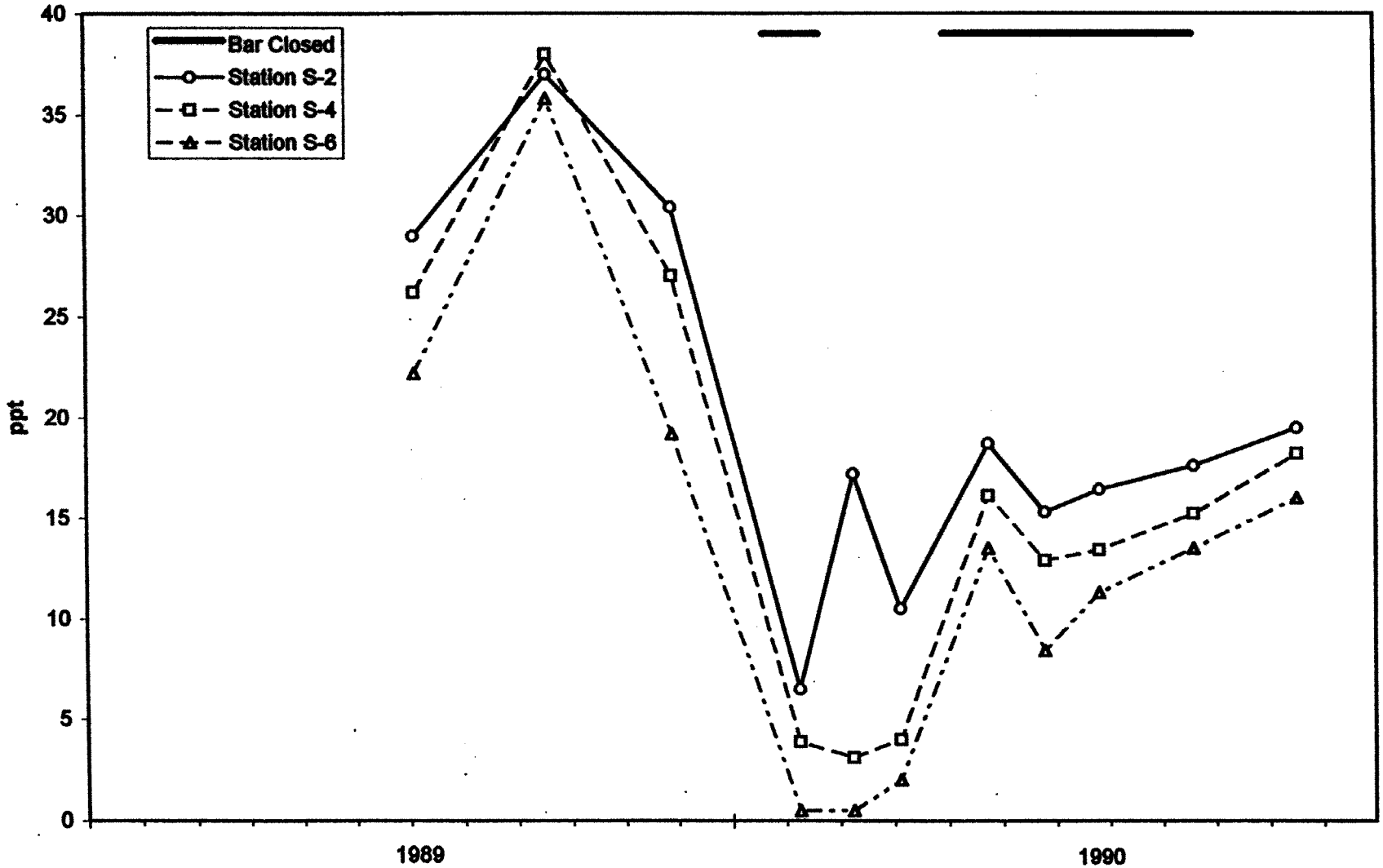


Figure WQ13. Surface Dissolved Oxygen
Estero de San Antonio

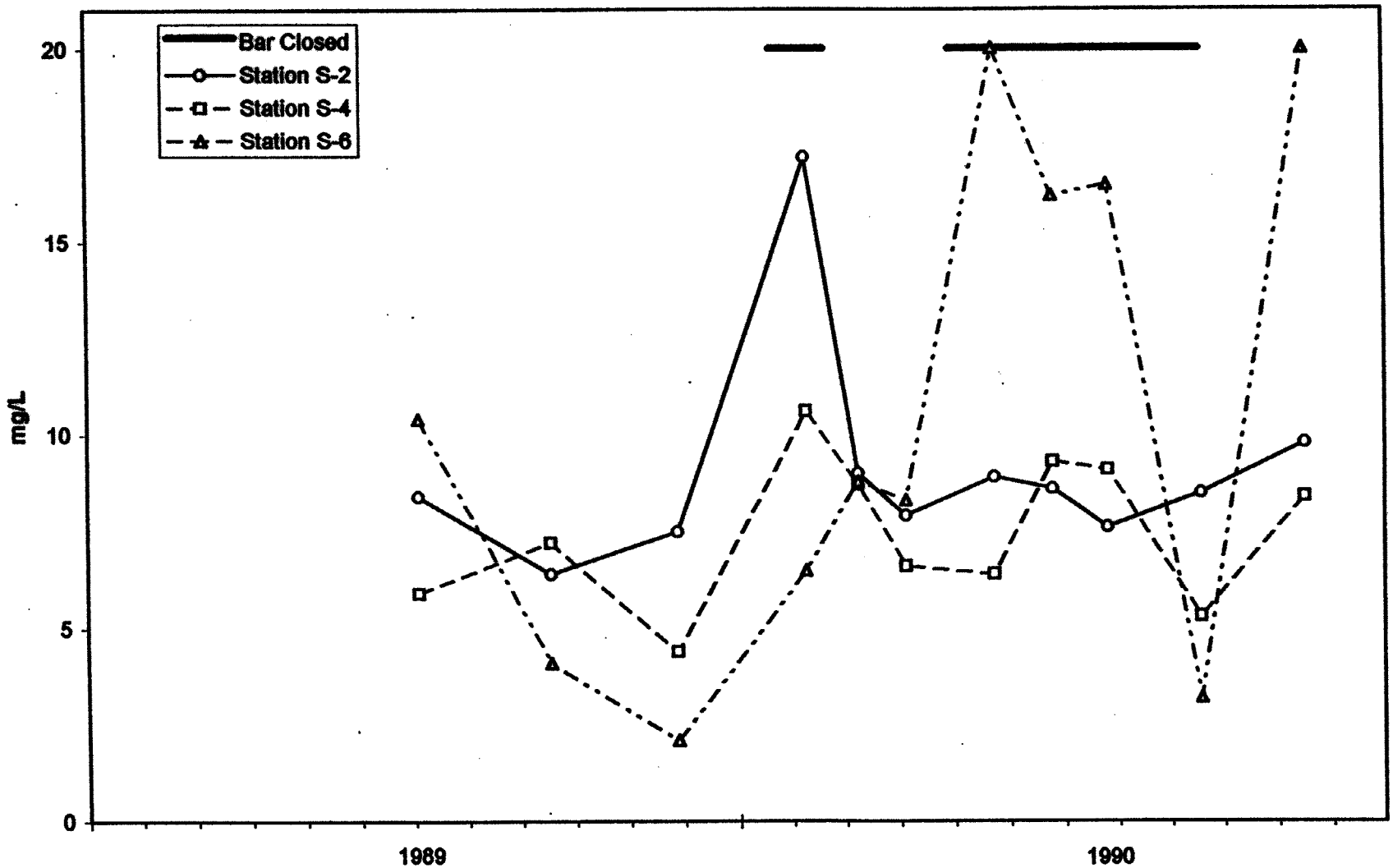


Figure WQ14. Dissolved Oxygen
Estero de San Antonio

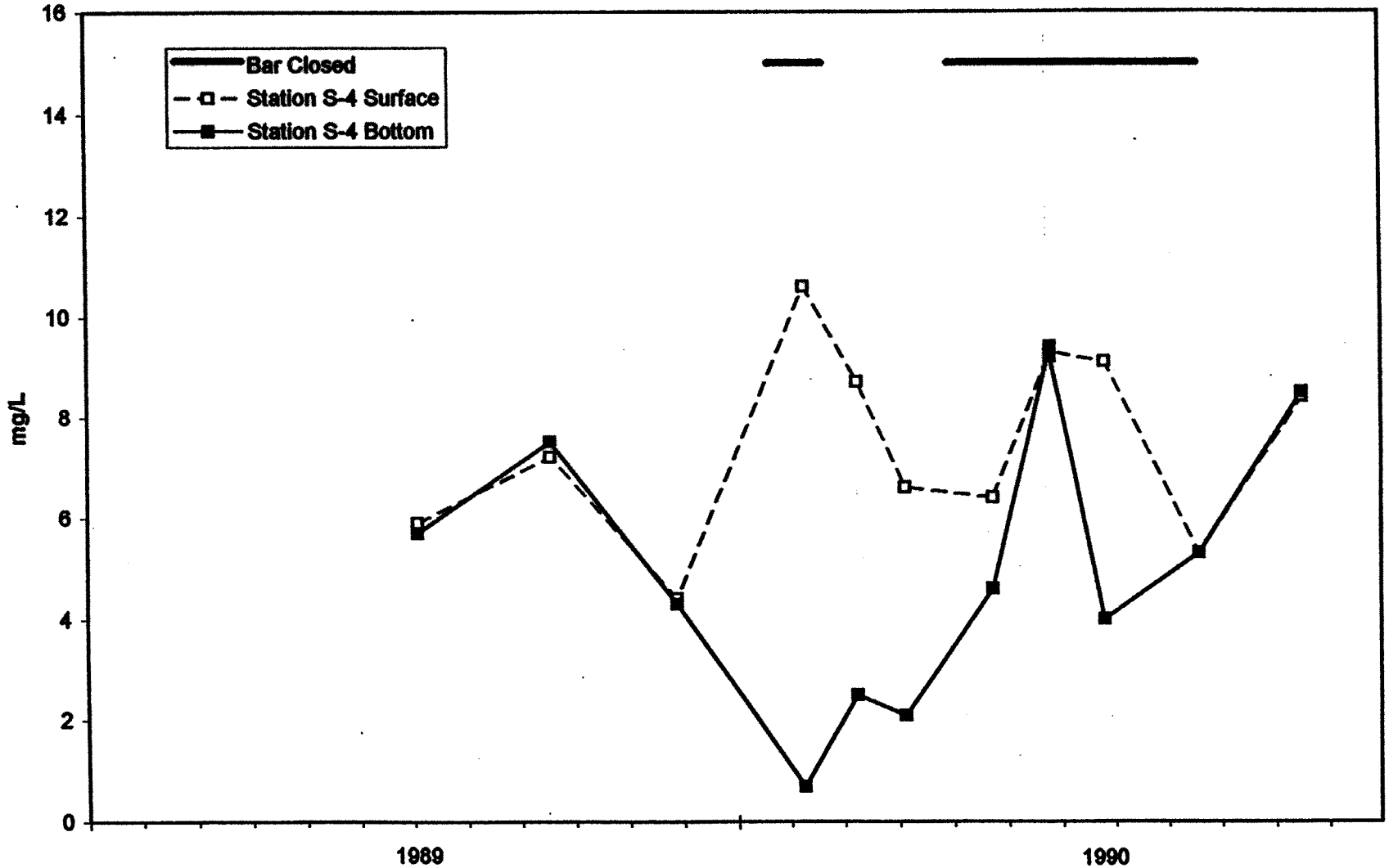


Figure WQ15. Nitrate
Estero de San Antonio

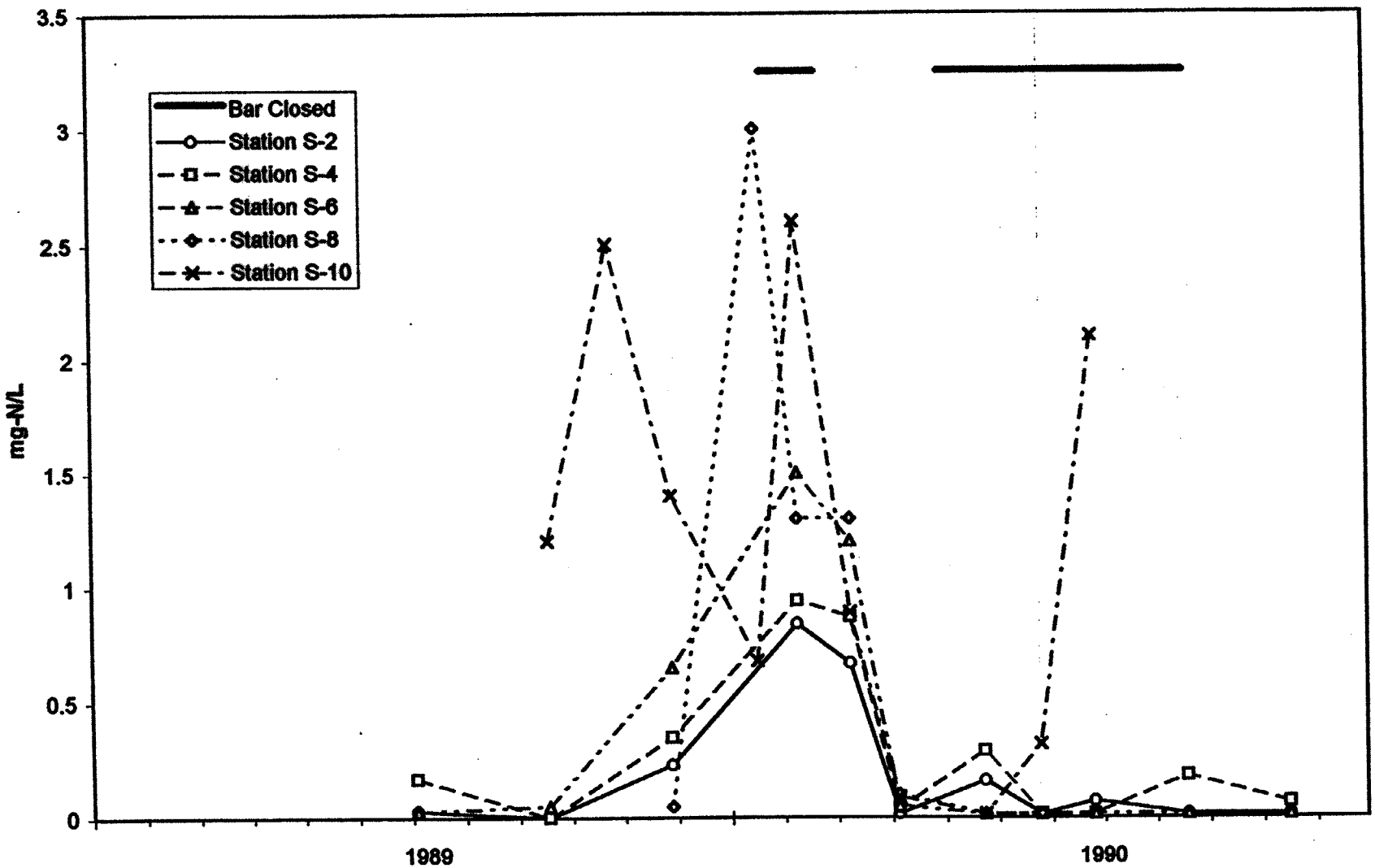


Figure WQ16. Un-ionized Ammonia
Stemple Creek

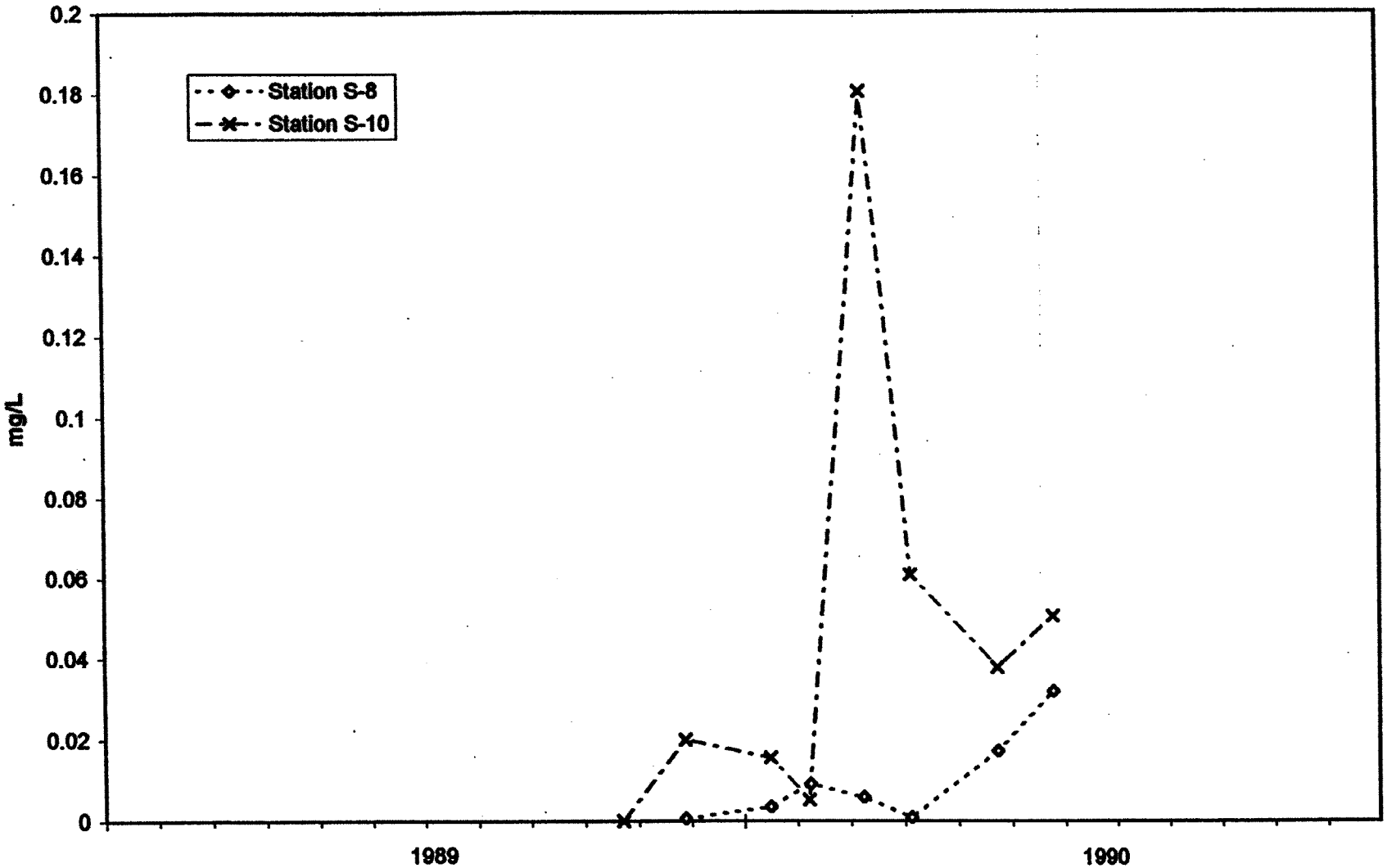
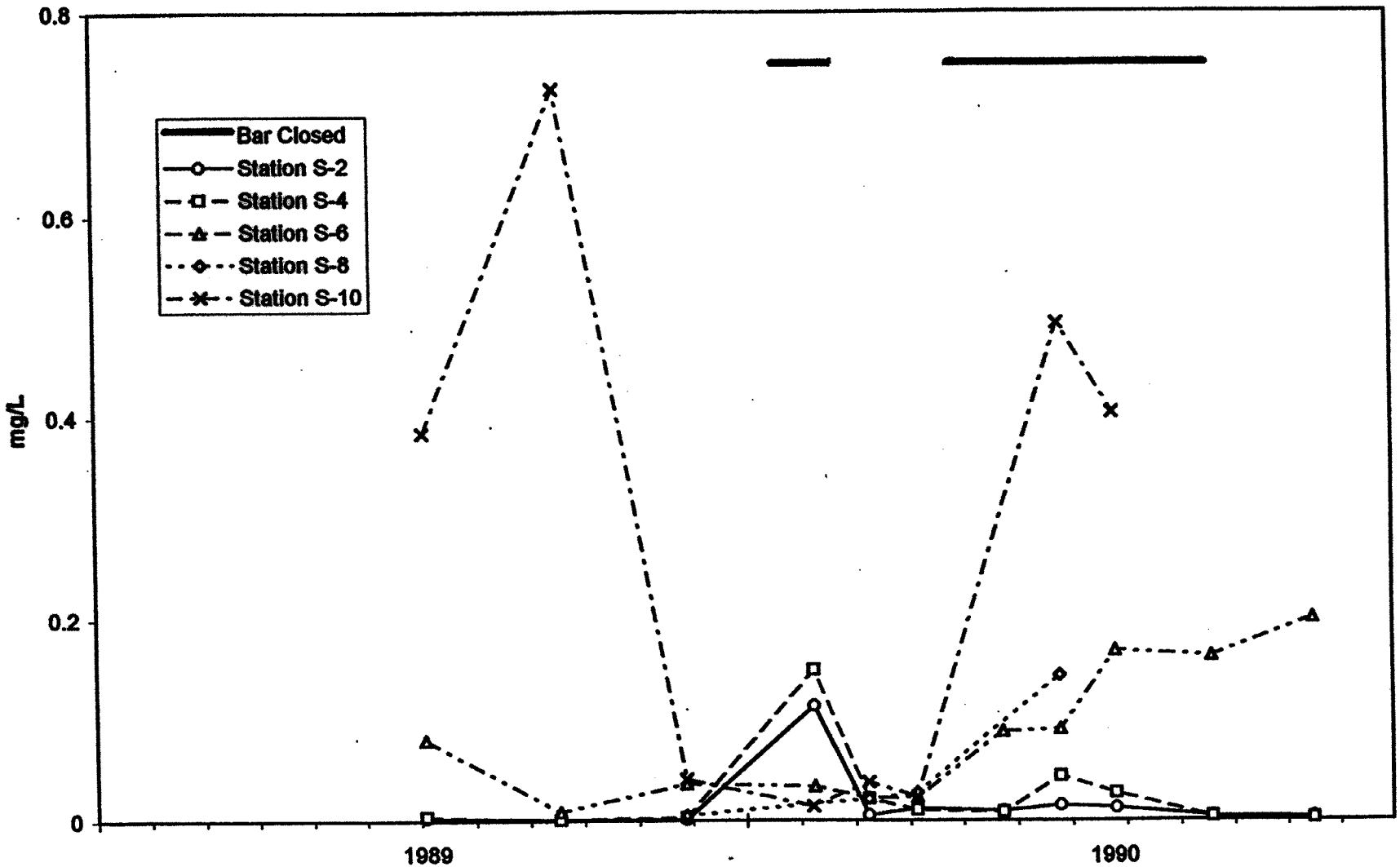


Figure WQ17. Chlorophyll *a*
Estero de San Antonio and Stemple Creek



ZOOPLANKTON AND FISH LARVAE FIGURES

Figure P1. Estero Americano: Zooplankton Invertebrate Diversity (Number of Taxa), 1988 -1990.

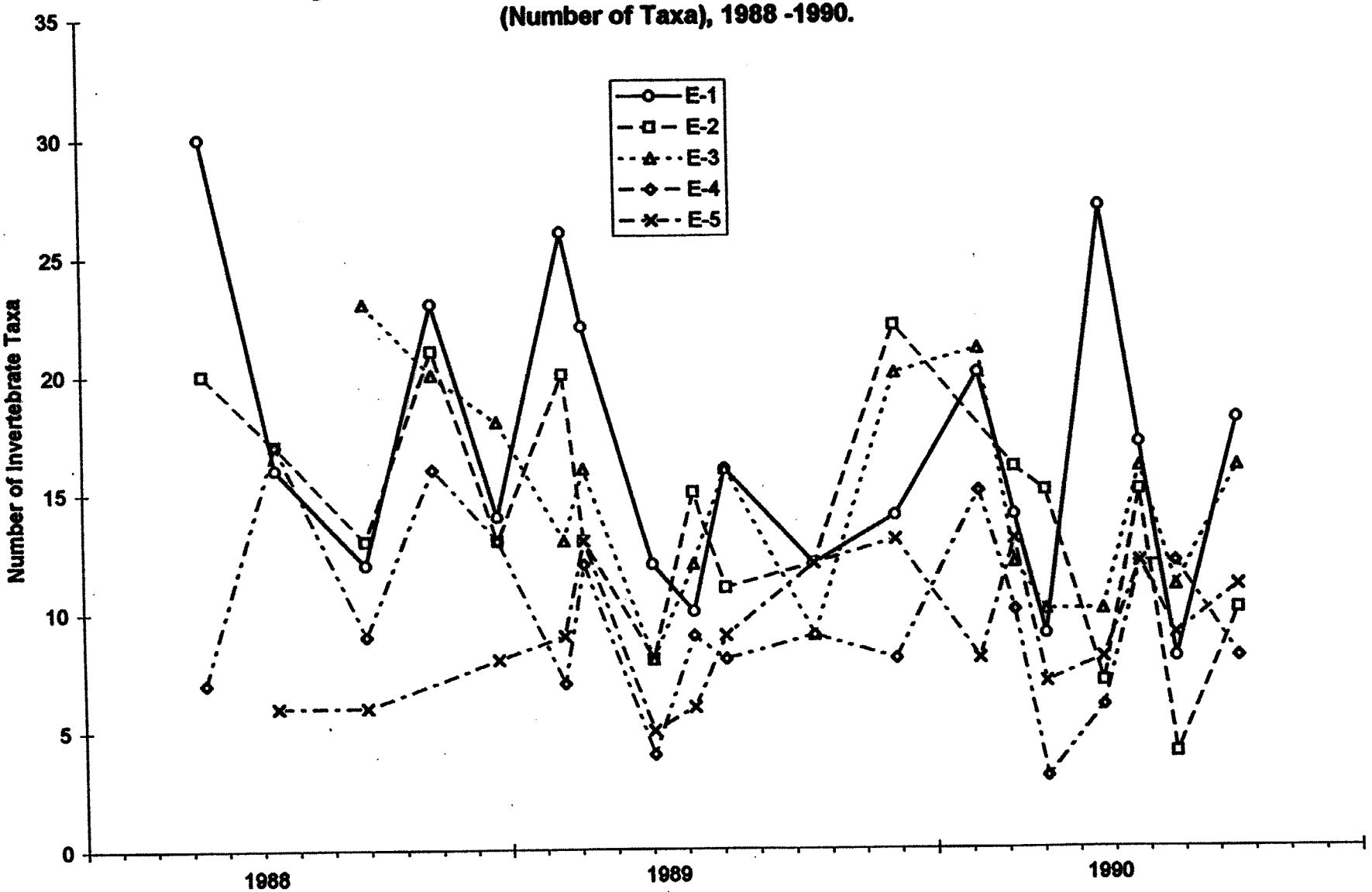


Figure P2. Estero Americano: Zooplankton Invertebrate Abundance, 1988 -1990.

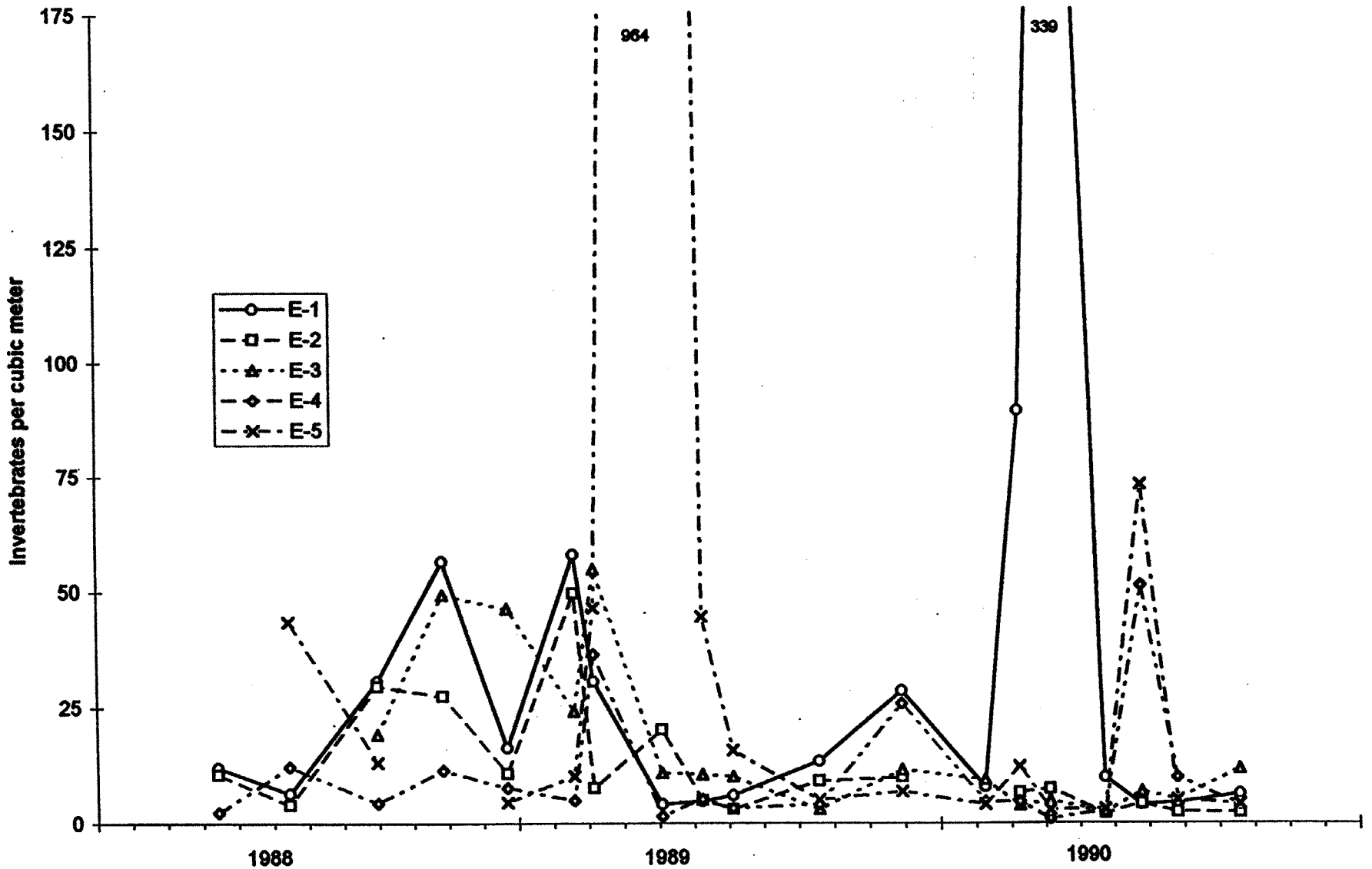


Figure P3. Estero Americano: Larval Fish Diversity (Number of Taxa), 1988 -1990.

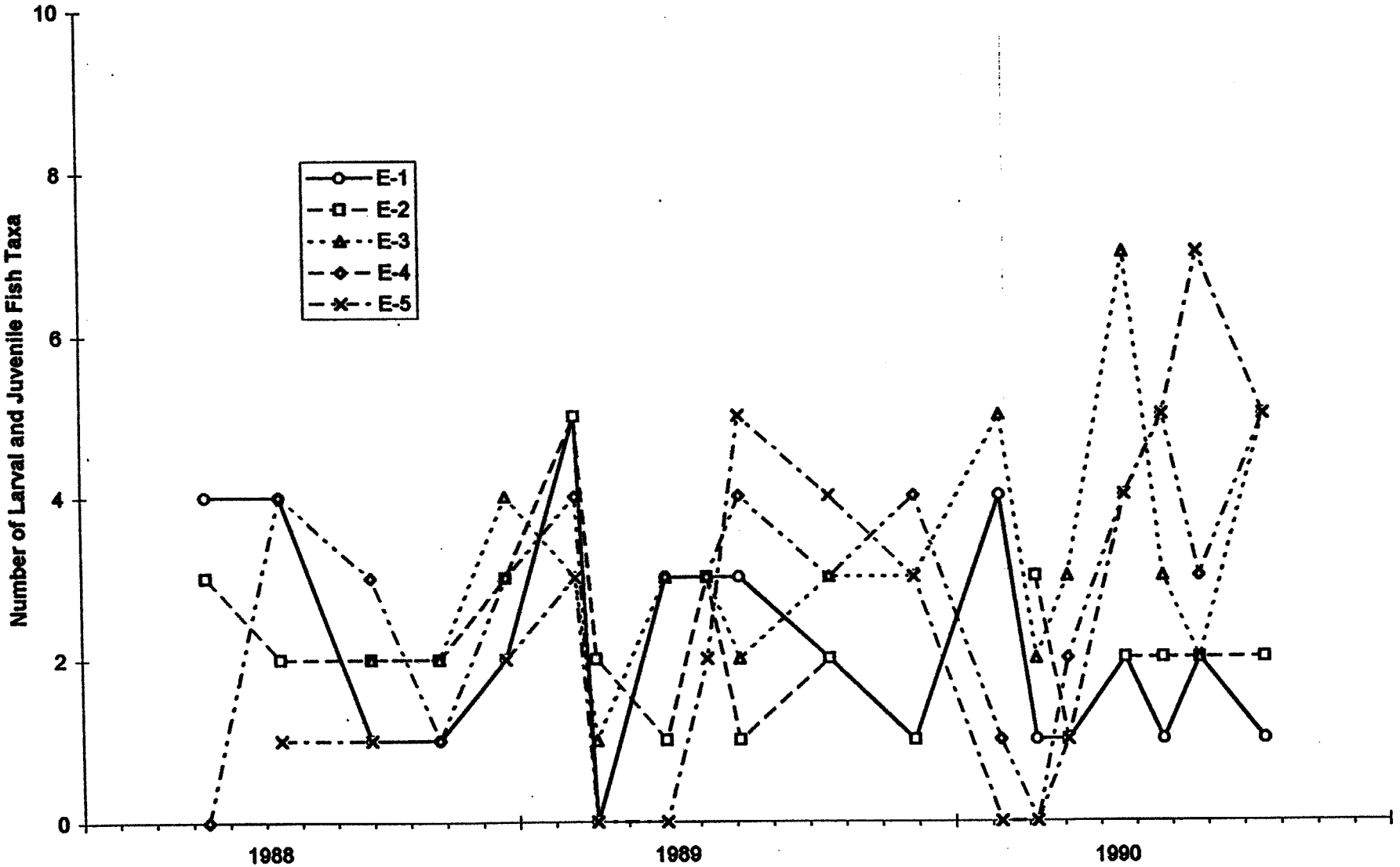


Figure P4. Estero Americano: Larval Fish Abundance, 1988 -1990.

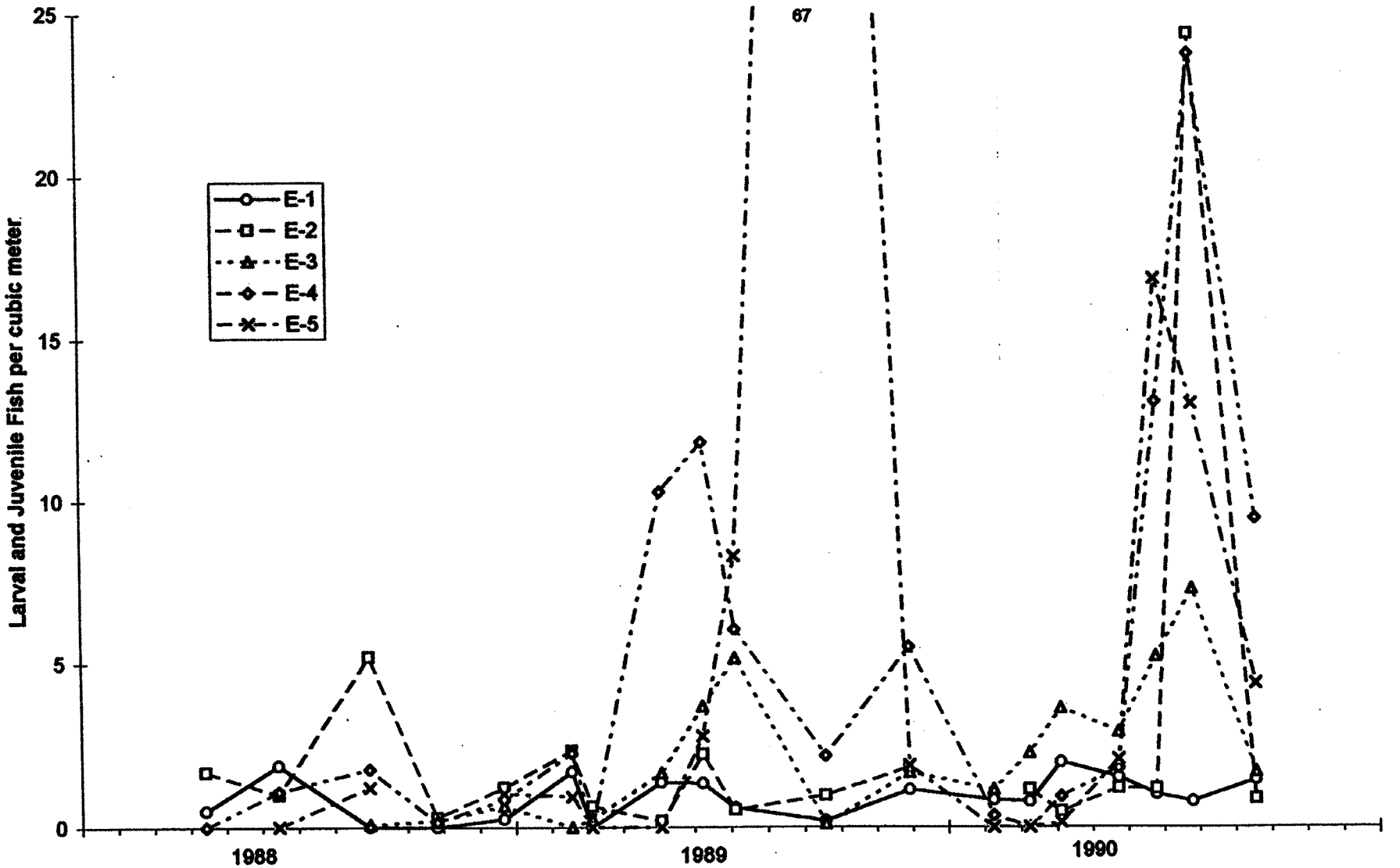


Figure P5. Estero de San Antonio: Zooplankton Invertebrate Diversity (Number of Taxa), 1988 -1990.

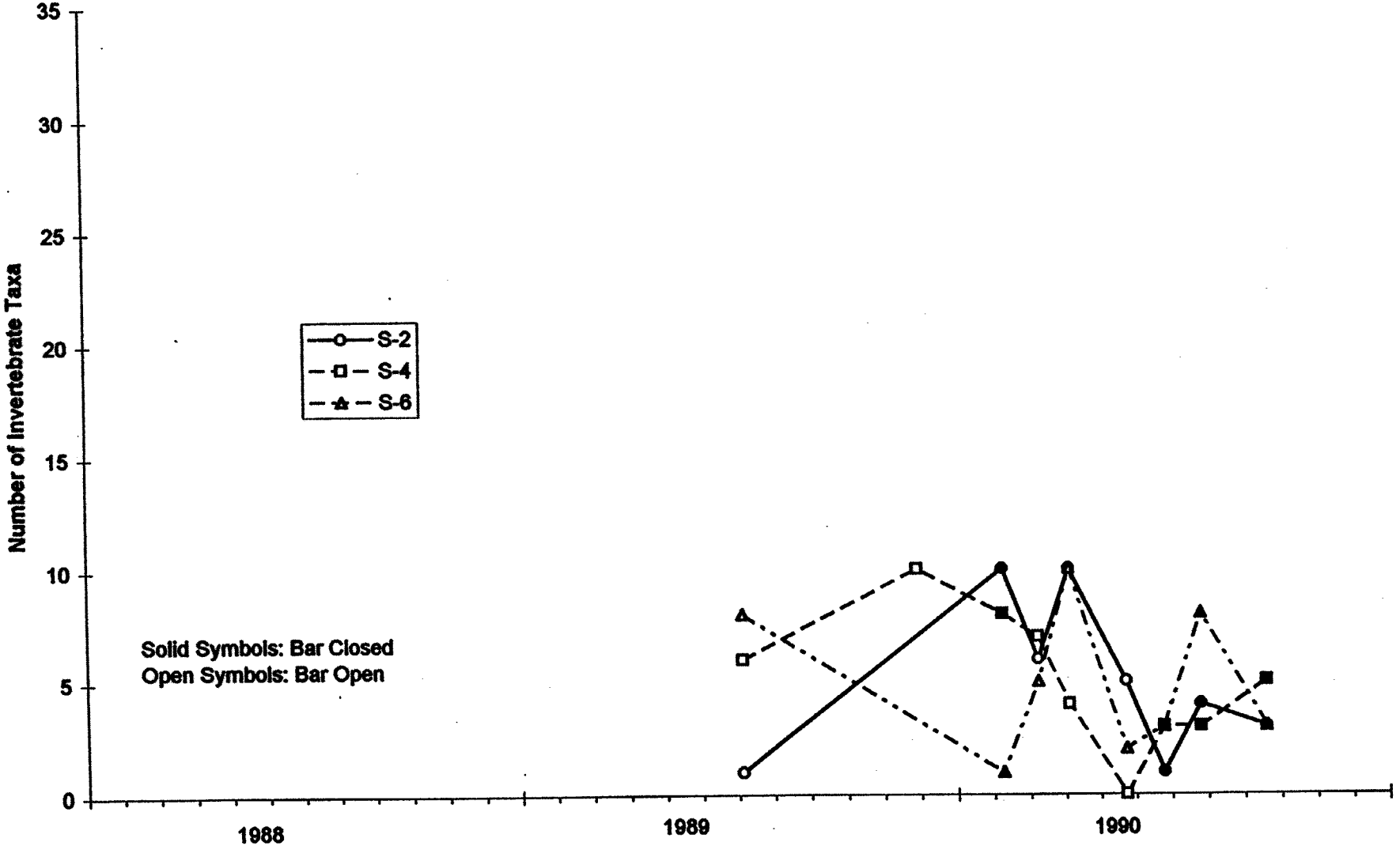


Figure P6. Estero de San Antonio: Zooplankton Invertebrate Abundance, 1989 -1990

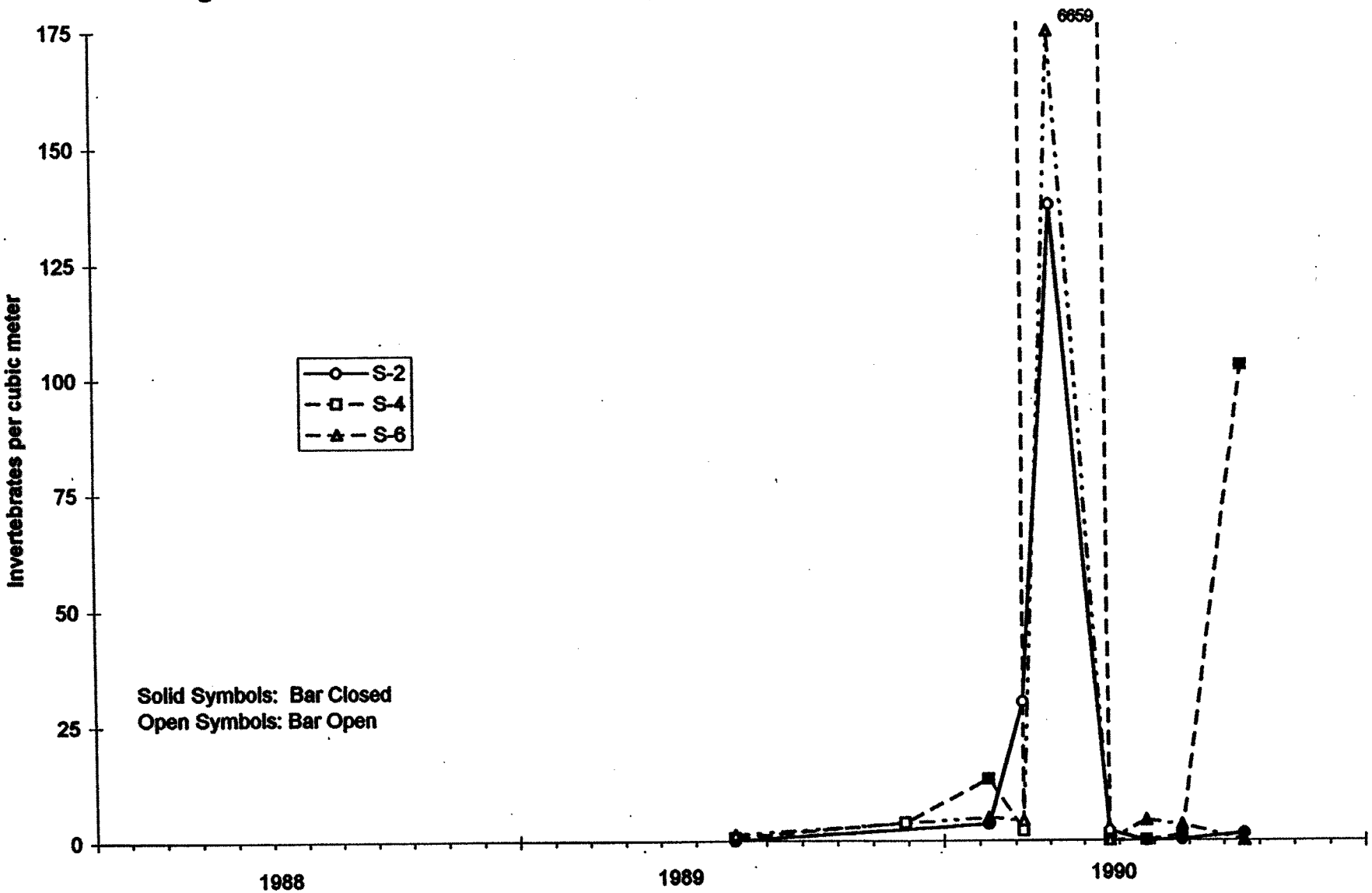


Figure P7. Composition of Estero Zooplankton.

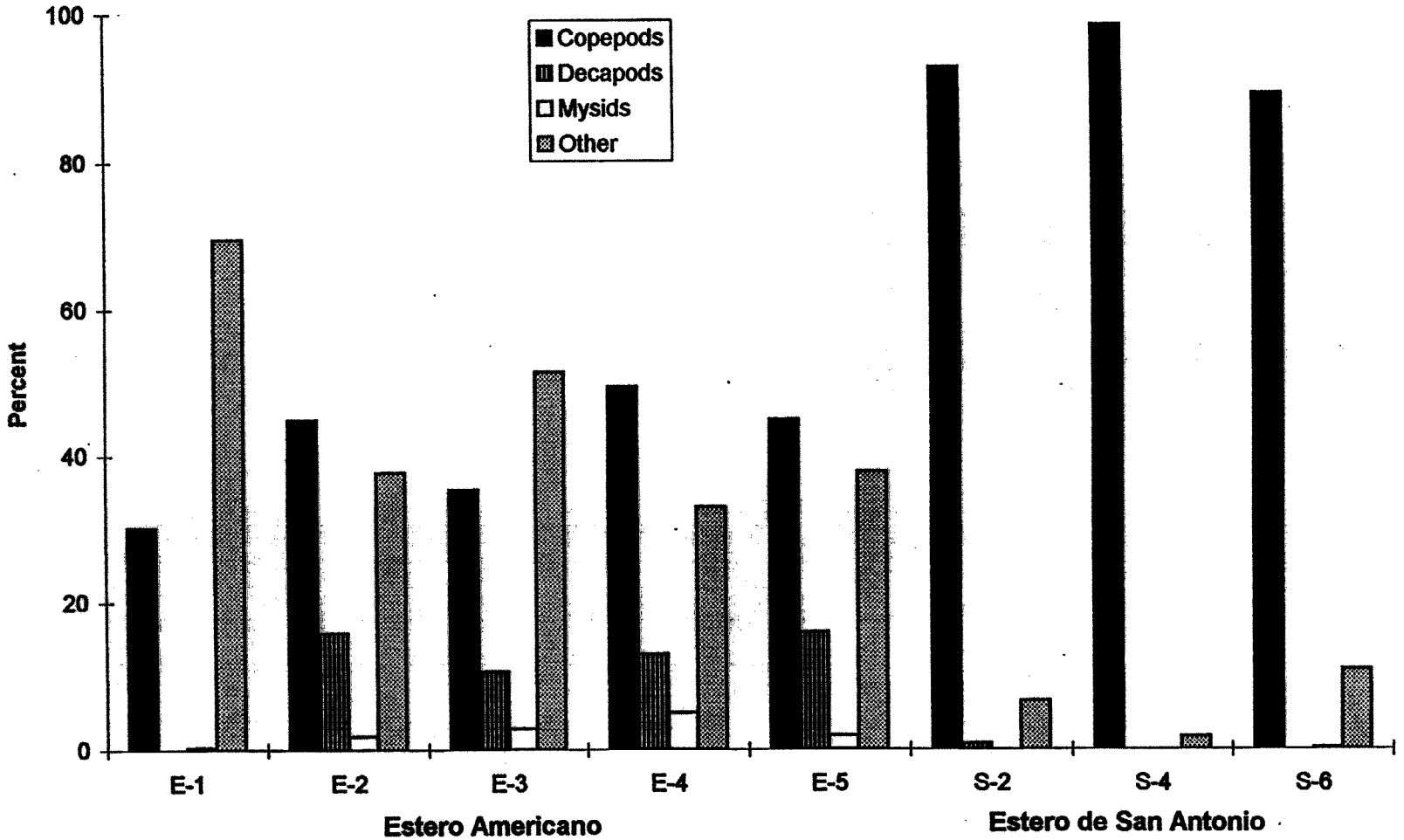


Figure P8. Estero de San Antonio: Bar Closure versus Zooplankton Diversity.

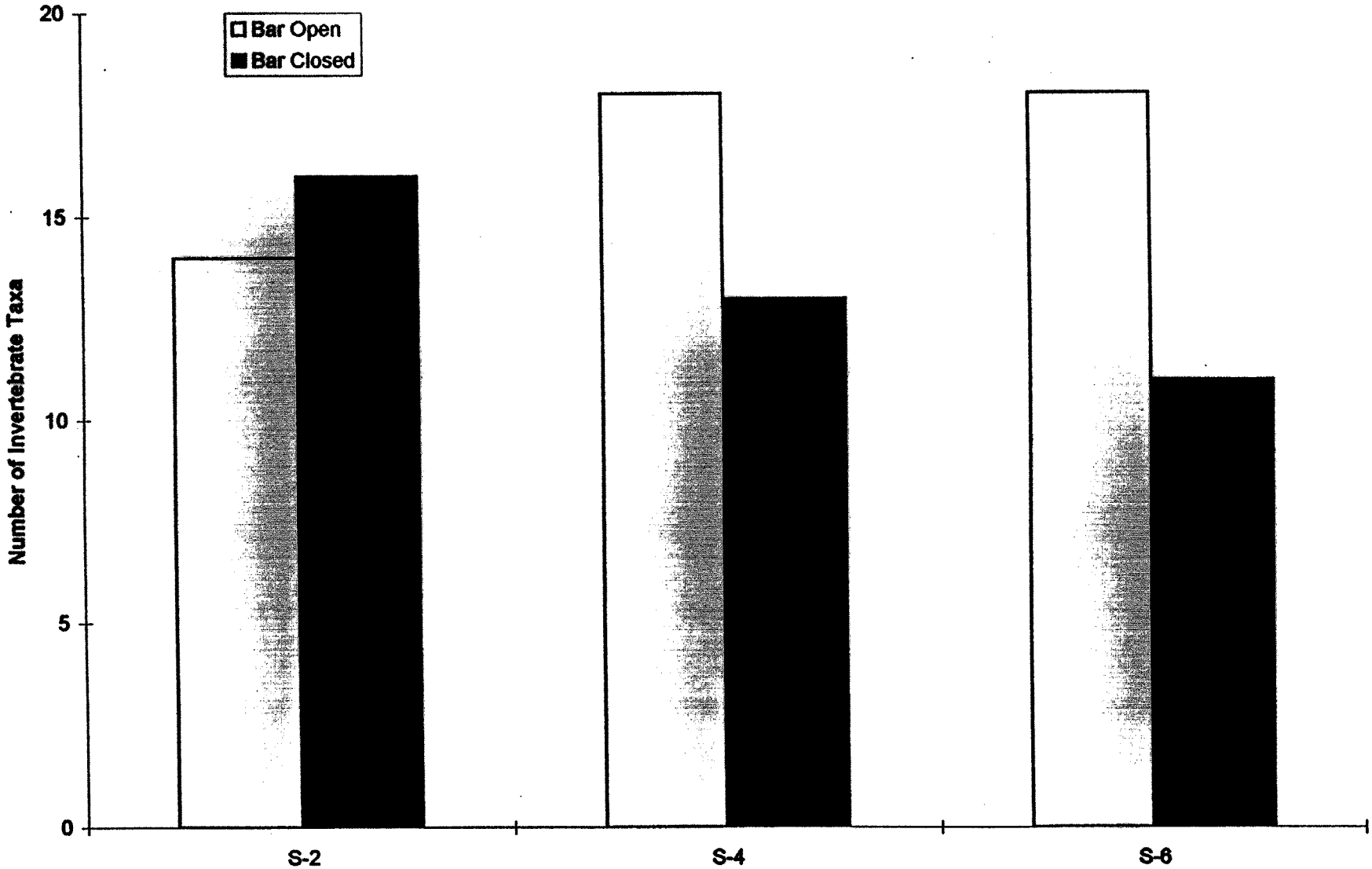


Figure P9. Estero de San Antonio: Bar Closure versus Zooplankton Abundance.

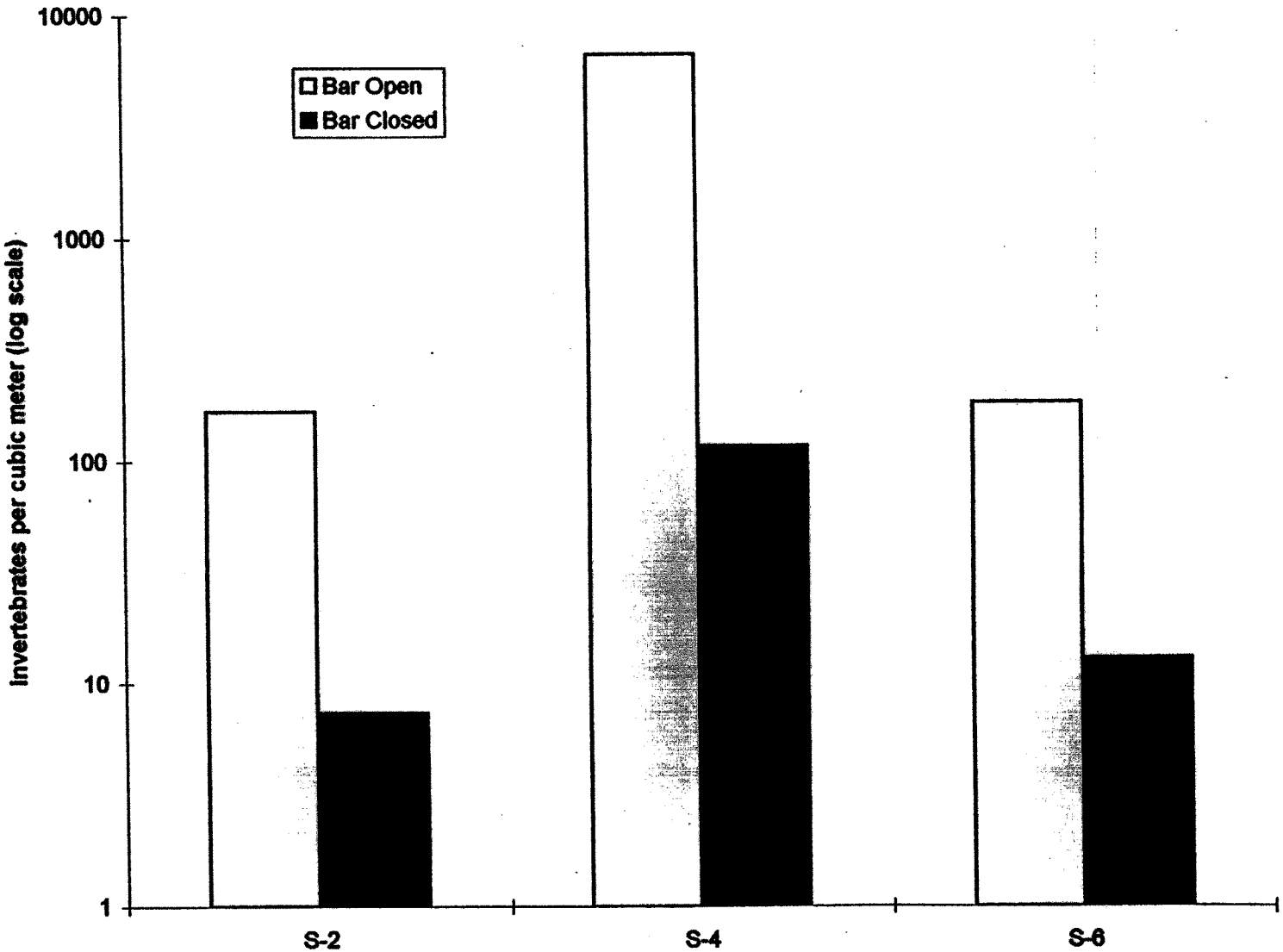


Figure P10. Estero de San Antonio: Larval Fish Diversity (Number of Taxa), 1988 -1990.

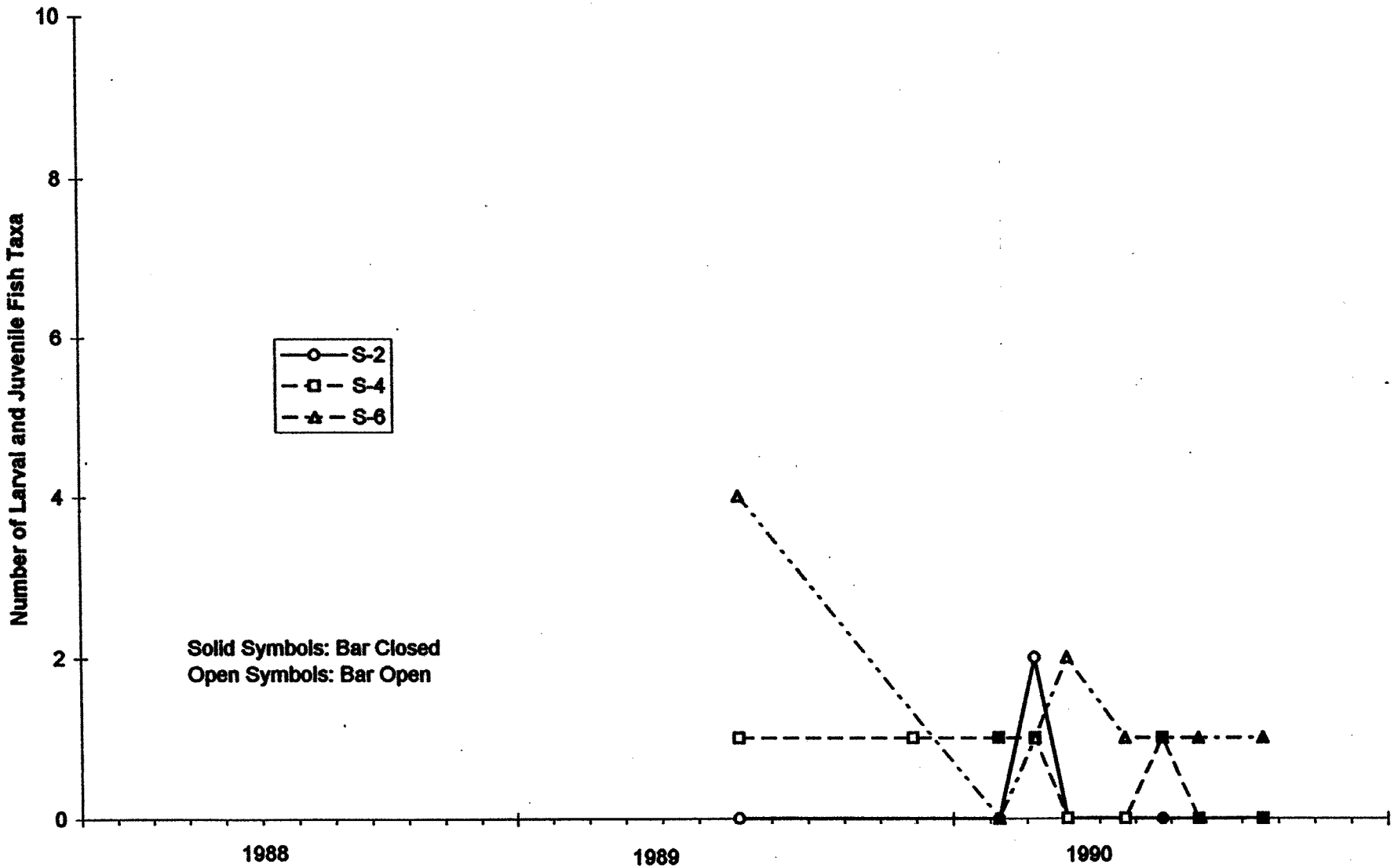
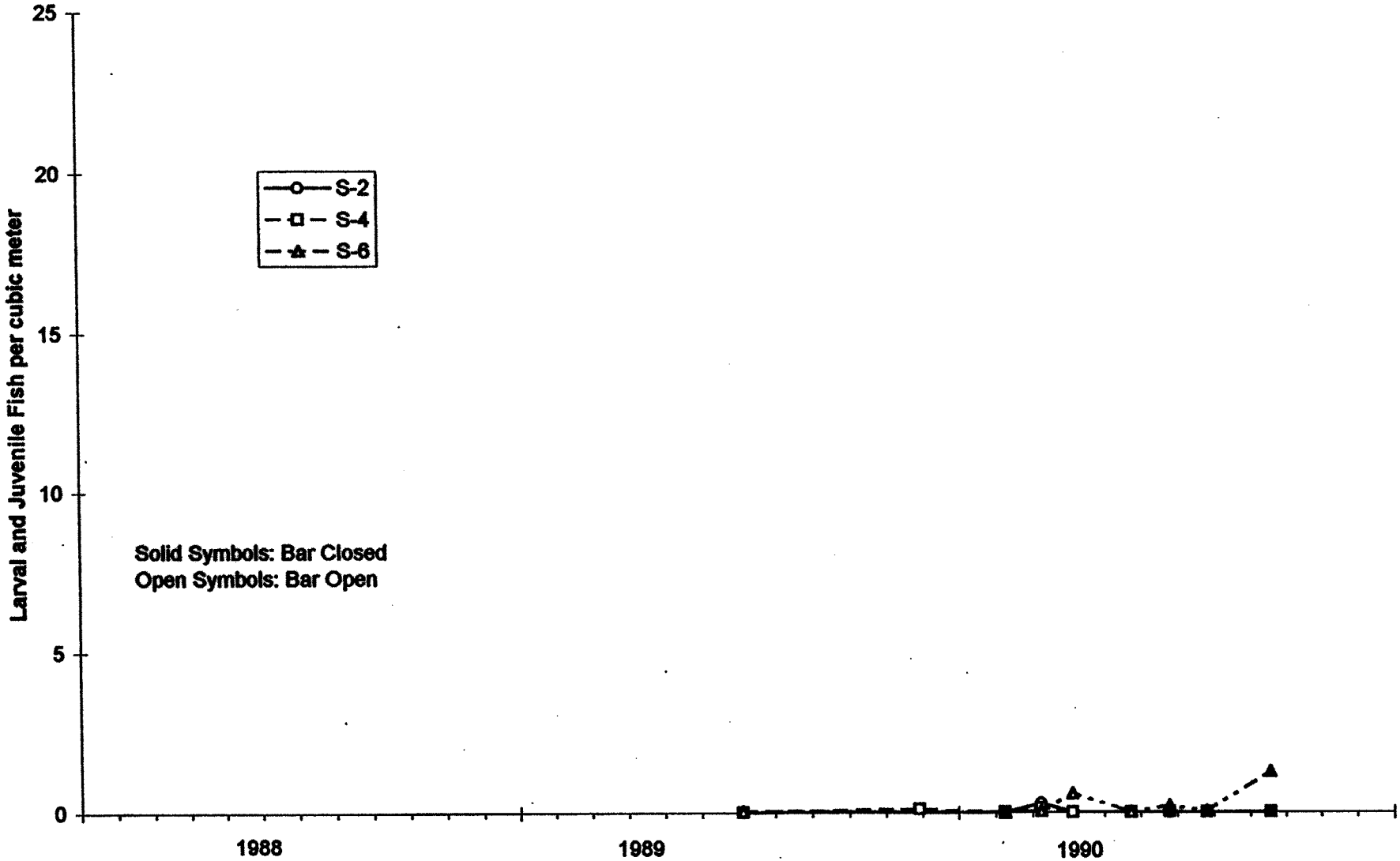


Figure P11. Estero de San Antonio: Larval Fish Abundance, 1988 -1990.



NEKTON/EPIBENTHIC INVERTEBRATE FIGURES

Figure E1. Mean Number of Species of Epibenthic Invertebrates Collected in Otter Trawls in Estero Americano, 1988-1990.

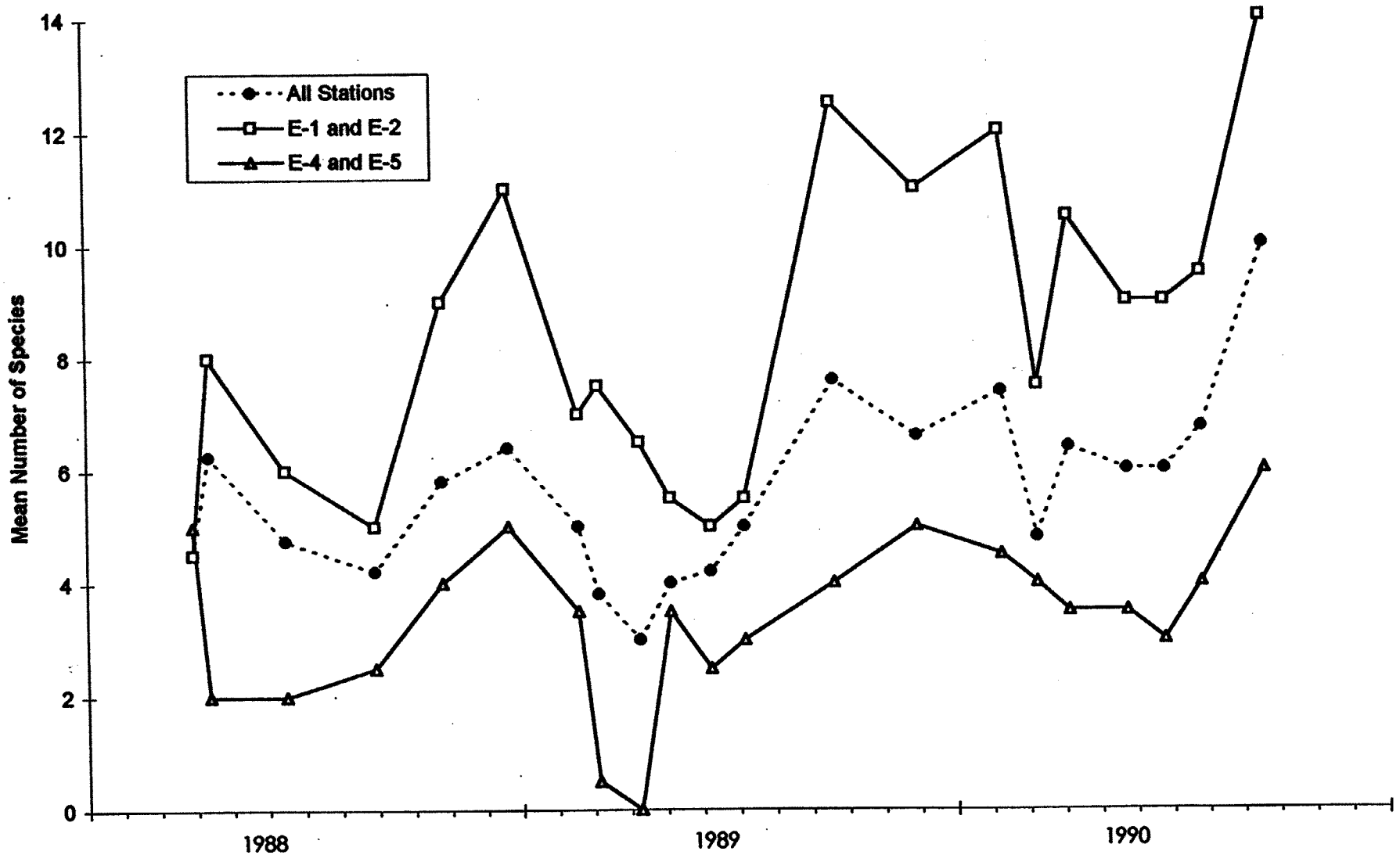
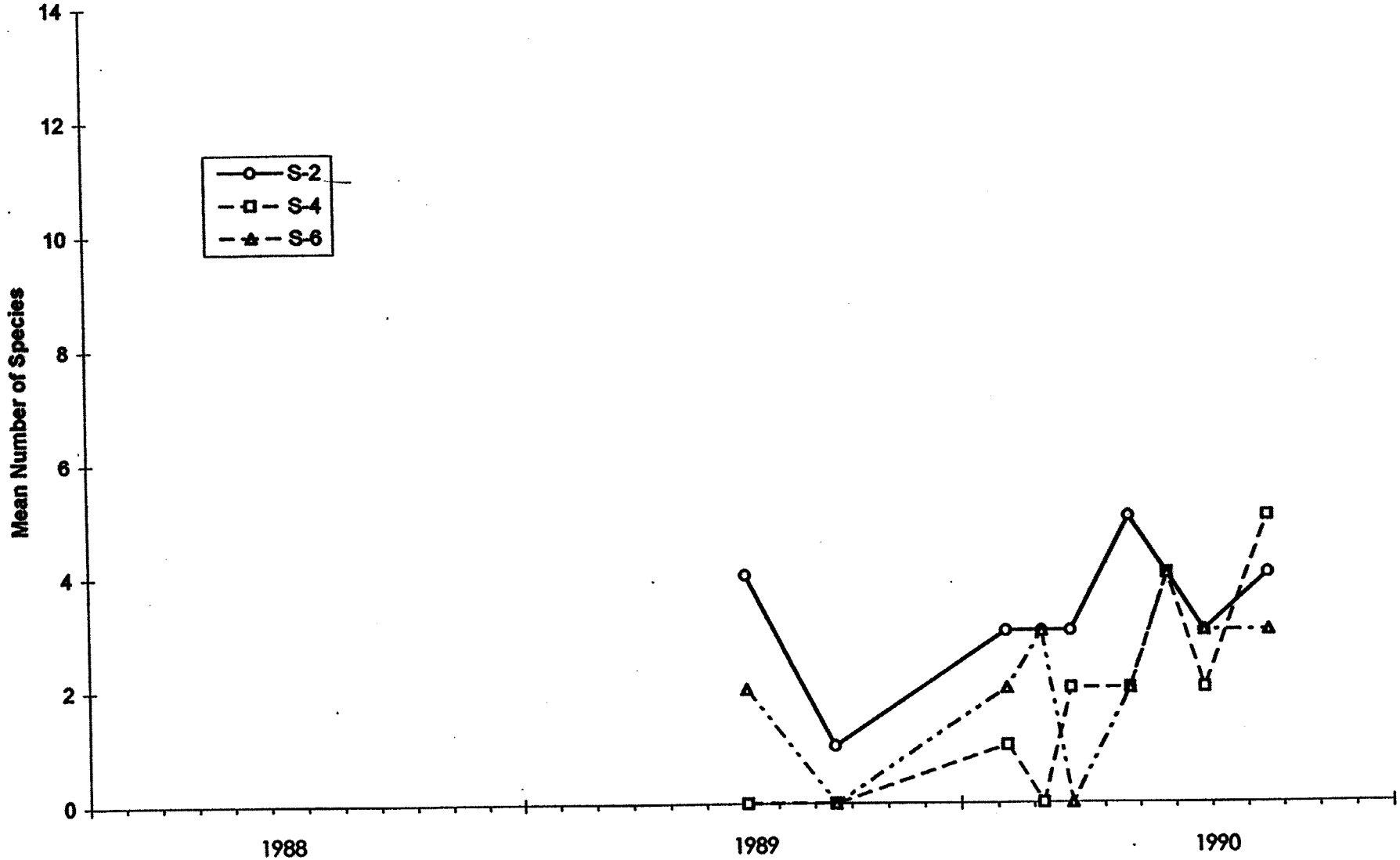


Figure E2. Mean Number of Species of Epibenthic Invertebrates Collected in Otter Trawls in Estero de San Antonio, 1989-1990.



BENTHIC INVERTEBRATE FIGURES

Figure B1. Estero Americano Benthic Invertebrates: Mean Number of Species.

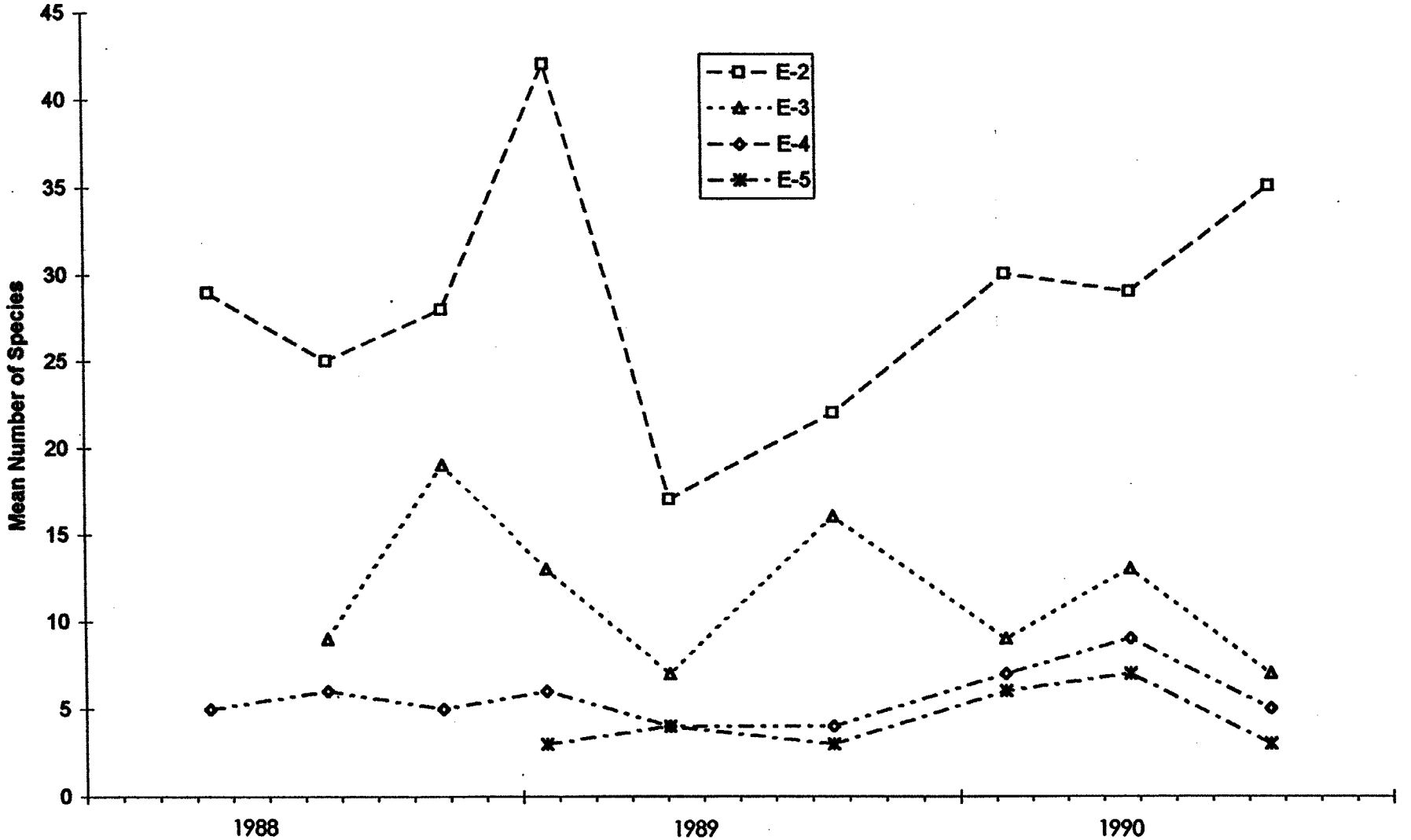


Figure B2. Estero Americano Benthic Invertebrates:
Mean Number of Species and Mean Number per Square Meter.

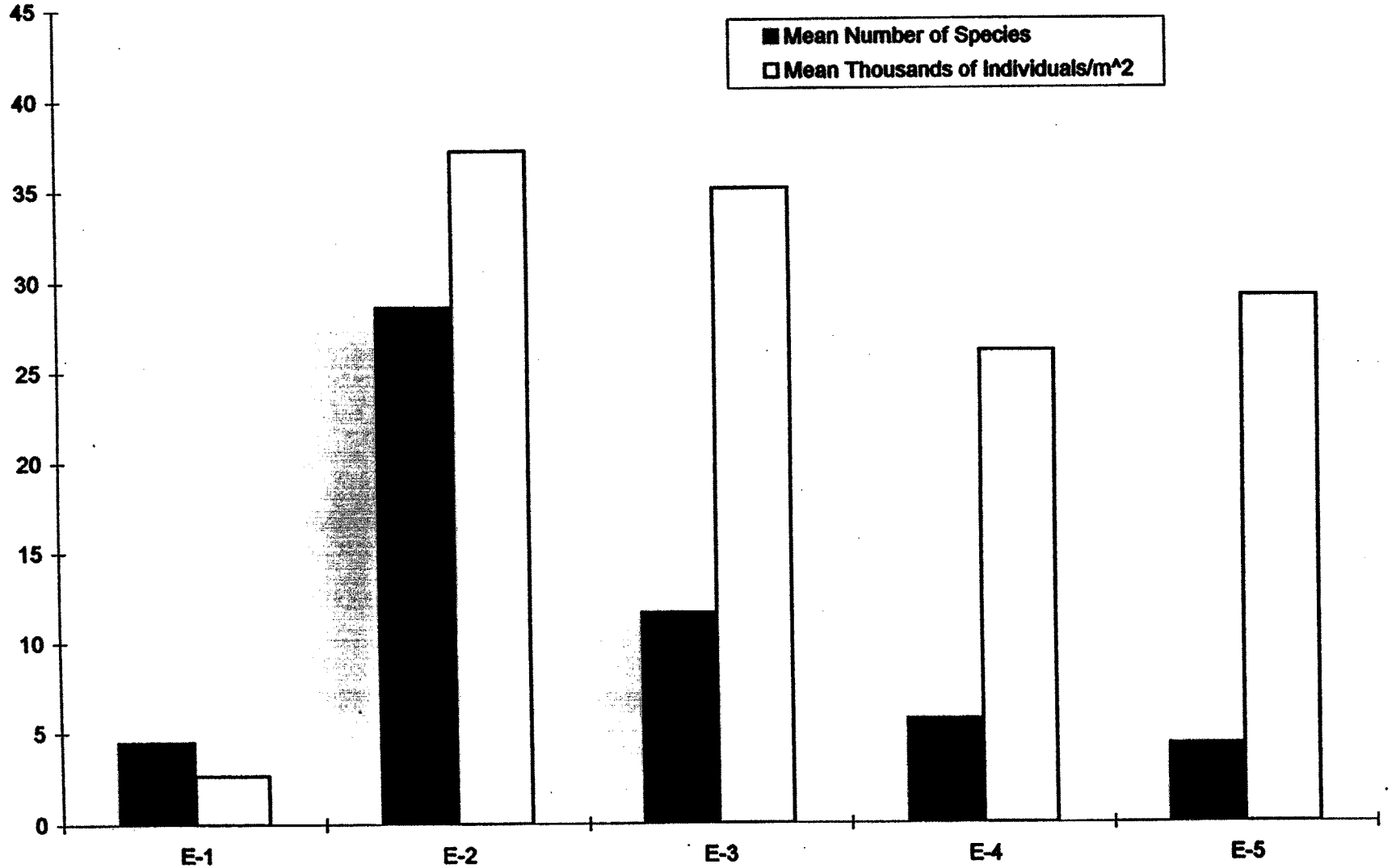


Figure B3. Estero de San Antonio Benthic Invertebrates: Mean Number of Species and Mean Number per Square Meter.

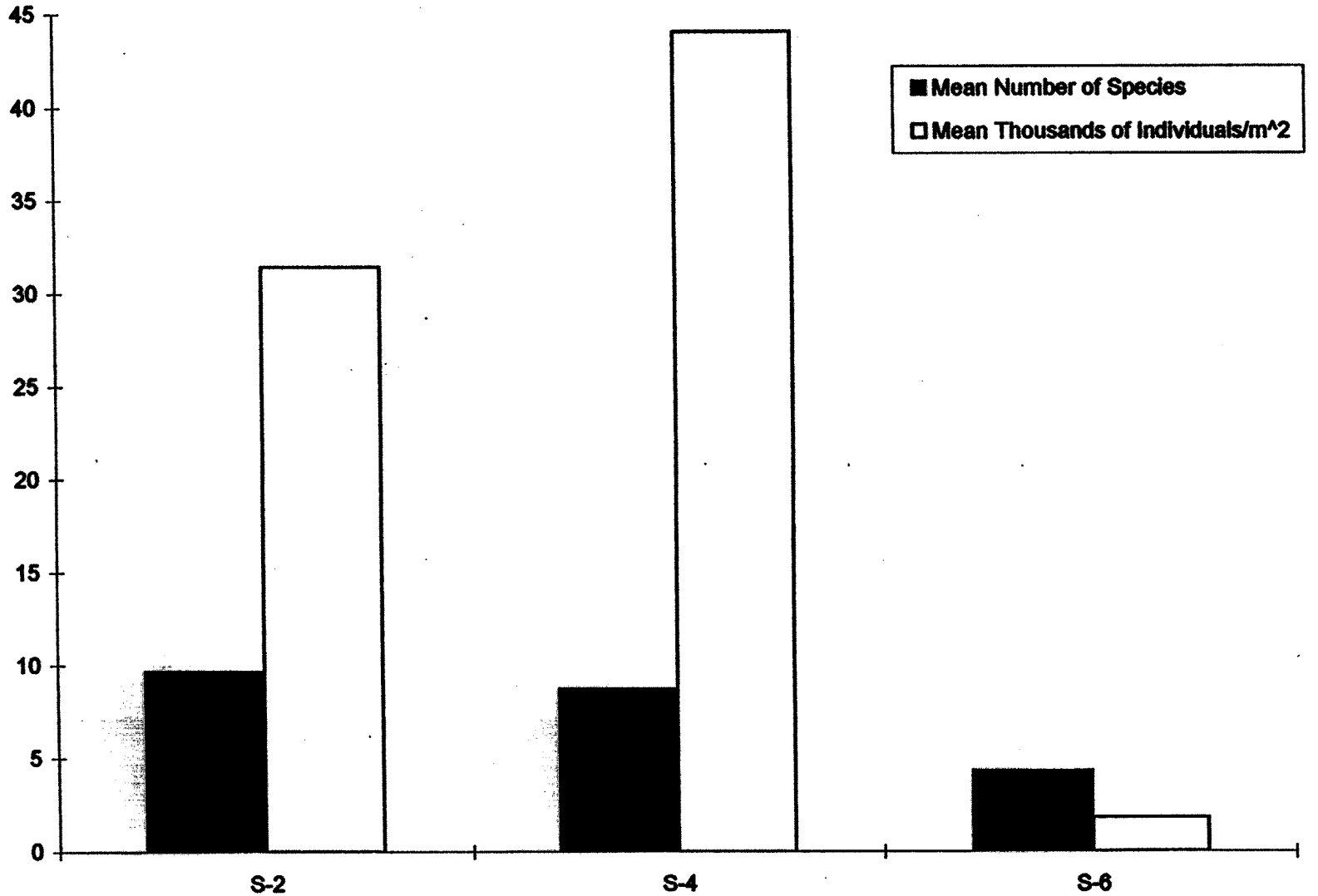
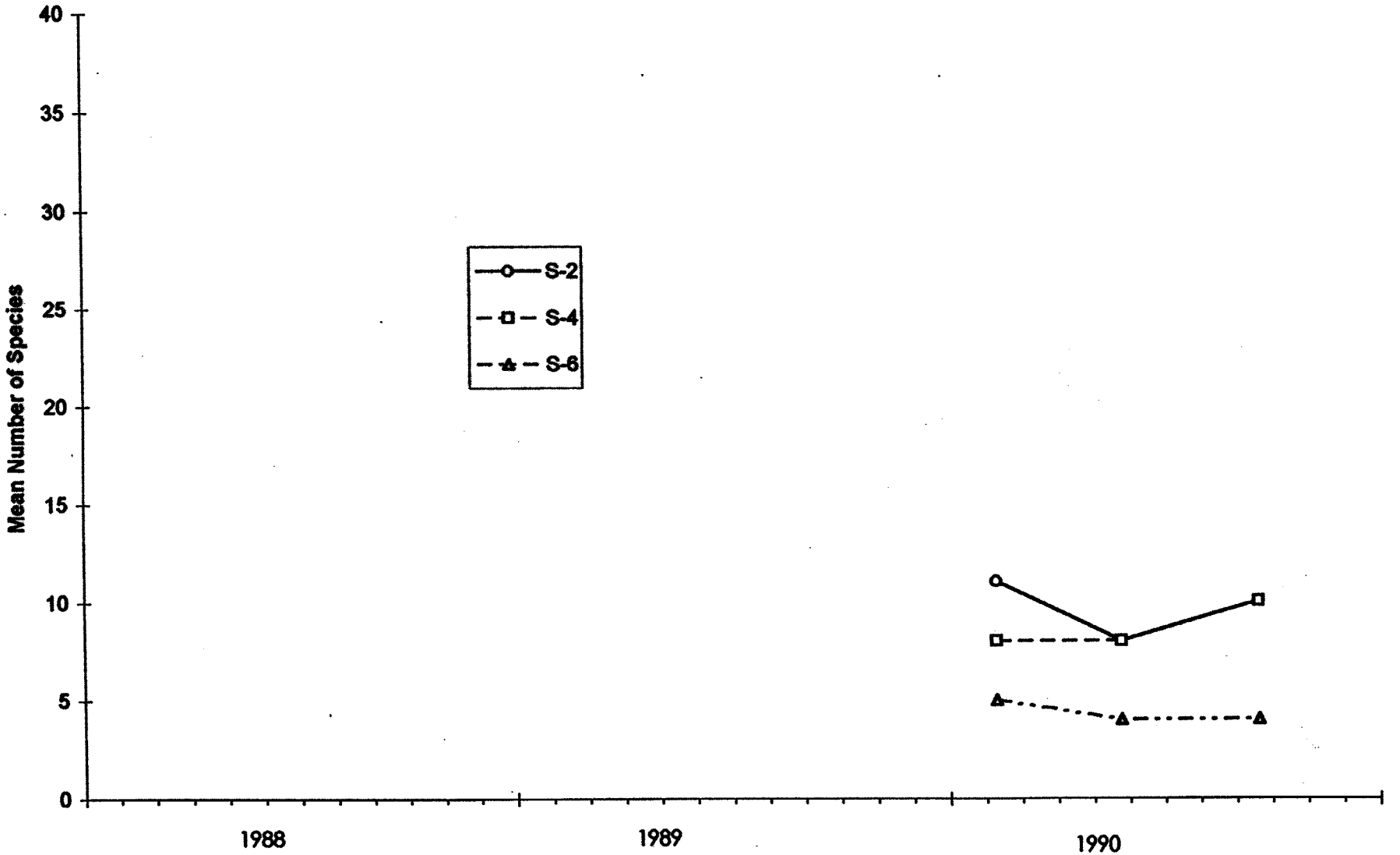


Figure B4. Estero de San Antonio Benthic Invertebrates: Mean Number of Species.



FISH FIGURES

Figure F1.
Estero Americano:
Otter Trawl Catch (All Species), November 1989 - September 1990

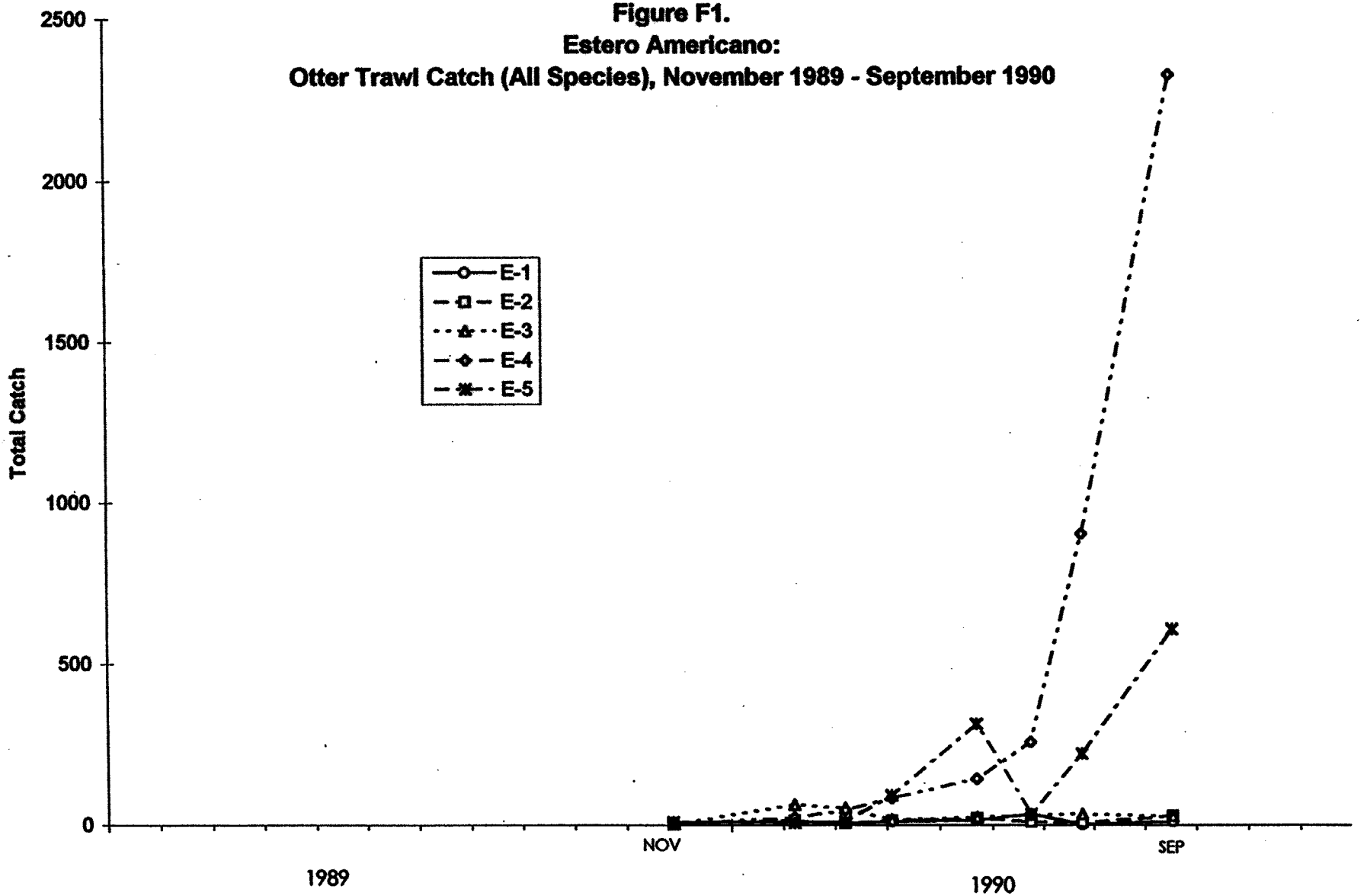


Figure F2.
Estero Americano:
Gillnet Catch (All Species), November 1989 - September 1990

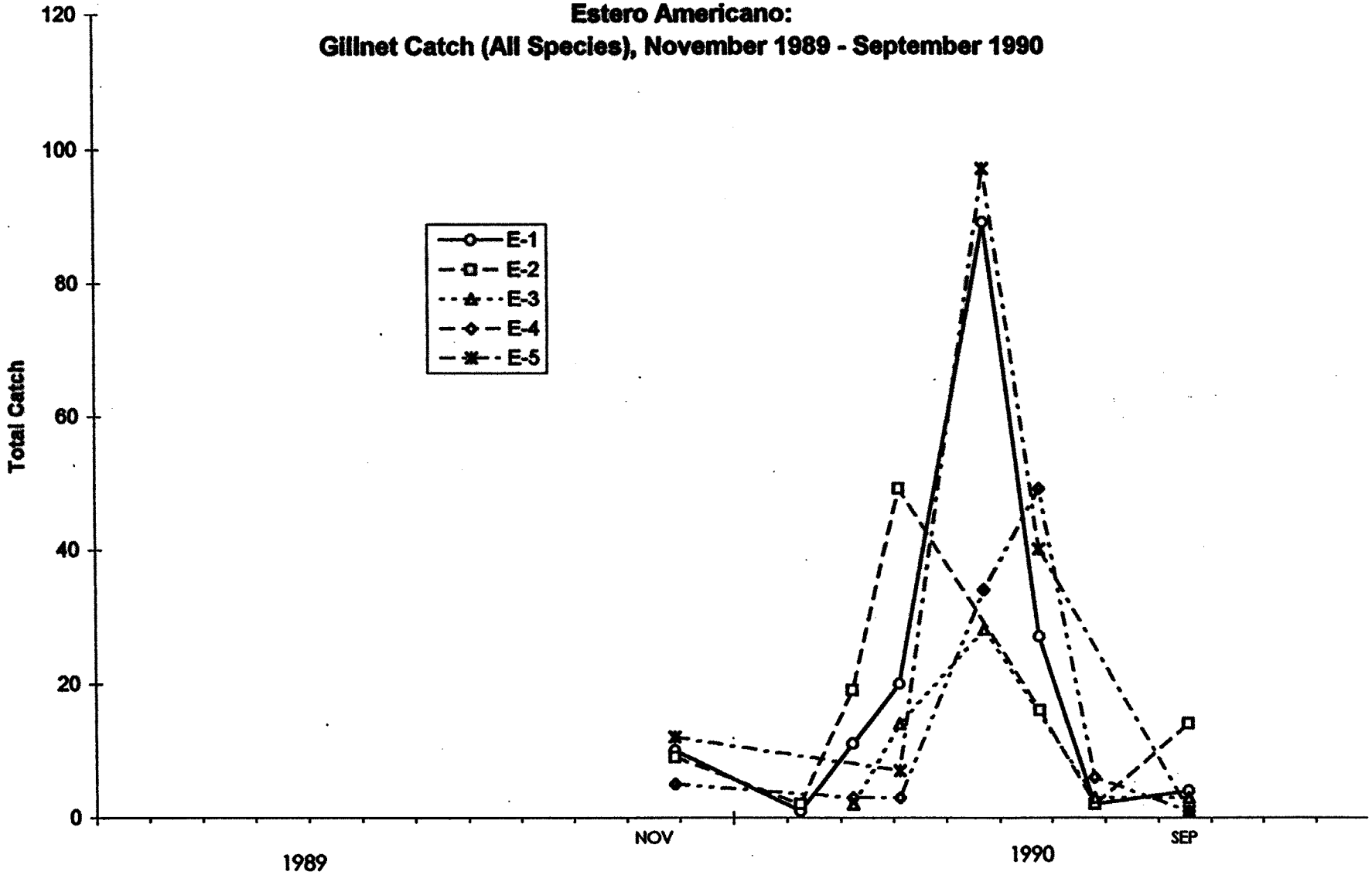


Figure F3.
Estero de San Antonio:
Otter Trawl Catch (All Species), February - September 1990

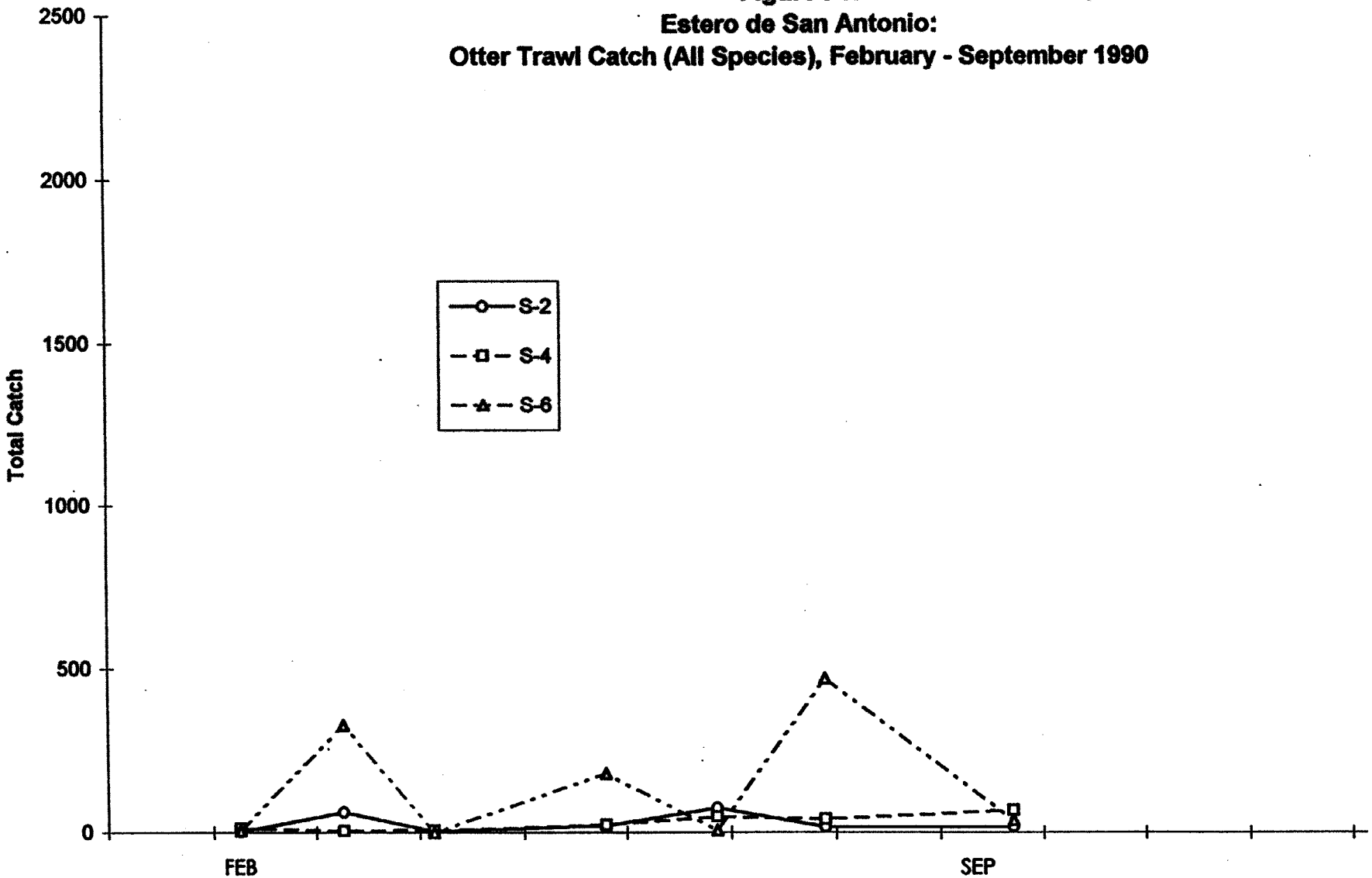


Figure F3.
Estero de San Antonio:
Otter Trawl Catch (All Species), February - September 1990

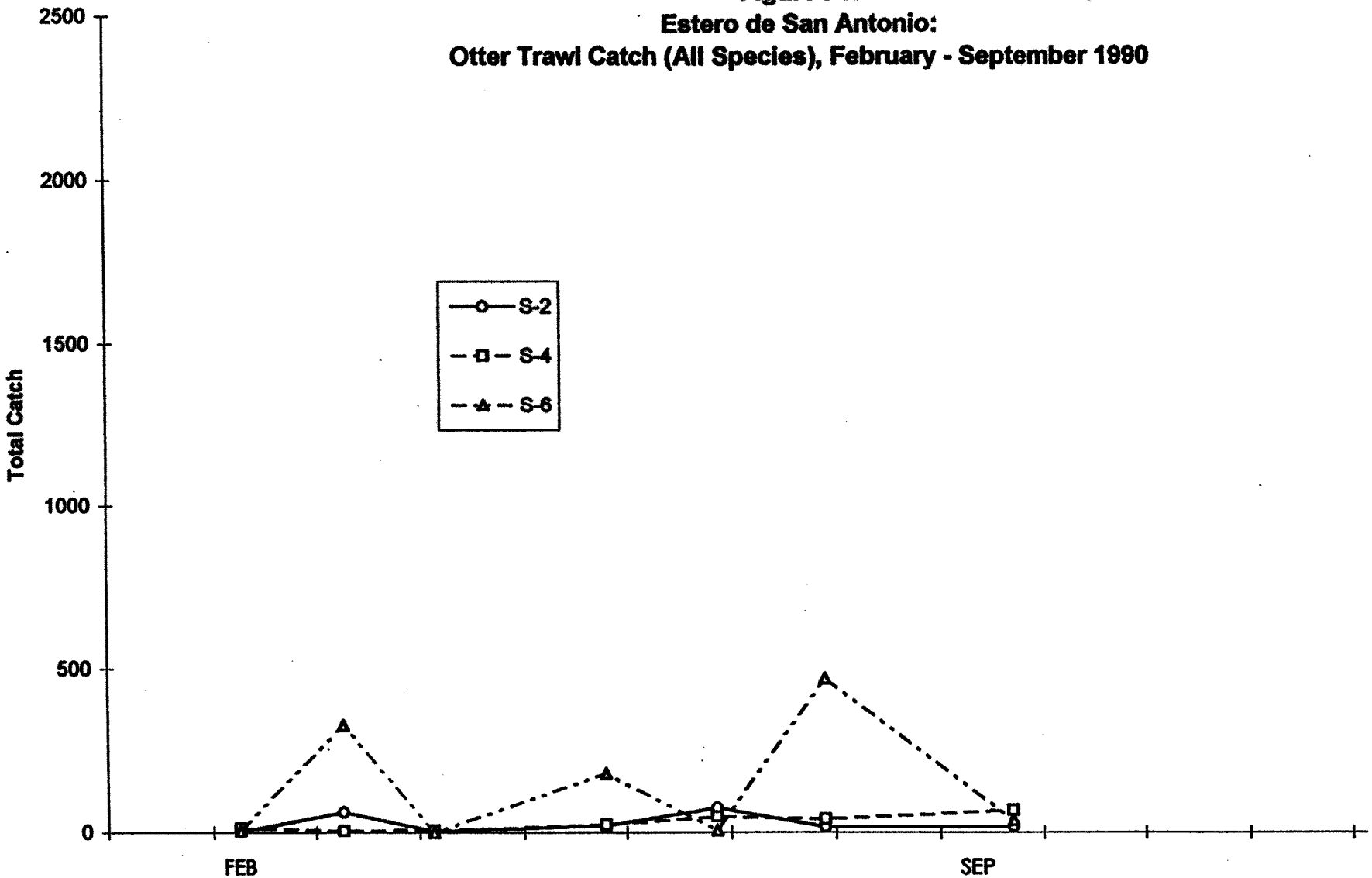


Figure F4.
Estero de San Antonio:
Gillnet Catch (All Species), February - September 1990

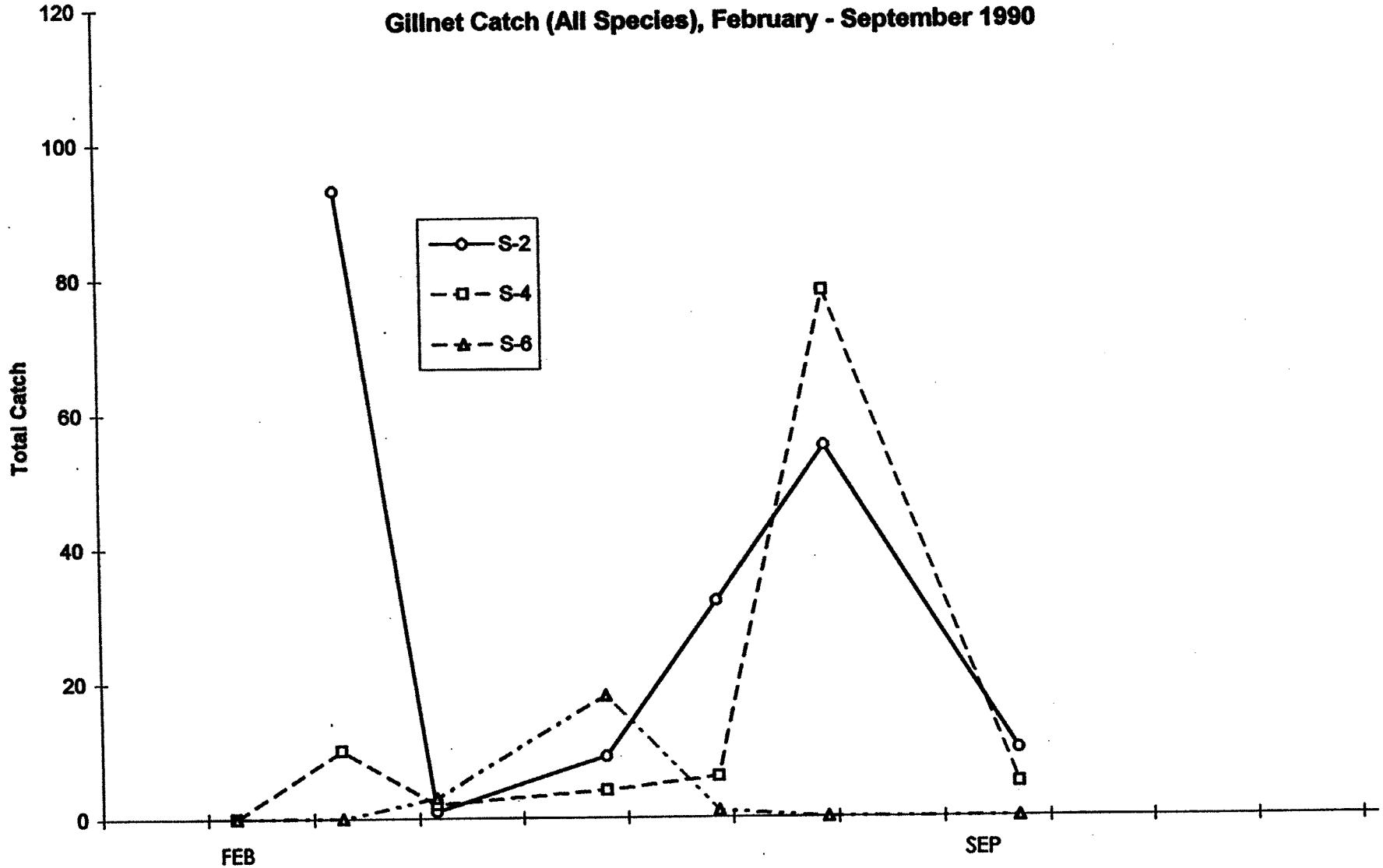


Figure F5.
Estero de San Antonio: Total Catch (All Species) in Otter Trawls, July 1989 - September 1990.
Solid symbols: bar closed; Open symbols: bar open.

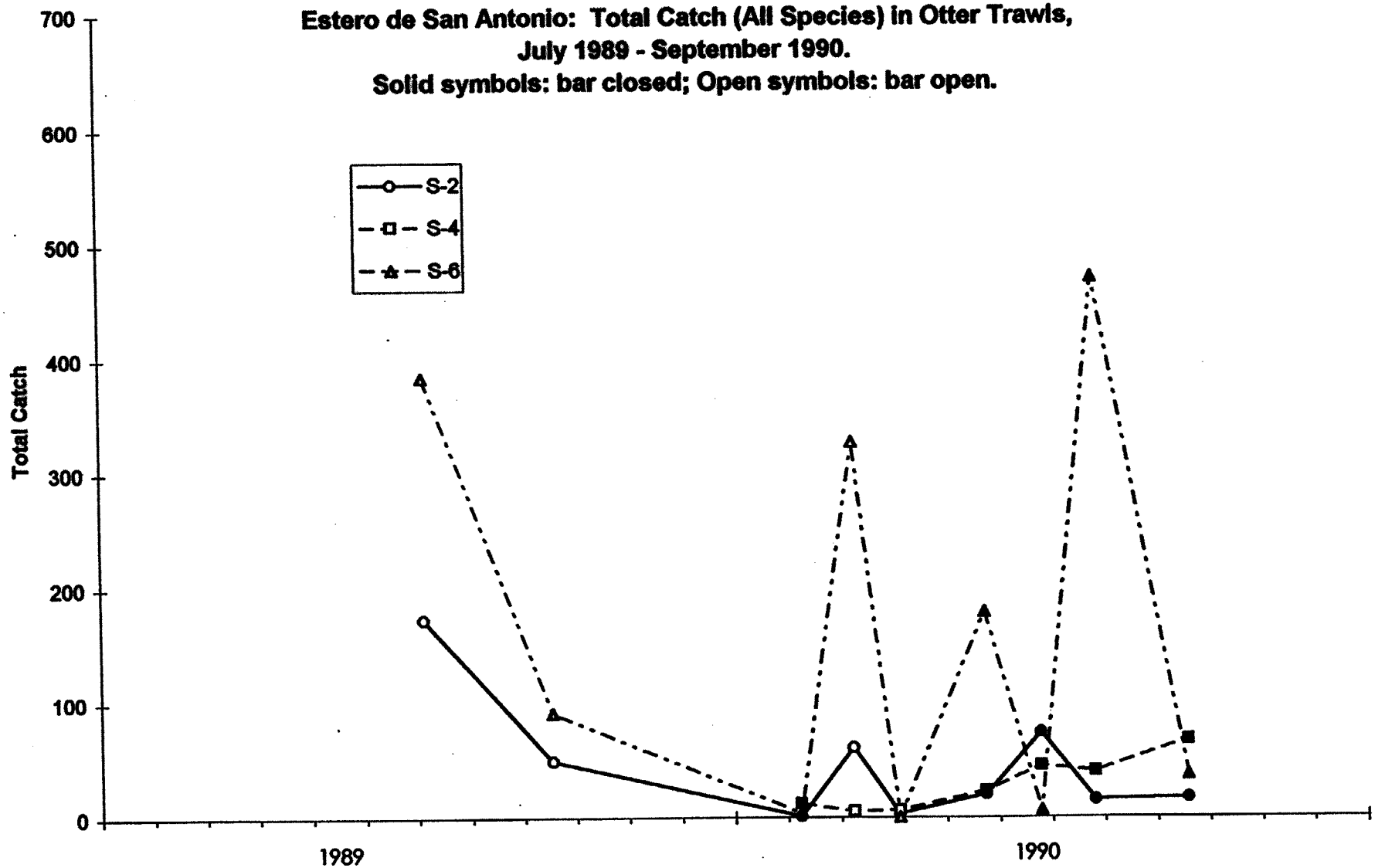
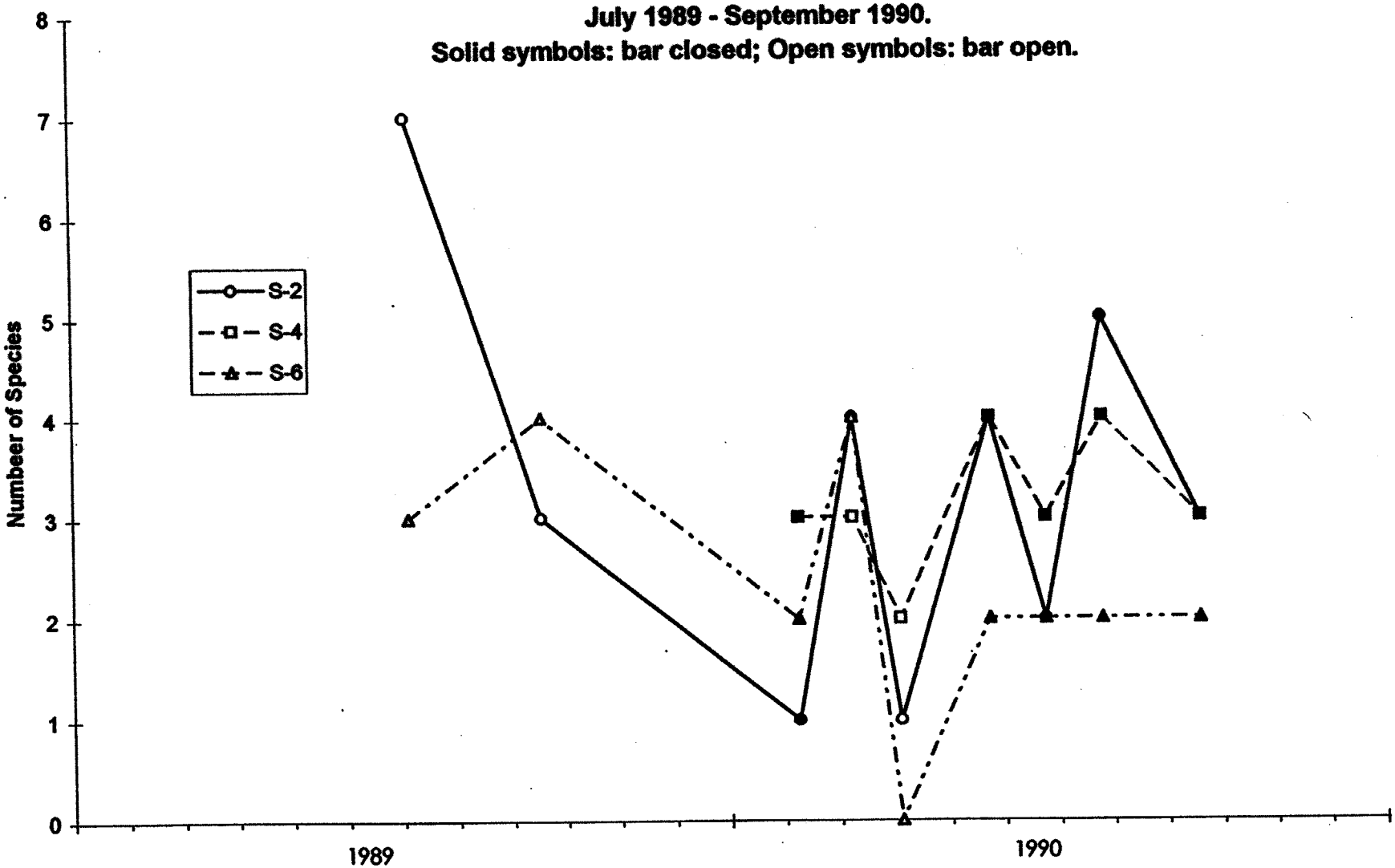


Figure F6.
Estero de San Antonio:
Number of Fish Species in Otter Trawls,
July 1989 - September 1990.
Solid symbols: bar closed; Open symbols: bar open.



WATER QUALITY APPENDIX

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

* indicates value below MDL, number to left is one half MDL
ND = Non Detectable

Station	Date	Temp. °C	Salinity ppt	Conduct.	DO ppm	pH	Turbid. FTU	Secchi cm	Chla mg/L	F Coli MPN/100ml	TDS	TSS	TOC	NO3 mg-N/L	NH3 mg-N/L
E-1	29-Feb-88	12	27		9.0			30.5		>16				0.05 *	0.05 *
E-1	30-Mar-88	10.5	32		8.5			70	0.0823		NR			0.05 *	ND
E-1	14-Apr-88	12	32		9.5			137	0.2432					ND	ND
E-1	16-May-88	15.2	33.5		11.2	7.55	3.7	137	0.047124	<2	NR			0.015 *	0.06
E-1	15-Jun-88	14.5	33	40000	11.5	7.2	3.6	91.5	0.17952					0.05 *	0.16
E-1	21-Jul-88	15.8	32.6		11	8.39	1.7	152						0.015 *	ND
E-1	29-Aug-88	15.1	31.8		8.8	7.81	1.8	170		ND				0.03 *	0.06
E-1	28-Sep-88	15.1	32.2		9.75	8	3.6	195	0.262261					0.15 *	0.05
E-1	25-Oct-88	13.4	30.4		8.4	7.9	2.4	180	0.0485					0.31	0.15
E-1	22-Nov-88	12.2	32.3		8.5	7.15	4	125	0.023053	11		7		0.18	0.05
E-1	20-Dec-88	10.2	33		8	7.9	4.5	>210	0.052017					0.19	0.06
E-1	20-Jan-89	9.5	34.1		8.5	7.8	6.3	100	0.030146					0.06	0.09
E-1	17-Feb-89	9	35.8		12.3	7.9	1.3	>195	0.050243	2				0.06	0.025 *
E-1	2-Mar-89	10.8	6.5	8100	9.6	7.3		15							
E-1	6-Mar-89	10	32.7			7.7	2.8	170	0.010008					0.22	0.025 *
E-1	9-Apr-89	15	31		9.1			>175							
E-1	4-May-89	15	32.2		8.6	8	4.3	140	0.02587	ND				0.015 *	0.06
E-1	26-May-89	15	31.5		8.9	8									
E-1	7-Jun-89	13	31.3		9.3	8	2.6	>170	0.037577					0.015 *	0.025 *
E-1	5-Jul-89	19	27		8.2	7.8	3.4	150	0.018663					0.16	0.06
E-1	18-Sep-89	13	34		8.2	7.7	1.7	>210	0.01	6.1		4.8		0.23	0.16
E-1	28-Nov-89	12	31		8	7.4	4	120	0.010666			13		8.7	0.12
E-1	7-Feb-90	8.2	35.1		8.9	7.8	5.2	95	0.010106	130		12		0.24	0.05
E-1	9-Mar-90	8.2	35		8.6	7.8	3.1	140	0.0517			29		0.21	0.025 *
E-1	5-Apr-90	11.2	34.5		8	7.8	2.6	>160	0.0041			54		0.05	0.025 *
E-1	24-May-90	9.5	34.9		8.5	7.9	4.4	>135	0.0825	5		55		0.22	0.025 *
E-1	25-Jun-90	12	32.5		8.5	7.8	1.9	>140	0.0696			26		0.04	0.025 *
E-1	26-Jul-90	11.2	32		7.4	8.1	1.6	170	0.0341	<2.0		41		0.015 *	0.025 *
E-1	18-Sep-90	10.3	30.3		8.6	7.5	2.4	>210	0.151			11		0.06	2
E-1	15-Nov-90	11.1	32.3		9.6	7.8		>210	0.172	<2		12		0.096	0.025 *
E-2	30-Mar-88	12	31.5		8.4			65	0.0813		NR			0.05 *	ND
E-2	14-Apr-88	12.5	32.7		10.4			>91	0.1342					ND	ND
E-2	16-May-88	16.5	33.2		9.8	7.2	12	71.1	0.079101	NR	NR			0.015 *	0.16
E-2	15-Jun-88	16	33	42000	10	7.1	4.2	78.7	0.108273					0.1	0.14
E-2	21-Jul-88	17	32.3		9.9	7.04	4.5	109						0.015 *	0.06
E-2	29-Aug-88	15.2	32		8.9	7.72	4.2	135cm						0.03 *	0.06
E-2	28-Sep-88	15.2	32.3		9.8	8.25	4.4	175	0.206783					0.15 *	0.025 *
E-2	25-Oct-88	13.3	31.2		8.4	8	3.6	160	0.045391					0.33	0.12
E-2	22-Nov-88	12	33.2		8.3	7.9	5.7	1.05	0.020097			11		0.2	0.06
E-2	20-Dec-88	10	33.5		9	8	2.8	>200	0.031328					0.22	0.11
E-2	20-Jan-89	9.7	33.5		8.2	7.75	5.4		0.04315					0.27	0.05
E-2	17-Feb-89	8.8	33.1		10.3	7.8	1.9	>200	0.029555					0.05	0.025 *
E-2	2-Mar-89	11	4.8	5500	9.3	6.8	78	15	0.197427						

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	un-ionized NH3 mg-N/L	Total P mg-P/L	Diss P mg-P/L	DOC mg/L		Cd mg/L	dissCd mg/L	Cr mg/L	dissCr mg/L	Cu mg/L	dissCu mg/L	Pb mg/L	dissPb mg/L	total Ni mg/L
							a=acute c=chronic violations								
E-1	29-Feb-88		0.05	0.06			0.005 *		0.01 *		0.02		0.05 *		
E-1	30-Mar-88		0.19	0.19											
E-1	14-Apr-88		0.2	0.04											
E-1	16-May-88		0.16	0.06			0.005 *		0.01 *		0.01 *		0.004		
E-1	15-Jun-88		2.1	1.8											
E-1	21-Jul-88		0.15	0.06											
E-1	29-Aug-88		0.3	0.1 *			0.005 *	0.005	0.01 *	0.01 *	0.01 *	0.01 *	0.1 *	0.1	
E-1	28-Sep-88		0.2	0.1 *											
E-1	25-Oct-88		0.1 *	0.1 *							0.01 *	0.01 *	0.005 *	0.005	
E-1	22-Nov-88		0.34	0.1 *			0.005 *	0.005	0.02	0.01 *	0.01	0.01	0.0025 *	0.0025	
E-1	20-Dec-88		0.1 *	0.1 *											
E-1	20-Jan-89		0.1 *	0.1 *											
E-1	17-Feb-89		0.1 *	0.1 *	4.2		0.005 *	0.005	0.01 *	0.01 *	0.001 *	0.001 *	0.0025 *	0.0025	
E-1	2-Mar-89														
E-1	6-Mar-89		0.4	0.18	2.1		0.005 *	0.005	0.01 *	0.01 *	0.001 *	0.001 *	0.001 *	0.001	
E-1	9-Apr-89														
E-1	4-May-89		0.2	0.05	5		0.005 *	0.005	0.01 *	0.01 *	0.003	0.001 *	0.05 *	0.05	
E-1	26-May-89														
E-1	7-Jun-89		0.47	0.02	0.5	*	0.01 *	0.01	0.0025 *	0.0025 *	0.001 *	0.001 *	0.0025 *	0.0025	
E-1	5-Jul-89		0.04	0.07	2.2		0.005 *	0.005	0.02	0.01 *	0.001 *	0.001 *	0.1 *	0.1	
E-1	18-Sep-89		0.07	0.06	1.4		0.01 *	0.01	0.025 *	0.025 *	0.001 *	0.001 *	0.001 *	0.001	
E-1	28-Nov-89	0.000438	0.1 *	0.1 *	0.5	*	0.00005 *	0.00005	0.012	0.011	0.00025 *	0.00025 *	0.0005 *	0.0005	
E-1	7-Feb-90	0.000331	0.07	0.09	0.5	*	0.0002	0.0002	0.0062	0.0064	0.00005 *	0.00005 *	0.00005 *	0.00005	
E-1	9-Mar-90	0.000165	0.1	0.06	1		0.067	0.062	0.0031	0.0028	0.0007	0.00005 *	0.00005 *	0.00005	
E-1	5-Apr-90	0.00021	0.01 *	0.01 *	1.4		0.00005 *	0.00005	0.0009	0.0057	0.002	0.00005 *	0.0006	0.00005	
E-1	24-May-90	0.000235	0.12	0.06	0.5	*	0.00005 *		0.0014		0.00005 *		0.01		
E-1	25-Jun-90	0.000227	0.09	0.05	0.5	*	0.0006		0.0061		0.00005 *		0.00005 *		
E-1	26-Jul-90	0.000418	0.09	0.06	1.3		0.00005 *		0.005		0.007		0.00005 *		
E-1	18-Sep-90	0.00784	0.06	0.07	0.5	*	0.00005 *		0.041		0.0028		0.00005 *		
E-1	15-Nov-90		0.06	0.03	3.6		0.0031		0.0005 *		0.00005 *		0.0027		
E-2	30-Mar-88		0.13	0.13											
E-2	14-Apr-88		0.06	0.04											
E-2	16-May-88		0.27	0.19											
E-2	15-Jun-88		2.1	2.1											
E-2	21-Jul-88		0.1	0.06											
E-2	29-Aug-88		0.1 *	0.1 *											
E-2	28-Sep-88		0.3	0.1 *											
E-2	25-Oct-88		0.1 *	0.1 *											
E-2	22-Nov-88		0.1 *	0.1 *											
E-2	20-Dec-88		0.1 *	0.1 *											
E-2	20-Jan-89		0.25	0.1 *											
E-2	17-Feb-89		0.1 *	0.1 *											
E-2	2-Mar-89														

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	Ag mg/L	dissAg mg/L	Zn mg/l	dissZn mg/L	Se µg/l	Fe µg/l	dissFe µg/l	Mn µg/l	dissMn µg/l	Silica µg/l	dissSilica µg/l
E-1	29-Feb-88			0.005 *								
E-1	30-Mar-88											
E-1	14-Apr-88											
E-1	16-May-88			0.01 *								
E-1	15-Jun-88											
E-1	21-Jul-88											
E-1	29-Aug-88			0.01 *	0.01 *							
E-1	28-Sep-88											
E-1	25-Oct-88											
E-1	22-Nov-88			0.01 *	0.01 *							
E-1	20-Dec-88											
E-1	20-Jan-89											
E-1	17-Feb-89			0.01 *	0.01 *							
E-1	2-Mar-89											
E-1	6-Mar-89			0.13	0.05							
E-1	9-Apr-89											
E-1	4-May-89			0.13	0.12							
E-1	26-May-89											
E-1	7-Jun-89			0.005 *	0.005 *		0.069	0.068	0.007	0.007	ND	ND
E-1	5-Jul-89			0.12	0.11							
E-1	18-Sep-89			0.01 *	0.01 *							
E-1	28-Nov-89	0.0011	0.0011	0.0018	0.0011	<1						
E-1	7-Feb-90	0.0004	0.0003	0.011	0.0067							
E-1	9-Mar-90	0.0012	0.001	0.0015	0.0005 *							
E-1	5-Apr-90	0.000025 *	0.000025 *	0.0062	0.0051							
E-1	24-May-90	0.0007		0.0005 *								
E-1	25-Jun-90	0.000025 *		0.0005 *								
E-1	26-Jul-90	0.0008		0.0005 *								
E-1	18-Sep-90	0.000025 *		0.0005 *								
E-1	15-Nov-90	0.000025 *		0.018								
E-2	30-Mar-88											
E-2	14-Apr-88											
E-2	16-May-88											
E-2	15-Jun-88											
E-2	21-Jul-88											
E-2	29-Aug-88											
E-2	28-Sep-88											
E-2	25-Oct-88											
E-2	22-Nov-88											
E-2	20-Dec-88											
E-2	20-Jan-89											
E-2	17-Feb-89											
E-2	2-Mar-89											

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

* indicates value below MDL, number to left is one half MDL.
ND = Non Detectable

Station	Date	Temp. °C	Salinity ppt	Conduct.	DO ppm	pH	Turbid. FTU	Secchi cm	Chla mg/L	F Coli MPN/100ml	TDS	TSS	TOC	NO3 mg-N/L	NH3 mg-N/L
E-2	6-Mar-89	11	17.4			7	37	30	0.039277					0.43	0.39
E-2	4-May-89	18.2	31.7		8.1	8.1	47	35	0.121164					0.015 *	0.05
E-2	7-Jun-89	12.8	32.4		9.2	7.8	3.1	155	0.023037					0.015 *	0.025 *
E-2	5-Jul-89	18	28.5		7.7	7.8	4.2	140	0.01164					0.2	0.025 *
E-2	18-Sep-89	13	34		8.2		4.2	170	0.0119			14		0.16	0.1
E-2	28-Nov-89	11.8	30.2		8.1	7	4.4	120	0.008983			14		7.8	0.07
E-2	7-Feb-90	8	35		8.8	7.6	5.2	70	0.011603			13		0.07	0.07
E-2	9-Mar-90	9	34.2		9	7.8	3.5	150	0.0281			28		0.17	0.07
E-2	5-Apr-90	11.9	33.8		7.5	8	3.7	130	0.0155			16		0.05	0.025 *
E-2	24-May-90	11.8	35.4		7.5	8	5.8	80	0.0314			36		0.05	0.06
E-2	25-Jun-90	14.3	33.9		6.8	7.6	6.2	70	0.0519			32		0.06	0.11
E-2	26-Jul-90	12.7	32		8	8	2.2	100	0.0359			53		0.24	0.025 *
E-2	18-Sep-90	10.4	30		8	7.6	2.2	160	0.069			9.2		0.09	0.025 *
E-2	15-Nov-90	10.6	32.3		9.6	7.8		185	0.13			16		0.11	0.063
E-3	29-Feb-88	14	23		7.5			91.5		>16				0.13	0.05 *
E-3	30-Mar-88	15	31.5		8.4				0.0974					0.05 *	ND
E-3	14-Apr-88	13.3	29.3	38900	9.5			46	0.0261					ND	ND
E-3	16-May-88	22	33.2		9.5	6	13	50.8	0.170544					0.015 *	0.025 *
E-3	15-Jun-88	21	33	46500	6.9	7.5	22	35.6	0.095931					0.13	0.19
E-3	21-Jul-88	18.1	33		10	7.99	16	56						0.015 *	0.13
E-3	29-Aug-88	16.9	31.3		8	7.54	8.4	100cm*						0.03 *	0.06
E-3	28-Sep-88	15.5	32.5		9.8	8.3	7.3	120	0.134283					0.15 *	0.025 *
E-3	25-Oct-88	13.5	31		8	8.1	3.6	>90	0.039087					0.15 *	0.09
E-3	22-Nov-88	13.1	32.2		8.2	7.9*	6.4	>70	0.014777			8		0.17	0.06
E-3	20-Dec-88	10	33		8.5	7.9*	3.2	>100	0.016551					0.21	0.06
E-3	20-Jan-89	9.5	32.8		9	7.9	4	~100	0.013595					0.04	0.1
E-3	17-Feb-89	9.5	31.5		8.8	7.8	5.3	134	0.020097					0.06	0.16
E-3	6-Mar-89	11	0.7	1100	7.8	7.5	62	20	0.104235					0.76	1.1
E-3	9-Apr-89	21.5	23.4		7.5										
E-3	10-Apr-89								0.070529						
E-3	10-Apr-89								0.33275						
E-3	4-May-89	21.7	28.8		9.2	8.4	11	75	0.017184					0.61	0.025 *
E-3	26-May-89	18	35		7.3	8.1		20							
E-3	7-Jun-89	16.5	32.4		7.3	7.8	7.4	>45	0.020771					0.015 *	0.025 *
E-3	5-Jul-89	21	30		6.1	7.7	25	?30	0.037728					0.2	0.15
E-3	18-Sep-89	13.9	34.2		8.4	7.8	6.8	80	0.0138			68		0.14	0.1
E-3	28-Nov-89	11.4	30		8.9	7.5	3.8	>60	0.003743			18		0.15	0.13
E-3	7-Feb-90	7.5	27.9		8.4	7.6	16	40	0.025265			12		0.41	1.2
E-3	9-Mar-90	10	24.2		8.5	7.4	12	45	0.0284			36		0.34	0.6
E-3	5-Apr-90	13.1	31.2		7.4	8.1	7.3	>42	0.1447			41		0.03	0.09
E-3	24-May-90	15	35.7		7.7	8.3	22	35	0.069			66		0.06	0.06
E-3	26-Jun-90	18	33.8		6.5	8	22	30	0.0533			180		0.015 *	0.11
E-3	26-Jul-90	16.4	32		8.4	8.5	8.8	65	0.0441			64		0.015 *	0.025 *
E-3	18-Sep-90	14	30.3		7.6	7.3	8.8	65	0.05			28		0.1	0.05

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	un-ionized NH3 mg-N/L	Total P mg-P/L	Diss P mg-P/L	DOC mg/L	Cd mg/L	dissCd mg/L	Cr mg/L	dissCr mg/L	Cu mg/L	dissCu mg/L	Pb mg/L	dissPb mg/L	total Ni mg/L
						a=acute c=chronic violations								
E-2	6-Mar-89		0.47	0.44										
E-2	4-May-89		0.56	0.07										
E-2	7-Jun-89		0.59	0.05	1.1	0.01 *	0.01	0.0025 *	0.0025 *	0.001 *	0.001 *	0.0025 *	0.0025	
E-2	5-Jul-89		0.06	0.06										
E-2	18-Sep-89		0.06	0.07										
E-2	28-Nov-89	0.000102	0.1 *	0.1 *										
E-2	7-Feb-90	0.000293	0.07	0.01 *										
E-2	9-Mar-90	0.000501	0.12	0.09										
E-2	5-Apr-90	0.000358	0.01 *	0.01 *										
E-2	24-May-90	0.001144	0.2	0.12										
E-2	25-Jun-90	0.000735	0.23	0.15										
E-2	26-Jul-90	0.000385	0.09	0.06										
E-2	18-Sep-90	0.000388	0.11	0.06										
E-2	15-Nov-90		0.09	0.04										
E-3	29-Feb-88		0.12	0.10		0.005 *		0.01 *		0.03		0.05 *		
E-3	30-Mar-88		0.18	0.18										
E-3	14-Apr-88		0.1	0.06										
E-3	16-May-88		0.65	0.3										
E-3	15-Jun-88		2.2	2										
E-3	21-Jul-88		0.15	0.1										
E-3	29-Aug-88		0.1 *	0.1 *										
E-3	26-Sep-88		0.1 *	0.1 *										
E-3	25-Oct-88		0.1 *	0.1 *										
E-3	22-Nov-88		0.29	0.21										
E-3	20-Dec-88		0.1 *	0.1 *										
E-3	20-Jan-89		0.1 *	0.1 *										
E-3	17-Feb-89		0.36	0.1 *	5	0.005 *	0.005	0.01 *	0.01 *	0.001 *	0.001 *	0.0025 *	0.0025	
E-3	6-Mar-89		1.1	0.92	28	0.005 *	0.005	0.01 *	0.01 *	0.007	0.005	0.001 *	0.001	
E-3	9-Apr-89													
E-3	10-Apr-89													
E-3	10-Apr-89													
E-3	4-May-89		0.53	0.16	3.3	0.005 *	0.005	0.01 *	0.01 *	0.004	0.001 *	0.05 *	0.05	
E-3	26-May-89													
E-3	7-Jun-89		0.15	0.07	1.8	0.01 *	0.01	0.0025 *	0.0025 *	0.001 *	0.001 *	0.0025 *	0.0025	
E-3	5-Jul-89		0.17	0.13	2.5	0.01	0.005	0.02	0.01 *	0.001 *	0.001 *	0.1 *	0.1	
E-3	18-Sep-89		0.1	0.05	0.5 *	0.01 *	0.01	0.025 *	0.025 *	0.001 *	0.001 *	0.002	0.001	
E-3	28-Nov-89	0.00051	0.1 *	0.1 *	0.5 *	0.00005 *	0.00005	0.008	0.008	0.003	0.002	0.009	0.0005	
E-3	7-Feb-90	0.00486	0.59	0.52	8.7	0.00005 *	0.00005	0.0046	0.0017	0.0013	0.0004	0.00005 *	0.00005	
E-3	9-Mar-90	0.001902	0.53	0.44	7.1	0.039	0.038	0.003	0.0028	0.0011	0.0007	0.0014	0.00005	
E-3	5-Apr-90	0.001746	0.63	0.01 *	2.9	0.00005 *	0.00005	0.0037	0.0014	0.0016	0.00005 *	0.00005 *	0.00005	
E-3	24-May-90	0.002106	0.29	0.17	1 *	0.00005 *		0.005		0.00005 *		0.011		
E-3	26-Jun-90	0.002464	0.78	0.37	2.3	0.0003		0.02		0.0019		0.00005 *		
E-3	26-Jul-90	0.001475	0.15	0.11	1.9	0.00005 *		0.01		0.01		0.00005 *		
E-3	18-Sep-90	0.000169	0.16	0.09	0.5 *	0.00005 *		0.051		0.003		0.00005 *		

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	Ag mg/L	disAg mg/L	Zn mg/l	disZn mg/L	Se µg/l	Fe µg/l	disFe µg/l	Mn µg/l	disMn µg/l	Silica µg/l	disSilica µg/l
E-2	6-Mar-89											
E-2	4-May-89											
E-2	7-Jun-89			0.005 *	0.005 *		0.19	ND	0.009	0.005	ND	ND
E-2	5-Jul-89											
E-2	18-Sep-89											
E-2	28-Nov-89											
E-2	7-Feb-90											
E-2	9-Mar-90											
E-2	5-Apr-90											
E-2	24-May-90											
E-2	25-Jun-90											
E-2	26-Jul-90											
E-2	18-Sep-90											
E-2	15-Nov-90											
E-3	29-Feb-88			0.36								
E-3	30-Mar-88											
E-3	14-Apr-88											
E-3	16-May-88											
E-3	15-Jun-88											
E-3	21-Jul-88											
E-3	29-Aug-88											
E-3	28-Sep-88											
E-3	25-Oct-88											
E-3	22-Nov-88											
E-3	20-Dec-88											
E-3	20-Jan-89											
E-3	17-Feb-89			0.07	0.01 *							
E-3	6-Mar-89			0.04	0.04							
E-3	9-Apr-89											
E-3	10-Apr-89											
E-3	10-Apr-89											
E-3	4-May-89			0.14	0.13							
E-3	26-May-89											
E-3	7-Jun-89			0.005 *	0.005 *		0.68	0.075	0.027	0.014	ND	ND
E-3	5-Jul-89			0.11	0.095							
E-3	18-Sep-89			0.01 *	0.01 *							
E-3	28-Nov-89	0.0019	0.0018	0.0026	0.0011	<1						
E-3	7-Feb-90	0.0002	0.0001	0.013	0.009							
E-3	9-Mar-90	0.0002	0.0001	0.0023	0.0013							
E-3	5-Apr-90	0.0003	0.0003	0.0017	0.0012							
E-3	24-May-90	0.000025 *		0.0005 *								
E-3	26-Jun-90	0.000025 *		0.0038								
E-3	26-Jul-90	0.0005		0.02								
E-3	18-Sep-90	0.000025 *		0.0005 *								

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

* indicates value below MDL, number to left is one half MDL
ND = Non Detectable

Station	Date	Temp. °C	Salinity ppt	Conduct.	DO ppm	pH	Turbid. FTU	Secchi cm	Chla mg/L	F Coli MPN/100ml	TDS	TSS	TOC	NO3 mg-N/L	NH3 mg-N/L
E-3	15-Nov-90	10.5	32.6		9.4	7.8		>117	0.071			8.8		0.12	0.077
E-4	29-Feb-88	15	7		4.0			61		>16				1.30	0.55
E-4	30-Mar-88	16	18		8.8			51	0.433					0.05 *	ND
E-4	14-Apr-88	16	25.7		5.5			46	0.0843					ND	ND
E-4	16-May-88	22	23.9		11.6	6.95	22	30.5	1.39689					0.015 *	0.025 *
E-4	15-Jun-88	24.5	30	45000	8.8	7.6	25	30.5	1.27908					0.05 *	0.73
E-4	21-Jul-88	25	36.6		10.8	7.96	20	41	0.297565					0.03	0.18
E-4	29-Aug-88	21	34.2		6.05	7.53	20	50						0.03 *	0.19
E-4	28-Sep-88	18.5	34.2		7.2	7.75	18	60	0.095826					0.15 *	0.08
E-4	25-Oct-88	13.5	31.8		6.2	7.9	12	85	0.204891					0.15 *	0.28
E-4	22-Nov-88	12.5	28		7.9	7.8	12	50	0.24235			ND		0.24	0.29
E-4	20-Dec-88	9	31.5		10	7.8	12	75	0.117037					0.2	0.17
E-4	20-Jan-89	8	18.1		6.8	8.2	12	~60	0.028373					0.55	2.6
E-4	17-Feb-89	9	12.4		5	7.4	15	50	0.062656					0.57	4.8
E-4	2-Mar-89	10.2	0	305	6	7.8		9							
E-4	6-Mar-89	10.7	0	270	4.8	7.5	54	15	0.40991					0.82	3.1
E-4	4-May-89	23	16.9		6.4	7.9	28	40	0.110917					1.5	0.07
E-4	7-Jun-89	19.4	28.8		7	7.7	34	25	0.063295					0.42	0.3
E-4	5-Jul-89	26	33.8		8.8	8.1	21	30	0.366821					0.03	0.025 *
E-4	18-Sep-89	16	34		6.4	7.7	32	35	0.0523			42		0.25	0.4
E-4	28-Nov-89	8.5	20.9		7.9	7.3	8.6	55	0.020212			16		0.86	0.56
E-4	7-Feb-90	6	1.4	1120	7.6	7.4	23	30	0.122427			10		0.9	2.8
E-4	9-Mar-90	9.2		1210	8.7	7.1	24	25	0.0653			25		0.72	3.3
E-4	5-Apr-90	13.4	10.5		5.2	7.7	18	30	0.1188			52		0.7	0.16
E-4	24-May-90	17.1	26.2		7.3	8.2	28	37	0.1281			58		0.34	0.29
E-4	25-Jun-90	22	30		4.9	7.9	92	10	0.4473			460		0.27	1.4
E-4	26-Jul-90	21	35		5.7	8.1	50	12	0.3665			240		0.015 *	0.24
E-4	18-Sep-90	16.1	33		8	8	37	20	0.811			110		0.015 *	0.06
E-4	15-Nov-90	9.5	32.6		8.4	7.7		75	0.021			18		0.015 *	0.01
E-5	29-Feb-88	15	6		3.0			61							
E-5	30-Mar-88	17	12.5		14			30	2.79		14516			0.2	ND
E-5	14-Apr-88	17	19.2		3.5			35.6	0.0594		23256			0.14	1.1
E-5	16-May-88	23	18.8		16.8	6.9	26	22.9	5.5539	26	21000			0.06	0.09
E-5	15-Jun-88						347	22.9	1.42494		29000			0.05 *	0.67
E-5	21-Jul-88	24	36.5		12	8.53	17	33			45000			0.015 *	0.21
E-5	29-Aug-88	22.5	37.3		9.2	7.94	23	50		11	41000			0.03 *	0.22
E-5	28-Sep-88	19.7	36.3		12.5	8.4	20	45	0.832174		4400			0.15 *	0.025 *
E-5	25-Oct-88	14	31.7		8.2	8.15	17	40	0.060522		37000			0.15 *	0.15
E-5	22-Nov-88	12.3	25.5		8.6	8	24	30	2.116129	>2400	28000	27		0.36	0.71
E-5	20-Dec-88	8	26.5		10.5	7.8	36	65	0.508344		29000			0.58	0.36
E-5	21-Dec-88	7	13.9			7.5					16000			0.67	1.1
E-5	20-Jan-89	8	10.9		6.4		17		0.100487		13000			0.84	6
E-5	17-Feb-89	10	5.5		4.9	7.5	17	25	0.078025	>/=2400	7500			0.39	10

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	un-ionized NH3 mg-N/L		Total P mg-P/L	Diss P mg-P/L	DOC mg/L	Cd mg/L	dissCd mg/L	Cr mg/L	dissCr mg/L	Cu mg/L	dissCu mg/L	Pb mg/L	dissPb mg/L	total Ni mg/L
							a=acute c=chronic violations								
E-3	15-Nov-90			0.06	0.05	5.5	0.0018		0.0005 *		0.005		0.00005 *		
E-4	29-Feb-88	0.001155		0.59	0.53		0.005 *		0.01 *		0.01 *		0.05 *		
E-4	30-Mar-88			0.43	0.41										
E-4	14-Apr-88			0.3	0.28										
E-4	16-May-88	7.03E-05		1.3	0.67										
E-4	15-Jun-88	0.010658		2.1	2.1										
E-4	21-Jul-88	0.00594		0.63	0.46										
E-4	29-Aug-88	0.001919		0.3	0.1 *										
E-4	28-Sep-88	0.001056		0.23	0.2										
E-4	25-Oct-88	0.003612		0.1 *	0.1 *										
E-4	22-Nov-88	0.002749		0.24	0.24										
E-4	20-Dec-88	0.001224		0.1 *	0.1 *										
E-4	20-Jan-89	0.04472	c	1	0.92										
E-4	17-Feb-89	0.015456		1.9	1.7										
E-4	2-Mar-89														
E-4	6-Mar-89	0.015593	c	2.4	1.9										
E-4	4-May-89	0.001939		0.84	0.44										
E-4	7-Jun-89	0.00369		0.24	0.23	6.6	0.01 *	0.01	0.0025 *	0.0025 *	0.003	0.001 *	0.0025 *	0.0025	
E-4	5-Jul-89	0.001233		0.34	0.28										
E-4	18-Sep-89	0.003908		0.22	0.11										
E-4	28-Nov-89	0.001277		0.83	0.2										
E-4	7-Feb-90	0.00612	c	2.1	1.8										
E-4	9-Mar-90	0.006105		2.4	1.9										
E-4	5-Apr-90	0.001398		1.1	0.99										
E-4	24-May-90	0.009657		0.73	0.37										
E-4	25-Jun-90	0.03374		1.5	0.76										
E-4	26-Jul-90	0.008376		0.57	0.22										
E-4	18-Sep-90	0.001158		0.38	0.15										
E-4	15-Nov-90			0.16	0.09										
E-5	29-Feb-88														
E-5	30-Mar-88			0.77	0.67										
E-5	14-Apr-88	0.002266		0.64	0.6										
E-5	16-May-88	0.000248		1.5	0.92		0.02		0.01 *		0.02		0.0005 *		
E-5	15-Jun-88			4.3	3.5										
E-5	21-Jul-88	0.02352		0.79	0.54										
E-5	29-Aug-88	0.006116		0.78	0.41		0.005 *	0.005	0.01 *	0.01 *	0.01 *	0.01 *	0.1 *	0.1	
E-5	28-Sep-88	0.00157		0.76	0.37										
E-5	25-Oct-88	0.003795		0.58	0.26						0.01 *	0.01 *	0.005 *	0.005	
E-5	22-Nov-88	0.010366		3.3	0.43		0.005 *	0.005	ND	0.03	0.036	0.001 *	0.0025 *	0.0025	
E-5	20-Dec-88	0.002434		0.29	0.21										
E-5	21-Dec-88	0.003652		0.92	0.51						0.001 *	0.001 *			
E-5	20-Jan-89	0.02244		2.6	2										
E-5	17-Feb-89	0.0459	c	3.7	2.3	20	0.005 *	0.005	0.01 *	0.01 *	0.005	0.003	0.0025 *	0.0025	

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	Ag mg/L	dissAg mg/L	Zn mg/l	dissZn mg/L	Se µg/l	Fe µg/l	dissFe µg/l	Mn µg/l	dissMn µg/l	Silica µg/l	dissSilica µg/l
E-3	15-Nov-90	0.000025 *		0.0005 *								
E-4	29-Feb-88			0.005 *								
E-4	30-Mar-88											
E-4	14-Apr-88											
E-4	16-May-88											
E-4	15-Jun-88											
E-4	21-Jul-88											
E-4	29-Aug-88											
E-4	26-Sep-88											
E-4	25-Oct-88											
E-4	22-Nov-88											
E-4	20-Dec-88											
E-4	20-Jan-89											
E-4	17-Feb-89											
E-4	2-Mar-89											
E-4	6-Mar-89											
E-4	4-May-89											
E-4	7-Jun-89			0.011	0.005 *		2.2	0.025	0.25	0.17	ND	ND
E-4	5-Jul-89											
E-4	18-Sep-89											
E-4	28-Nov-89											
E-4	7-Feb-90											
E-4	9-Mar-90											
E-4	5-Apr-90											
E-4	24-May-90											
E-4	25-Jun-90											
E-4	26-Jul-90											
E-4	18-Sep-90											
E-4	15-Nov-90											
E-5	29-Feb-88											
E-5	30-Mar-88											
E-5	14-Apr-88											
E-5	16-May-88			0.01 *								
E-5	15-Jun-88											
E-5	21-Jul-88											
E-5	29-Aug-88			0.01 *	0.01 *							
E-5	26-Sep-88											
E-5	25-Oct-88											
E-5	22-Nov-88			0.01 *	0.01 *							
E-5	20-Dec-88											
E-5	21-Dec-88			0.099	0.032							
E-5	20-Jan-89											
E-5	17-Feb-89			0.05	0.01 *							

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

* indicates value below MDL, number to left is one half MDL
ND = Non Detectable

Station	Date	Temp. °C	Salinity ppt	Conduct.	DO ppm	pH	Turbid. FTU	Secchi cm	Chla mg/L	F Coli MPN/100ml	TDS	TSS	TOC	NO3 mg-N/L	NH3 mg-N/L
E-5	2-Mar-89	10.5	0	332	4.7	7.6	66	7	0.93157					1.4	5
E-5	6-Mar-89	11	0	315	4.2	7.5	52	18	0.434022		360			0.85	3.6
E-5	10-Apr-89								0.049474						
E-5	4-May-89	21.5	6.3	9500	6.1	7.8	33	25	0.258002	1010	1200			1.3	0.38
E-5	26-May-89	23	16		7	8.1									
E-5	7-Jun-89	19.5	24.8		5.5	7.5	34	35	0.067515		16800			0.47	0.21
E-5	5-Jul-89	25	31		8.3	8	41	22	0.359767		38400			0.015 *	0.025 *
E-5	18-Sep-89	17	35.2		5.4	7.5	60	22	0.3687	3300	39000	96		0.21	0.92
E-5	23-Oct-89	15.5	29.2		7.9	7.6						58	9.8	0.55	0.15
E-5	28-Nov-89	10	17.3		7.5	7.4	20	35	0.056316		19000	49		1.3	0.5
E-5	16-Jan-90	11	0.5	820	6.2	6.8					680	22		1.4	3.3
E-5	7-Feb-90	7	1	900	7.2	7.5	16	45	0.090596	540	900	7.4		0.93	3.1
E-5	9-Mar-90	9		1020	8.1	7.2	14	45	0.0948		700	14		0.72	2.4
E-5	5-Apr-90	14	5	5800	5.6	7.5	32	23	0.2525		4900	47		0.09	0.26
E-5	24-May-90	17.5	22.5		4.7	7.9	31	42	0.1053	920	25000	100		0.27	0.43
E-5	25-Jun-90	21.2	24.3		3.3	7.8	120	5	0.5499		30000	730		0.15	2.2
E-5	26-Jul-90	21.7	34.3		11.1	8.7	35	12	1.3532	11	48000	270		0.015 *	0.025 *
E-5	18-Sep-90	16.2	34.5		10.4	7.9	37	20	2.706		47000	130		0.015 *	0.06
E-5	15-Nov-90	9.5	33.7		9	7.8		110	0.09	17	39000	12		0.11	0.06
E-5	6-May-94	18.5	6	9000	3.2	8			0.014		6100	42	19	0.35	0.21
E-6	29-Feb-88	14			1.6					>16				0.10	11.00
E-6	30-Mar-88	17	0.2		9.6			9	6.196		888			0.5	6.7
E-6	14-Apr-88	15	0.7	900	10.8				8.638		2160			3.4*	268
E-6	16-May-88	15.8	1.1	1700	2.1	7.55	62		4.711875	>2400000	1100			0.015 *	41
E-6	15-Jun-88	16	1.5	2320	3.5	8			7.6296		2000			0.05 *	61
E-6	21-Jul-88	25.5	3.2	4230	20	9.35					4100			0.96	5.7
E-6	22-Nov-88	13		650	5.1	7.35	14		0.174374	>2400	610	13		1.3	2.7
E-6	20-Dec-88	8.9			4	8*	41		1.702361		1100			0.59	24
E-6	21-Dec-88		1.2	1700	1.2	7.8*	v.high		6.058749		1500			0.015 *	110
E-6	20-Jan-89	10.8	0	700	2.3	7.65	27		0.359387		640			0.03	18
E-6	17-Feb-89	13.9	0.2	700	11.2	7.5	15		0.546174	>/=2400	560			0.05	14
E-6	2-Mar-89	11	0	462	5.7	7.5									
E-6	6-Mar-89		0	250	5.1	7.4	46		0.605219		350			1.4	2.5
E-6	4-May-89	23.5		800	9	8.3	30		0.868044	20900	570			0.31	7.5
E-6	7-Jun-89	17	0.3	620	10.4	8.3	26		5.714622		440			0.45	0.49
E-6	6-Jul-89	19	0.2	900	19	8.6	off scale		32.73172		770			3.2	4.2
E-6	18-Sep-89	16.8	1	1120	2.7	7.7	20		0.1534	2400000	950	28		2.1	9.6
E-6	23-Oct-89	14.9		700	5	7.7					580	86	63	2.6	4.7
E-6	28-Nov-89	10		900	3.5	7.6	51		0.710077		1000	110		7.8	15
E-6	16-Jan-90	11.7	0.2	415		7					400	17		2.3	4.9
E-6	8-Feb-90	7		457	9.4	7.8	22		0.170174	9200	440	40		0.95	4.3
E-6	9-Mar-90	13		530	8.3	7.9	25		0.1879		410	33		0.26	4.6
E-6	5-Apr-90	15.3		720	8	7.3	22		0.9237		520	36		0.72	5.4
E-6	24-May-90	12.8		590	4.1	7.3	50		3.0665	350000	450	130		0.015 *	2.7

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

a=acute c=chronic violations

Station	Date	un-ionized NH3 mg-N/L		Total P mg-P/L	Diss P mg-P/L	DOC mg/L	Cd mg/L		dissCd mg/L		Cr mg/L		dissCr mg/L		Cu mg/L		dissCu mg/L		Pb mg/L		dissPb mg/L		total Ni mg/L	
E-5	2-Mar-89	0.0341		3.7	2.1																			
E-5	6-Mar-89	0.020304	c	2.9	2.4	42	0.005	*	0.005		0.01	*	0.01	*	0.012		0.007		0.01		0.001			
E-5	10-Apr-89																							
E-5	4-May-89	0.006206		1.4	0.97	17	0.005	*	0.005		0.01	*	0.01	*	0.008		0.001	*	0.05	*	0.05			
E-5	26-May-89																							
E-5	7-Jun-89	0.00173		0.68	0.39	9.3	0.01	*	0.01		0.014		0.009		0.007		0.003		0.0025	*	0.0025			
E-5	5-Jul-89	0.000928		0.53	0.34	11	0.005	*	0.005		0.01	*	0.01	*	0.006		0.001	*	0.1	*	0.1			
E-5	18-Sep-89	0.006146		1.3	0.13	5.2	0.01	*	0.01		0.025	*	0.025	*	0.005		0.001	*	0.001	*	0.001			
E-5	23-Oct-89	0.001131		0.42	0.22										0.001	*	0.001	*						
E-5	28-Nov-89	0.001675		0.29	0.2	14	0.00005	*	0.00005		0.011		0.005		0.001		0.001		0.0005	*	0.0005			
E-5	16-Jan-90	0.00363	c	3.5	2.6										0.005		0.0043	a						
E-5	7-Feb-90	0.012276	c	2.7	2.2	23	0.0001		0.0001		0.0034		0.0021		0.0051		0.0037	a	0.0007		0.0006			
E-5	9-Mar-90	0.00569		2.6	2	20	0.003		0.003		0.0004		0.0005	*	0.0027		0.0022		0.0005		0.00005			
E-5	5-Apr-90	0.001625	c	1.7	0.48	6.2	0.00005	*	0.00005		0.0045		0.0005	*	0.0036		0.0023		0.00005	*	0.00005			
E-5	24-May-90	0.007676		0.7	0.5	7.9	0.00005	*			0.0049				0.0018				0.012					
E-5	25-Jun-90	0.04004	c	2.8	1.8	19	0.0005				0.079				0.014				0.00005	*				
E-5	26-Jul-90	0.00315		0.86	0.44	14	0.00005	*			0.0066				0.018				0.00005	*				
E-5	18-Sep-90	0.000924		1.1	0.17	7.3	0.00005	*			0.064				0.009				0.00005	*				
E-5	15-Nov-90			0.29	0.28	7.1	0.0026				0.0005	*			0.012				0.00005	*				
E-5	6-May-94						0.0005	*			0.005	*			0.005	*			0.002	*			0.009	
E-6	29-Feb-88	0.07788	c																					
E-6	30-Mar-88	0.057553	c																					
E-6	14-Apr-88	1.85992	a																					
E-6	16-May-88	0.36285	a	*			0.005	*			0.01	*			0.07				0.006					
E-6	15-Jun-88	1.4213	a	*																				
E-6	21-Jul-88	1.8069	a	*																				
E-6	22-Nov-88	0.012582	c				0.005	*	0.005		0.03		0.03		0.041		0.031		0.0025	*	0.0025			*
E-6	20-Dec-88	0.348	a																					
E-6	21-Dec-88	0.9623	a	*											0.091		0.028							
E-6	20-Jan-89	0.14292	a	*																				
E-6	17-Feb-89	0.09912	c			31	0.005	*	0.005		0.01	*	0.01	*	0.007		0.001	*	0.0025	*	0.0025			*
E-6	2-Mar-89																							
E-6	6-Mar-89	0.0112	c			38	0.005	*	0.005		0.01	*	0.01	*	0.011		0.001	*	0.001	*	0.001			*
E-6	4-May-89	0.62475	a			30	0.005	*	0.005		0.01	*	0.01	*	0.015		0.008		0.05	*	0.05			*
E-6	7-Jun-89	0.026215				28	0.01	*	0.01		0.0025	*	0.0025	*	0.007		0.003		0.0025	*	0.0025			*
E-6	6-Jul-89	0.7098	a			64	0.005	*	0.005		0.01	*	0.01	*	0.031		0.005		0.1	*	0.1			*
E-6	18-Sep-89	0.12864	c			49	0.01	*	0.01		0.025	*	0.025	*	0.026		0.026	a	0.003		0.001			*
E-6	23-Oct-89	0.0564	c	5.5	3.9										0.032		0.024	a						
E-6	28-Nov-89	0.09435	a	7.9	6.9	100	0.0009		0.00005		0.014		0.008		0.032		0.014	c	0.0005	*	0.0005			
E-6	16-Jan-90	0.009457	c	4.8	2.3										0.0061		0.0026							
E-6	8-Feb-90	0.035217	c	3.1	2.4	28	0.0011		0.00005		0.0029		0.0009		0.0061		0.0028		0.00005	*	0.00005			
E-6	9-Mar-90	0.07824	c	4	3.1	24	0.002		0.003		0.0005	*	0.0005	*	0.0071		0.0026		0.0015		0.00005			
E-6	5-Apr-90	0.026062	c	5.6	4.4	20	0.00005	*	0.00005		0.0006		0.0005	*	0.011		0.0026		0.002		0.00005			
E-6	24-May-90	0.011205	c	3.2	1.1	26	0.0001				0.0093				0.011				0.0045					

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	Ag mg/L	dissAg mg/L	Zn mg/l	dissZn mg/L	Se µg/l	Fe µg/l	dissFe µg/l	Mn µg/l	dissMn µg/l	Silica µg/l	dissSilica µg/l
E-5	2-Mar-89											
E-5	6-Mar-89			0.11	0.06							
E-5	10-Apr-89											
E-5	4-May-89			0.06	0.04							
E-5	26-May-89											
E-5	7-Jun-89			0.013	0.005 *		2.9	0.011	0.58	0.46	ND	ND
E-5	5-Jul-89			0.12	0.12							
E-5	18-Sep-89			0.01 *	0.05							
E-5	23-Oct-89											
E-5	28-Nov-89	0.0018	0.0019	0.0078	0.0051	<1						
E-5	16-Jan-90											
E-5	7-Feb-90	0.000025 *	0.000025 *	0.016	0.011							
E-5	9-Mar-90	0.00005 *	0.00005 *	0.028	0.0055							
E-5	5-Apr-90	0.000025 *	0.000025 *	0.021	0.0051							
E-5	24-May-90	0.000025 *		0.0005 *								
E-5	25-Jun-90	0.000025 *		0.031								
E-5	26-Jul-90	0.0018		0.02								
E-5	18-Sep-90	0.0004		0.0075								
E-5	15-Nov-90	0.000025 *		0.015								
E-5	6-May-94	0.001 *		0.01 *								
E-6	29-Feb-88											
E-6	30-Mar-88											
E-6	14-Apr-88											
E-6	16-May-88			0.03								
E-6	15-Jun-88											
E-6	21-Jul-88											
E-6	22-Nov-88			0.07	0.01 *							
E-6	20-Dec-88											
E-6	21-Dec-88			0.23	0.064							
E-6	20-Jan-89											
E-6	17-Feb-89			0.05	0.04							
E-6	2-Mar-89											
E-6	6-Mar-89			0.15	0.007							
E-6	4-May-89			0.05	0.11							
E-6	7-Jun-89			0.014	0.005 *						ND	ND
E-6	6-Jul-89			0.06	0.01 *							
E-6	18-Sep-89			0.01 *	0.06							
E-6	23-Oct-89											
E-6	28-Nov-89	0.0006	0.0004	0.11	0.036	<1						
E-6	16-Jan-90											
E-6	8-Feb-90	0.0001	0.0001	0.024	0.012							
E-6	9-Mar-90	0.00005 *	0.00005 *	0.024	0.005							
E-6	5-Apr-90	0.000025 *	0.000025 *	0.027	0.016							
E-6	24-May-90	0.000025 *		0.039								

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

* Indicates value below MDL, number to left is one half MDL
ND = Non Detectable

Station	Date	Temp. °C	Salinity ppt	Conduct.	DO ppm	pH	Turbid. FTU	Secchi cm	Chla mg/L	F Coli MPN/100ml	TDS	TSS	TOC	NO3 mg-N/L	NH3 mg-N/L
E-6	25-Jun-90	16	0.8	1140	19	9.1	57		36.279		1100	270		0.06	1.5
E-6	26-Jul-90	20.5		1920	20	9.8			109.532	35000	1700	1200		0.015 *	3.6
E-6	6-May-94	16.6		700	3.2	7.8			0.017		530	11	34	0.03 *	2.1
E-7	29-Feb-88	13			5.5					>16				0.05 *	0.05 *
E-7	30-Mar-88	16	0		7.6				0.374		468			0.3	1.4
E-7	16-May-88	14	1	1600	2.3	7.75	11		14.8665		1100			0.015 *	86
E-7	15-Jun-88	14.9	3.2	35210	2.7	7.9			166		3200			0.05 *	170
E-7	20-Dec-88	9			10.5	7.9*	7.5		0.0663		440			0.06	0.06
E-7	20-Jan-89	11.6		412	15.2	8.7	3.5		0.047879		390			0.09	0.15
E-7	17-Feb-89	12.9		620		7	6.2		0.068074		330			0.015 *	0.12
E-7	2-Mar-89	11.2	0	221	9.8	7.7									
E-7	6-Mar-89		0	218	8.8	7.5	13		0.054761		300			0.81	0.24
E-7	4-May-89	21.8		500	10.5	8.6	14		0.344806		380			0.58	0.14
E-7	7-Jun-89	15.1	0.5	890	5.8	7.8	25		1.065055		630			0.09	32
E-7	6-Jul-89	completely dry													
E-7	18-Sep-89	dry													
E-7	23-Oct-89	16.1		770	8.2	7.5					600	32	37	0.2	0.68
E-7	28-Nov-89	10.9		520	8.4	7.5	18		0.299946		530	19		8.7	2.6
E-7	16-Jan-90	11.5	0.1	296	10.4	7					290	5.2		1.1	0.14
E-7	8-Feb-90	7		360	12.8	7.4	8		0.023581			12		0.41	0.08
E-7	9-Mar-90	13		383	12	8.1	6.5		0.0616		330	12		0.08	0.07
E-7	5-Apr-90	14.2		520	5.2	7.5	27		0.5727		400	60		0.07	0.44
E-7	24-May-90	10.8		570	5	7.2	8.3		0.3387		440	16		0.015 *	1.2
E-7	25-Jun-90	11.5	0.9	1120	0.7	7.2	93		5.63		930	380		0.015 *	49
E-7	26-Jul-90	dry													
E-8	29-Feb-88	12			6.4					>16				0.82	0.05 *
E-8	30-Mar-88	15	0		9.8				0.0493		380			0.1	0.16
E-8	16-May-88	16.6	0.2	650	4.5	6.99	6.1		0.068638		75000			0.015 *	0.52
E-8	22-Nov-88	13.2		600	7.25	7.6*	12		0.039012		600	ND		1.4	1.2
E-8	20-Dec-88	8.6			9.5	7.6	5.4		0.041377		510			1.5	0.12
E-8	20-Jan-89	9		405	11.8	7.65	4.1		0.047879		410			0.63	0.13
E-8	17-Feb-89	11.5	1.8	700	11.4	5.87	3.1		0.046697		340			0.16	0.025 *
E-8	2-Mar-89	10.5	0	221	10.2	7.8									
E-8	6-Mar-89	11.5	0	220	9.8	7.7	16		0.020583		320			1.1	0.38
E-8	4-May-89	19.2		490	7.4	8.3	5.7		0.039277		390			1.7	0.025 *
E-8	7-Jun-89	15.5	0.3	560	4.2	7.5	11		0.347218		390			0.06	3
E-8	6-Jul-89	completely dry													
E-8	18-Sep-89	dry													
E-8	23-Oct-89	14		620	7.5	7.2					640	55	57	6.5	4.3
E-8	28-Nov-89	8.4		520	9.6	7.5	6.9		0.027696		670	6.8		5.8	0.69
E-8	16-Jan-90	10.5		292	10.2	6.8					300	7.2		1.5	0.21
E-8	8-Feb-90	6		312	11.8	7.3	11		0.006609		350	16		0.57	0.07
E-8	9-Mar-90	10		340	12.5	7.9	6.4		0.0068		310	11		0.34	0.025 *

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

a=acute c=chronic violations

Station	Date	un-ionized NH3 mg-N/L		Total P mg-P/L	Diss P mg-P/L	DOC mg/L	Cd mg/L	dissCd mg/L	Cr mg/L	dissCr mg/L	Cu mg/L	dissCu mg/L	Pb mg/L	dissPb mg/L	total Ni mg/L
E-6	25-Jun-90	0.3015	a	4.9	2.2	74	0.00005 *		0.0061		0.012		0.0069		
E-6	26-Jul-90	0.918	a	15	2.6	150	0.0001		0.017		0.032		0.00005 *		
E-6	6-May-94						0.0005 *		0.005 *		0.005 *		0.002 *		0.009
E-7	29-Feb-88			*											
E-7	30-Mar-88	0.0182	c	*											
E-7	16-May-88	1.032	a	*											
E-7	15-Jun-88	2.822	a	*											
E-7	20-Dec-88	0.00072		*											
E-7	20-Jan-89	0.013275		*	*	*									
E-7	17-Feb-89	0.000258													
E-7	2-Mar-89														
E-7	6-Mar-89	0.00145													
E-7	4-May-89	0.0196													
E-7	7-Jun-89	0.4736	a												
E-7	6-Jul-89														
E-7	18-Sep-89														
E-7	23-Oct-89	0.005596		2.2	1.7						0.004	0.002			
E-7	28-Nov-89	0.014864	c	2.9	2.3										
E-7	16-Jan-90	0.000269		1.7	0.41						0.0012	0.0002			
E-7	8-Feb-90	0.00027		1	0.78										
E-7	9-Mar-90	0.001848		0.97	0.92										
E-7	5-Apr-90	0.00312		1	0.6										
E-7	24-May-90	0.003396		1.7	0.94										
E-7	25-Jun-90	0.13867	a	9.7	7.1										
E-7	26-Jul-90														
E-8	29-Feb-88			0.44	0.40										
E-8	30-Mar-88	0.000443		0.45	0.45										
E-8	16-May-88	0.00104		0.8	0.74										
E-8	22-Nov-88	0.0099		1.5	1.2										
E-8	20-Dec-88	0.000726		0.77	0.64										
E-8	20-Jan-89	0.000884		0.1 *	0.4										
E-8	17-Feb-89			0.29	0.21	8.2	0.005 *	0.005	0.01 *	0.01 *	0.002	0.001 *	0.0025 *	0.0025	
E-8	2-Mar-89														
E-8	6-Mar-89	0.003629		0.88	0.86	21	0.005 *	0.005	0.01 *	0.01 *	0.005	0.001 *	0.001 *	0.001	
E-8	4-May-89	0.001538		0.58	0.41	8.3	0.005 *	0.005	0.01 *	0.01 *	0.002	0.001 *	0.05 *	0.05	
E-8	7-Jun-89	0.02418	c			17	0.01	0.01	0.0025 *	0.0025 *	0.004	0.002	0.0025 *	0.0025	
E-8	6-Jul-89	0.015007	c												
E-8	18-Sep-89	0.003008													
E-8	23-Oct-89	0.000235		6.4	5.6						0.037	0.027 a			
E-8	28-Nov-89	0.000174		1.5	1.1	24	0.0003	0.0001	0.002	0.001	0.004	0.007	0.0005 *	0.0005	
E-8	16-Jan-90	0.000335		1.3	0.15 *						0.0024	0.0014			
E-8	8-Feb-90	0.00005		0.43	0.24	11	0.0003	0.0001	0.0005 *	0.0005 *	0.0017	0.0017	0.0005	0.00005	
E-8	9-Mar-90	0.0001		0.43	0.3	9.1	0.002	0.002	0.0005 *	0.0005 *	0.0024	0.002	0.0007	0.00005	

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	Ag mg/L	dissAg mg/L	Zn mg/l	dissZn mg/L	Se µg/l	Fe µg/l	dissFe µg/l	Mn µg/l	dissMn µg/l	Silica µg/l	dissSilica µg/l
E-6	25-Jun-90	0.000025 *		0.023								
E-6	26-Jul-90	0.0003		0.3								
E-6	6-May-94	0.001 *		0.01 *								
E-7	29-Feb-88											
E-7	30-Mar-88											
E-7	16-May-88											
E-7	15-Jun-88											
E-7	20-Dec-88											
E-7	20-Jan-89											
E-7	17-Feb-89											
E-7	2-Mar-89											
E-7	6-Mar-89											
E-7	4-May-89											
E-7	7-Jun-89										ND	ND
E-7	6-Jul-89											
E-7	18-Sep-89											
E-7	23-Oct-89											
E-7	28-Nov-89					<1						
E-7	16-Jan-90											
E-7	8-Feb-90											
E-7	9-Mar-90											
E-7	5-Apr-90											
E-7	24-May-90											
E-7	25-Jun-90											
E-7	26-Jul-90											
E-8	29-Feb-88											
E-8	30-Mar-88											
E-8	16-May-88											
E-8	22-Nov-88											
E-8	20-Dec-88											
E-8	20-Jan-89											
E-8	17-Feb-89			0.01 *	0.01 *							
E-8	2-Mar-89											
E-8	6-Mar-89			0.03	0.05							
E-8	4-May-89			0.04	0.06							
E-8	7-Jun-89			0.014	0.005 *						ND	ND
E-8	6-Jul-89											
E-8	18-Sep-89											
E-8	23-Oct-89					<1						
E-8	28-Nov-89	0.00005 *	0.00005 *	0.03	0.018							
E-8	16-Jan-90											
E-8	8-Feb-90	0.000025 *	0.000025 *	0.02	0.012							
E-8	9-Mar-90	0.00005 *	0.00005 *	0.0063	0.0078							

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

* indicates value below MDL, number to left is one half MDL
ND = Non Detectable

Station	Date	Temp. °C	Salinity ppt	Conduct.	DO ppm	pH	Turbid. FTU	Secchi cm	Chla mg/L	F Coli MPN/100ml	TDS	TSS		TOC	NO3 mg-N/L	NH3 mg-N/L	
E-6	5-Apr-90	12.5		500	7.6	7	4		0.016		380	2	*		0.04	0.025	*
E-6	24-May-90	11.9		510	6.8	7.3	4.2		0.0271		440	<10			0.26	0.025	*
E-6	25-Jun-90	13.3	0.2	580	5.2	7.4	4		0.1129		510	19			0.03	2.8	
E-6	26-Jul-90	dry															

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	un-ionized NH3 mg-N/L		Total P mg-P/L	Diss P mg-P/L	DOC mg/L	Cd mg/L	dissCd mg/L	Cr mg/L	dissCr mg/L	Cu mg/L	dissCu mg/L	Pb mg/L	dissPb mg/L	total Ni mg/L
									a=acute c=chronic violations						
E-8	5-Apr-90	0.014616		0.3	0.24	7.1	0.00005 *	0.00005	0.0005 *	0.0005 *	0.0017	0.0011	0.0008	0.00005	
E-8	24-May-90	0.0001		0.77	0.66	8.2	0.00005 *		0.0021		0.001		0.0063		
E-8	25-Jun-90	0.014616	c	1.5	1.2	9.2	0.0002		0.0005 *		0.0021		0.00005 *		
E-8	26-Jul-90														

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 1. Surface Water Quality

Station	Date	Ag mg/L	dissAg mg/L	Zn mg/l	dissZn mg/L	Se µg/l	Fe µg/l	dissFe µg/l	Mn µg/l	dissMn µg/l	Silica µg/l	dissSilica µg/l
E-8	5-Apr-90	0.000025 *	0.000025 *	0.014	0.0073							
E-8	24-May-90	0.000025 *		0.006								
E-8	25-Jun-90	0.000025 *		0.0048								
E-8	26-Jul-90											

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E-1	29-Feb-88				12	27		9.0			30.5	
E-3	29-Feb-88				14	23		7.5			91.5	
E-4	29-Feb-88				15	7		4.0			61	
E-5	29-Feb-88				15	6		3.0			61	
E-6	29-Feb-88				14			1.6				
E-7	29-Feb-88				13			5.5				
E-8	29-Feb-88				12			6.4				
E1	30-Mar-88	11:10 AM	70	0	10.5	32		8.5			70	
E1	30-Mar-88	11:10 AM		70	10.5	32		8.5				
E2	30-Mar-88	?11:30 A	152	0	12	31.5		8.4			65	
E2	30-Mar-88	?11:30 A		152	12	31.5		9.6				
E3	30-Mar-88	11:46 AM	44	0	15	31.5		8.4				
E3	30-Mar-88	11:46 AM		44	15	31.5		8.4				
E4	30-Mar-88	12:40 PM	>100cm	0	16	18		8.8			51	
E4	30-Mar-88	12:40 PM		>1m	14	21		8.5				
E5	30-Mar-88	1:00 PM	100	0	17	12.5		14			30	
E5	30-Mar-88	1:00 PM		100	16	13.5		14				
E6	30-Mar-88	2:35 PM	20	0	17	0.2		9.6			9	
E7	30-Mar-88	2:55 PM		0	16	0		7.6				
E8	30-Mar-88	3:10 PM		0	15	0		9.8				
E1	14-Apr-88	10:40 AM	183	0	12	32		9.5			137	
E1	14-Apr-88	10:40 AM		183				9.5				
E2	13-Apr-88	11:25 AM	91	0	12.5	32.7		10.4			>91	
E2	13-Apr-88	11:25 AM		46	12.5	32.7		11.2				
E2	13-Apr-88	11:25 AM		91	12.5	32.4		11.4				
E2	14-Apr-88	12:10 PM		0		32.1						
E3	13-Apr-88	10:00 AM	61	0	13.3	29.3	38900	9.5				
E3	13-Apr-88	10:00 AM		30.5	13.5	29.3		9.2				
E3	13-Apr-88	10:00 AM		61	13.5	29.3		9.4				
E3	13-Apr-88	11:55 AM									46	
E3	14-Apr-88	12:40 PM		0		31.8						
E4	13-Apr-88	12:55 PM	122	0	16	25.7		5.5			46	
E4	13-Apr-88	12:55 PM		61	16	26		6				
E4	13-Apr-88	12:55 PM		122	16	27.9		5				
E4	14-Apr-88	12:40 PM		0		25.3						
E5	13-Apr-88	2:47 PM		0	17	19.2		3.5				
E5	13-Apr-88	7:03 PM		0	16.1	17.9		5.7				
E5	13-Apr-88	10:45 PM		0	16	21.2		3.4				
E5	14-Apr-88	3:00 AM		0	15	22.5		0.2				
E5	14-Apr-88	6:25 AM		0	15	19		2.6				
E5	14-Apr-88	12:06 PM		0	16							
E5	14-Apr-88	1:00 PM									35.6	
E5	14-Apr-88	3:00 PM		0		19.7		3.9				
E6	13-Apr-88	4:04 PM		0	15	0.7	900	10.8				

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E6	13-Apr-88	7:20 PM		0	14.6	0.5	900	10				
E6	13-Apr-88	11:10 PM		0	13.7	0.8		5.8				
E6	14-Apr-88	3:30 AM		0	13	2.5	2900	2.1				
E6	14-Apr-88	6:35 AM		0	13.5	7.5		0.7				
E6	14-Apr-88	2:50 PM		0		3	4170	6.3				
E1	15-May-88	3:10 PM	137									
E1	15-May-88	3:10 PM	107	0	15.2	33.5		11.2	7.55	3.7	137	
E1	15-May-88	3:10 PM		30.5	15	33.5		11.2				
E1	15-May-88	3:10 PM		61	15	33.5						
E1	15-May-88	3:10 PM		91.5	15	33.5		11.4				
E2	15-May-88	3:45 PM	107	0	18.5	33.2		9.8	7.2	12	71.1	
E2	15-May-88	3:45 PM		107	18	33.5		9.4				
E3	15-May-88	4:10 PM		0	22	33.2		9.5	6	13	50.8	
E3	15-May-88	4:10 PM	50.8	50.8	22.2	33		9.5				
E4	15-May-88	4:35 PM		0	22	23.9		11.6	6.95	22	30.5	
E4	15-May-88	4:35 PM	96.5	96.5	22.1	23.5		11.6				
E5	15-May-88	3:00 PM		0	23	18.8		16.8	6.9	26	22.9	
E5	15-May-88	3:00 PM		30.5				16.8				
E5	15-May-88	3:00 PM		61				16.6				
E5	15-May-88	3:00 PM	91.5	91.5	23	18.6		15.8				
E6	16-May-88	10:53 AM		0	15.8	1.1	1700	2.1	7.55	62		0
E7	16-May-88	10:07 AM		0	14	1	1600	2.3	7.75	11		0
E8	16-May-88	10:30 AM		0	16.6	0.2	650	4.5	6.99	6.1		0.04
E1	15-Jun-88	2:15 PM	91.5							3.6	91.5	
E1	15-Jun-88	4:20 PM		0	14.5	33	40000	11.5	7.2			
E2	15-Jun-88	2:55 PM								4.2	78.7	
E2	15-Jun-88	3:48 PM		0	16	33	42000	10	7.1			
E2	15-Jun-88	3:48 PM		152.4	16	34	42500	9.3				
E3	15-Jun-88	3:40 PM	38.1							22	35.6	
E3	15-Jun-88	2:20 PM		0	21	33	46500	6.9	7.5			
E3	15-Jun-88	2:20 PM		91.4	18	35	46500	6.5				
E4	15-Jun-88	5:17 PM	106.7							25	30.5	
E4	15-Jun-88	1:40 PM		0	24.5	30	45000	8.8	7.6			
E4	15-Jun-88	1:40 PM		61	22	31.5	45000	7.8				
E4	15-Jun-88	1:40 PM		122	22	32	47000					
E5	15-Jun-88	6:00 PM	71.1							34?	22.9	
E6	15-Jun-88	10:10 AM		0	16	1.5	2320	3.5	8	34??		0
E6	16-Jun-88											
E7	15-Jun-88	9:55 AM		0	14.9	3.2	3520	2.7	7.9			0
	16-Jun-88									???		
E8	15-Jun-88		completely dry									
	15-Jun-88											
E1	21-Jul-88	5:00 PM		0	15.8	32.6		11	8.39	1.7	152	

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E1	21-Jul-88	5:00 PM	163	157	15.8	32.6						
E2	21-Jul-88	5:35 PM		0	17	32.3		9.9	7.04	4.5	109	
E2	21-Jul-88		198	198	16.5	32.1						
E3	21-Jul-88	5:55 PM		0	18.1	33		10	7.99	16	56	
E3	21-Jul-88		61	61	18.1	33						
E4	21-Jul-88	6:23 PM		0	25	38.8		10.8	7.96	20	41	
E4	21-Jul-88		127	127	25.5	38.2						
E5	21-Jul-88	6:42 PM		0	24	38.5		12	8.53	17	33	
E5	21-Jul-88					38.5						
E6	21-Jul-88	(~1:00 PM)		0	25.5	3.2	4230	>20	9.35	0.9*		
E7	21-Jul-88		completely dry									
E8	21-Jul-88		completely dry									
E1	29-Aug-88	2:20 PM	>170	0	15.1	31.8		8.8	7.81		170	
E1	29-Aug-88	2:20 PM		152	15.1	31.8		9.9				
E1	30-Aug-88	2:10 PM		0						1.8		
E2	29-Aug-88	2:45 PM	110	0	15.2	32		8.9	7.72			
E2	29-Aug-88	2:45 PM		110	15.1	31.5		8.9				
E2	30-Aug-88	2:30 PM		0						4.2		
E3	29-Aug-88	3:05 PM	90	0	16.9	31.3		8	7.54			
E3	29-Aug-88	3:05 PM		90	16.5	31.7		8				
E3	30-Aug-88	2:45 PM		0						8.4		
E4	29-Aug-88	3:30 PM	150	0	21	34.2		6.05	7.53		50	
E4	29-Aug-88	3:30 PM		150	21	34.9		6				
E4	30-Aug-88	3:15 PM		0						20		
E5	29-Aug-88	3:50 PM	140	0	22.5	37.3		9.2	7.94		50	
E5	29-Aug-88	3:50 PM		140	23	37.2		9.3				
E5	30-Aug-88	3:35 PM		0						23		
E6	29-Aug-88		completely dry									
E7	29-Aug-88		completely dry									
E8	29-Aug-88		completely dry									
E1	28-Sep-88	1:25 PM	200	0	15.1	32.2		9.75	8	3.6	195	
E1	28-Sep-88	1:25 PM		200	15.1	32.2		9.7				
E2	28-Sep-88	1:55 PM	200	0	15.2	32.3		9.8	8.25	4.4	175	
E2	28-Sep-88	1:55 PM		200	15.2	32.3		9.8				
E3	28-Sep-88	2:11 PM	100	0	15.5	32.5		9.8	8.3	7.3	120	
E3	28-Sep-88	2:11 PM		100	15	32.6		9.8				
E4	28-Sep-88	2:33 PM	1.6	0	18.5	34.2			7.75	18	60	
E4	28-Sep-88	2:33 PM		1.5		34.2		7.2				
E5	28-Sep-88	2:46 PM	135	0	19.7	36.3		12.5	8.4	20	45	
E5	28-Sep-88	2:46 PM		100	19.8	35.7		12.6				
E1	25-Oct-88	1:05 PM	>200	0	13.4	30.4		8.4	7.9		180	
E1	25-Oct-88	1:05 PM		200								
E1	26-Oct-88	2:10 PM								2.4		

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E2	25-Oct-88	1:25 PM	185	0	13.3	31.2		8.4	8		160	
E2	25-Oct-88	1:25 PM		140		31.2		8.35				
E2	26-Oct-88	2:30 PM								3.6		
E3	25-Oct-88	1:40 PM	90	0	13.5	31		8	8.1		>90	
E3	25-Oct-88	1:40 PM		90	13.5	31		8				
E3	26-Oct-88	1:25 PM								3.6		
E4	25-Oct-88	2:00 PM	155	0	13.5	31.8		6.2	7.9		85	
E4	25-Oct-88	2:00 PM		155	13.5	31.8		6				
E4	26-Oct-88	3:40 PM								12		
E5	25-Oct-88	2:44 PM	135	0	14	31.7		8.2	8.15		40	
E5	25-Oct-88	2:44 PM		135	14	31.7		8				
E5	26-Oct-88	12:45 PM								17		
E1	22-Nov-88	11:50 AM	138	0	12.2	32.3		8.5	7.15	4	125	
E1	22-Nov-88	11:50 AM		138		32.3						
E2	22-Nov-88	12:10 PM	190	0	12	33.2		8.3		5.7	105	
E3	22-Nov-88	12:40 PM	70	0	13.1	32.2		8.2		6.4	70	
E3	22-Nov-88	12:40 PM		70		32.2						
E4	22-Nov-88	1:03 PM	140	0	12.5	28		7.9		12	50	
E4	22-Nov-88	1:03 PM		140	12.5	29.5		7.9				
E5	22-Nov-88	1:35 PM	120	0	12.3	25.5		8.6		24	30	
E5	22-Nov-88	1:35 PM		120	12.3	25.5						
E6	22-Nov-88	10:20 AM		0	13		650	5.1	7.35	14		
E7	22-Nov-88	completely dry										
E8	22-Nov-88	3:40 PM		0	13.2		600	7.25		12		
E1	20-Dec-88	8:40 AM	210	0	10.2	33		8	7.5	4.5	>210	
E1	20-Dec-88	8:40 AM		210	10.2	33		8				
E1	21-Dec-88	9:30 AM		0	10.1	33.5						
E2	20-Dec-88	8:55 AM	200	0	10	33.5		9	7.7	2.8	>200	
E2	20-Dec-88	8:55 AM		200	10	33.5		9				
E2	21-Dec-88	10:09 AM		0	10.1	33.2						
E3	20-Dec-88	9:52 AM	100	0	10	33		8.5	7.8	3.2	>100	
E3	20-Dec-88	9:52 AM		100	10	33		8.5				
E3	21-Dec-88	10:40 AM		0	9	33.5						
E4	20-Dec-88	10:12 AM	175	0	9	31.5		10		12	75	
E4	20-Dec-88	10:12 AM		175	9	31.5		9.5				
E4	21-Dec-88	11:15 AM		0	7.5	16						
E4	21-Dec-88	11:15 AM		50	7	21.2						
E4	21-Dec-88	11:15 AM		100	6.5	23						
E4	21-Dec-88	11:15 AM		150	6.5	25.5						
E5	20-Dec-88	10:28 AM	162	0	8	26.5		10.5		36	65	
E5	20-Dec-88	10:28 AM		162	8	27		10.5				
E5	21-Dec-88	11:50 AM		0	7	13.9						
E5	21-Dec-88	11:50 AM		50	7	14.2						
E5	21-Dec-88	11:50 AM		100	7	15						

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E5	21-Dec-88	11:50 AM		150	6.8	15.5						
E6	20-Dec-88	1:15 PM		0	8.9			4		41		
E6	21-Dec-88	1:30 PM		0		1.2	1700	1.2				14
E7	20-Dec-88	1:32 PM		0	9			10.5		7.5		
E8	20-Dec-88	1:45 PM		0	8.6			9.5		5.4		
E1	20-Jan-89	9:30 AM	175	0	9.5	34.1		8.5	7.8	6.3	100	
E1	20-Jan-89	9:30 AM		175		34.1						
E2	20-Jan-89	10:10 AM		0	9.7	33.5		8.2	7.75	5.4		
E2	20-Jan-89	10:10 AM		Bottom		33.5						
E3	20-Jan-89	10:40 AM	~100	0	9.5	32.8		9	7.9	4	~100	
E3	20-Jan-89	10:40 AM		~100		32.8						
E4	20-Jan-89	11:25 AM	~150	0	8	18.1		6.8	8.2	12	~60	
E4	20-Jan-89	11:25 AM		50		19						
E4	20-Jan-89	11:25 AM		100		23.8		7				
E4	20-Jan-89	11:25 AM		150		24		7.5				
E5	20-Jan-89	12:02 PM	~125	0	8	10.9		6.4		17		
E5	20-Jan-89	12:02 PM		100		12.5		6.2				
E5	20-Jan-89	12:02 PM		125		12.5						
E6	20-Jan-89	1:33 PM		0	10.8	0	700	2.3	7.65	27		
E7	20-Jan-89	2:12 PM		0	11.8		412	15.2	8.7	3.5		
E8	20-Jan-89	2:40 PM		0	9		405	11.8	7.65	4.1		
E1	17-Feb-89	9:02 AM	195	0	9	35.8		12.3	7.9		>195	
E1	17-Feb-89	9:02 AM		195	9	35.8		12.3				
E1	18-Feb-89	~10:30AM		0						1.3		
E2	17-Feb-89	9:40 AM	200	0	8.8	33.1		10.3	7.8		>200	
E2	17-Feb-89	9:40 AM		200	9	32.9		10.3				
E2	17-Feb-89	2:10 PM		0	12	33.5						
E2	17-Feb-89	2:10 PM		213	12	34						
E2	18-Feb-89	~10:30AM		0						1.9		
bay upfrom 2	17-Feb-89	2:30 PM				29						
bay upfrom 2	17-Feb-89	2:40 PM			14	25						
bay upfrom 2	17-Feb-89	2:45 PM			15	28						
2-3pier	17-Feb-89	2:50 PM			14	22						
E3	17-Feb-89	10:10 AM	135	0	9.5	31.5		8.8	7.8		134	
E3	17-Feb-89	10:10 AM		135	9.5	32		8.8				
E3	17-Feb-89	4:00 PM	35	0	12.7	18.4					>35	
E3	18-Feb-89	~10:30AM		0						5.3		
E4	17-Feb-89	10:55 AM	130	0	9	12.4		5	7.4		50	
E4	17-Feb-89	10:55 AM		100		20.5						
E4	17-Feb-89	10:55 AM		130	9	23.4		5.6				
E4	17-Feb-89	3:25 PM	82	0	11.5	7					45	
E4	17-Feb-89	3:25 PM		82	14.5	7.6						
E4	17-Feb-89	5:05 PM	70	0	11	5.5					45	
E4	17-Feb-89	5:05 PM		70	10.5	7						

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E4	18-Feb-89	~10:30AM		0						15		
E5	17-Feb-89	8:20 AM		0	9	7.2	8800	4.7	7.3			
E5	17-Feb-89	11:30 AM	90	0	10	5.5		4.9	7.5		25	
E5	17-Feb-89	11:30 AM		90	10	5.5		4.8				
E5	17-Feb-89	3:00 PM	70	0	11	3.3					35	
E5	17-Feb-89	3:00 PM		70	10.5	4.2						
E5	18-Feb-89	~10:30AM		0						17		
E6	17-Feb-89	1:40 PM		0	13.9	0.2	700	11.2	7.5	15		some
E6	17-Feb-89	6:00 PM		0								1
E7	17-Feb-89	1:48 PM		0	12.9		620		7	6.2		some
E8	17-Feb-89	2:04 PM		0	11.5	1.8	700	11.4	5.8?	3.1		
E1	2-Mar-89	1:35 PM	170	0	10.8	6.5	8100	9.6	7.3		15	
E1	2-Mar-89	1:35 PM		170	10	6.5	8000					
E2	2-Mar-89	1:20 PM	65	0	11	4.8	5500	9.3	6.8	78	15	
E4	2-Mar-89	2:35 PM	140	0	10.2	0	305	6	7.8		9	
E4	2-Mar-89	2:35 PM		140	10.2	0	305					
E5	2-Mar-89	2:45 PM	160	0	10.5	0	332	4.7	7.6	66	7	
E5	2-Mar-89	2:45 PM		160	10.5	0	328					
E6	2-Mar-89	3:30 PM		0	11	0	462	5.7	7.5			est20-30cfs
E6R	2-Mar-89	3:30 PM		0	10.8	0	220	10	7.7	56		
E7	2-Mar-89	4:00 PM		0	11.2	0	221	9.8	7.7			11.5
E7R	2-Mar-89	4:00 PM		0	14	0	195	7.3	7.4	22		
E8	2-Mar-89	4:17 PM		0	10.5	0	221	10.2	7.8			
E1	6-Mar-89	10:25 AM	175	0	10	32.7		11.5*	7.7	2.8	170	
E1	6-Mar-89	10:25 AM		175		32.7		11.5*				
E1	7-Mar-89	11:45 AM		0	11.5	31.5						
E1	7-Mar-89	11:45 AM		200		31.5						
BetE1-E2	6-Mar-89	~11:20AM		0	10	32.2						
BetE1-E2	6-Mar-89	~11:25AM		0								
E2	6-Mar-89	11:03 AM	190	0	11	17.4		10*	7	37	30	
E2	6-Mar-89	11:03 AM		20		22.5						
E2	6-Mar-89	11:03 AM		30		28						
E2	6-Mar-89	11:03 AM		40		29.8						
E2	6-Mar-89	11:03 AM		50		30						
E2	6-Mar-89	11:03 AM		80		30.3		10.5*				
E2	6-Mar-89	11:03 AM		150		30.3		11*				
E2	6-Mar-89	11:03 AM		200		30.3						
E2	7-Mar-89	12:00 PM		0	12	28					95	
E2	7-Mar-89	12:00 PM		50		29						
E2	7-Mar-89	12:00 PM		100		29.5						
E2	7-Mar-89	12:00 PM		1.5		30.5						
E2	7-Mar-89	12:00 PM		200	11	31						
E2+	7-Mar-89	12:00 PM		0	11	31.5					125	
E2-3	7-Mar-89	~1210AM	160	0	11.5	30					100	

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E2-3	7-Mar-89	~1215AM		0	12	20						
E2-3	7-Mar-89	~1215AM		50		31						
E2-3	7-Mar-89	~1215AM		100	10.5	31.5						
E3	6-Mar-89	12:12 PM	80	0	11	0.7	1100	7.8	7.5	62	20	
E3	6-Mar-89	12:12 PM		40		1.5						
E3	6-Mar-89	12:12 PM		50		2.8						
E3	6-Mar-89	12:12 PM		60		5						
E3	6-Mar-89	12:12 PM		70		8.5						
E3	6-Mar-89	12:12 PM		80	10	12.2		7.8				
E3	7-Mar-89	12:20 PM	150	0	13.5	12.6					35	
E3	7-Mar-89	12:20 PM		50	11	28.7						
E3	7-Mar-89	12:20 PM		100	10.8	29.3						
E3	7-Mar-89	12:20 PM		150	10.5	29.5						
E4	6-Mar-89	12:50 PM	140	0	10.7	0	270	4.8	7.5	54	15	
E4	6-Mar-89	12:50 PM		140	10.7	0		4.65				
E4	7-Mar-89	12:45 PM	150	0	13	0.2	470				30	
E4	7-Mar-89	12:45 PM		0.5	12.5	0.2						
E4	7-Mar-89	12:45 PM		100		0.2						
E4	7-Mar-89	12:45 PM		1.5		0.2						
E5	6-Mar-89	9:30 AM		0	10.5	0	292					
E5	6-Mar-89	9:30 AM		100	10.5	0	292					
E5	6-Mar-89	1:15 PM	120	0	11	0	315	4.2	7.5	52	18	
E5	6-Mar-89	1:15 PM		120	11		325	4.2				
E5	7-Mar-89	10:00 AM		0	11.7	0	258					
E5	7-Mar-89	10:00 AM		100	11.7	0						
E5	7-Mar-89	10:00 AM		bottom		0						
E6	6-Mar-89	3:08 PM	50	0		0	250	5.1	7.4	46		58
E7	6-Mar-89	4:00 PM	65	0		0	218	8.8	7.5	13		10
E8	6-Mar-89	4:15 PM		0	11.5	0	220	9.8	7.7	16		
E1	9-Apr-89	3:30 PM	175	0	15	31		9.1			>175	
E1	9-Apr-89	3:30 PM		175	14	31.8						
E3	9-Apr-89	3:45 PM	80	0	21.5	23.4		7.5			75	
E3	9-Apr-89	3:45 PM		80	20.8	23.5						
E6	12-Apr-89											4cfs
E1	4-May-89	3:05 PM	195	0	15	32.2		8.6	8	4.3	140	
E1	4-May-89	3:05 PM		195	15	32.2		8.6				
E2	4-May-89	3:48 PM	50	0	18.2	31.7		8.1	8.1	47	35	
E2	4-May-89	3:48 PM		50	18.2	31.7		8.1				
E3	4-May-89	1:30 PM										
E3	4-May-89	2:33 PM	75	0	21.7	28.8		9.2	8.4	11	75	
E3	4-May-89	2:33 PM		75	21.7	28.8		9.2				
E4	4-May-89	12:57 PM	107	0	23	16.9		6.4	7.9	28	40	

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E4	4-May-89	12:57 PM		107	22.5	18		6.4				
E5	4-May-89	12:07 PM	90	0	21.5	6.3	9500	6.1	7.8	33	25	
E5	4-May-89	12:07 PM		90	21.5	6.3		6.1				
E6	4-May-89	5:45 PM		0	23.5		800	9	8.3	30		.5cfs
E7	4-May-89	6:00 PM		0	21.8		500	10.5	8.6	14		
E8	4-May-89	6:10 PM		0	19.2		490	7.4	8.3	5.7		
E1	26-May-89	4:15 PM			15	31.5		8.9	8			
E3	26-May-89	3:42 PM	40		18	35		7.3	8.1		20	
E5	26-May-89	5:30 PM			23	16		7	8.1			
E1	7-Jun-89	3:43 PM	170	0	13	31.3		9.3	8	2.6	>170	
E1	7-Jun-89	3:43 PM		170		31.3						
E1	8-Jun-89	7:55 PM										
E2	7-Jun-89	4:10 PM	215	0	12.8	32.4		9.2	7.8	3.1	155	
E2	7-Jun-89	4:10 PM		200	12.5	32.1						
E2	8-Jun-89	7:17 PM										
E3	7-Jun-89	4:40 PM	45	0	16.5	32.4		7.3	7.8	7.4	>45	
E3	7-Jun-89	4:40 PM		45	16.5	32.4						
E3	8-Jun-89	6:25 PM										
E3.5	8-Jun-89	6:00 PM										
E4	7-Jun-89	5:00 PM	95	0	19.4	28.8		7	7.7	34	25	
E4	7-Jun-89	5:00 PM		95	19.3	29		8.5				
E4	8-Jun-89	5:03 PM										
E5	7-Jun-89	5:23 PM	95	0	19.5	24.8		5.5	7.5	34	35	
E5	7-Jun-89	5:23 PM		95	19.6	24.8		5.5				
E5	8-Jun-89	5:21 PM										
E6	7-Jun-89	12:30 PM		0	17	0.3	620	10.4	8.3	26		
E7	7-Jun-89	12:12 PM		0	15.1	0.5	890	5.8	7.8	25		
E8	7-Jun-89	12:00 PM		0	15.5	0.3	560	4.2	7.5	11		
E1	5-Jul-89	5:19 PM		0	19	27		8.2	7.8	3.4	150	
E1	5-Jul-89	5:19 PM		bottom	20	27		8.2				
E1	5-Jul-89	5:40 PM										
E2	5-Jul-89	5:08 PM		0	18	28.5		7.7	7.8	4.2	140	
E2	5-Jul-89	5:08 PM		bottom	18	28.5		7.6				
E2	5-Jul-89	5:30 PM										
E2	5-Jul-89	6:00 PM										
E3	5-Jul-89	4:50 PM	~75	0	21	30		6.1	7.7	25	?30	
E3	5-Jul-89	4:50 PM		bottom	21	29		6.1				
E3	5-Jul-89	5:00 PM										
E4	5-Jul-89	4:05 PM	104	0	26	33.8		8.8	8.1	21	30	
E4	5-Jul-89	4:05 PM		104	26	33.4		8.3				
E5	5-Jul-89	3:15 PM	80	0	25	31		8.3	8	41	22	
E5	5-Jul-89	3:15 PM		80	25	31		8.4				
E6	6-Jul-89	10:00 AM		0	19	0.2	900	19	8.8	too turbid		

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E7	6-Jul-89	completely dry										
E8	6-Jul-89	completely dry										
E1	21-Aug-89	2:15 PM	70								>70	
E1	21-Aug-89	6:07 PM	170	0	15	34.1		8.8			120	
E1	21-Aug-89	7:00 PM	170	0	15.1	34.1		8.4	8		80	
E1	21-Aug-89	7:50 PM	185	0	15.4	34		8.2	8		90	
E1	21-Aug-89	9:00 PM	142	0	16	34.3		7.6	8			
E1	21-Aug-89	10:05 PM		0	16.5	34			7.9			
E2	21-Aug-89	2:45 PM	110								>110	
E2.5	21-Aug-89	2:15 PM	100								100	
E3	21-Aug-89	2:00 PM	75								60	
E3	21-Aug-89	3:30 PM	95	0	15.5	34.1		8.4	7.7			
E3	21-Aug-89	3:30 PM		95	15.3	34.1		8.4				
E3	21-Aug-89	6:20 PM	70	0	17.2	34.5		7.3	7.8		50	
E3	21-Aug-89	8:10 PM		0	17.8	35.2		6.2	7.8			
E1	18-Sep-89	2:05 PM	210	0	13	34		8.2	7.7	1.7	>210	
E1	18-Sep-89	2:05 PM		200	13	34		8				
E2	18-Sep-89	2:58 PM	>200	0	13	34		8.2		4.2	170	
E2	18-Sep-89	2:58 PM		200	13	34		9.1				
E2	18-Sep-89	7:15 PM		0	15	34		6.9	7.7			
E2	19-Sep-89	12:15 AM		0	14.3	34.3		5.3	7.7			
E2	19-Sep-89	6:30 AM		0	11.8	34.7		6.3	7.7			
E3	18-Sep-89	3:25 PM	95	0	13.9	34.2		8.4	7.6	6.8	90	
E3	18-Sep-89	3:25 PM		95	13.9	34.2		8.9				
E4	18-Sep-89	4:06 PM	155	0	16	34		6.4	7.7	32	35	
E4	18-Sep-89	4:06 PM		155	16	34		6.6				
E5	18-Sep-89	4:35 PM	130	0	17	35.2		5.4	7.5	60	22	
E5	18-Sep-89	4:35 PM		130	17	35.2		5.7				
E5	18-Sep-89	6:45 PM		0	17.1	35.9		5.1	7.4			
E5	18-Sep-89	11:50 PM		0	15	38		2.7	7.2			
E5	19-Sep-89	6:00 AM		0	14	36.4		2.8	7.5			
E6	18-Sep-89	5:50 PM		0	16.8	1	1120	2.7	7.7	20		0
E7	18-Sep-89	dry										
E8	18-Sep-89	dry										
E5	23-Oct-89	3:20 PM		0	15.5	29.2		7.9	7.6			
E6	23-Oct-89	2:00 PM		0	14.9		700	5	7.7			3
E7	23-Oct-89	1:10 PM		0	16.1		770	8.2	7.5			
E8	23-Oct-89	1:35 PM		0	14		620	7.5	7.2			
E1	28-Nov-89	10:50 AM	210	0	12	31		8	7.4	4	120	
E1	28-Nov-89	10:50 AM		210	12			8				
E2	28-Nov-89	10:25 AM										
E2	28-Nov-89	11:45 AM	>220	0	11.8	30.2		8.1	7	4.4	120	

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E2	28-Nov-89	11:45 AM		200	11.8			8				
E3	28-Nov-89	12:45 PM	60	0	11.4	30		8.9	7.5	3.8	>60	
E3	28-Nov-89	12:45 PM		60	11.4	30		9				
E4	28-Nov-89	1:55 PM	102	0	8.5	20.9		7.9	7.3	8.6	55	
E4	28-Nov-89	1:55 PM		102	8.5	22.5		7.8				
E5	28-Nov-89	2:30 PM	85	0	10	17.3		7.5	7.4	20	35	
E5	28-Nov-89	2:30 PM		85	10	17.3		7.4				
E6	28-Nov-89	4:25 PM		0	10		900	3.5	7.6	51		est1-2
E7	28-Nov-89	4:48 PM		0	10.9		520	8.4	7.5	18		0.25
E8	28-Nov-89	5:03 PM		0	8.4		520	9.6	7.5	6.9		0.25
E5	16-Jan-90	~12:00		0	11	0.5	820	6.2	6.8			
E6	16-Jan-90	2:40 PM		0	11.7	0.2	415		7			"good"jcr
E7	16-Jan-90	3:05 PM		0	11.5	0.1	298	10.4	7			
E8	16-Jan-90	3:35 PM		0	10.5		292	10.2	6.8			
E1	7-Feb-90	11:33 AM	200	0	8.2	35.1		8.9	7.8	5.2	95	
E1	7-Feb-90	11:33 AM		190	8.2	35.1		8.9				
E2	7-Feb-90	9:30 AM	>200	0	8	35		8.8	7.6	5.2	70	
E2	7-Feb-90	9:30 AM		200	8	35		8.8				
E2	7-Feb-90	12:50 PM		0								
E3	7-Feb-90	10:00 AM	140	0	7.5	27.9		8.4	7.6	16	40	
E3	7-Feb-90	10:00 AM		25		29						
E3	7-Feb-90	10:00 AM		50		32.5						
E3	7-Feb-90	10:00 AM		100		35.3						
E3	7-Feb-90	10:00 AM		200		35.3		8.2				
E3		1:05 PM										
E3A	7-Feb-90											
E4	7-Feb-90	1:50 PM	120	0	6	1.4	1120	7.6	7.4	23	30	
E4	7-Feb-90	1:50 PM		120	6	2	1620	6.8				
E5	7-Feb-90	2:22 PM	95	0	7	1	900	7.2	7.5	16	45	
E5	7-Feb-90	2:22 PM		95	6.5	1	900	7.2				
E6	8-Feb-90	4:40 PM		0	7		457	9.4	7.8	22		12
E7	8-Feb-90	5:00 PM		0	7		360	12.8	7.4	8		
E8	8-Feb-90	5:10 PM		0	6		312	11.8	7.3	11		
E1	9-Mar-90	11:15 AM	200	0	9	34.5		8**	7.8	3.1	140	
E1	9-Mar-90	11:15 AM		200	9	34.5		12.5**				
E1	9-Mar-90	10:18 AM										
E1	10-Mar-90	10:12 AM		0	8.2	35		8.6				
E2	9-Mar-90	11:36 AM	>220	0	9.5	33.5		8.3**	7.8	3.5	150	
E2	9-Mar-90	11:36 AM		200	9.5	33.5		12.5**				
E2	9-Mar-90	12:55 PM										
E2	10-Mar-90	11:18 AM		0	9	34.2		9				
E3	9-Mar-90	10:50 AM	70	0	9	26		11.0**	7.4	12	45	
E3	9-Mar-90	10:50 AM		70	9	27		13.0**				

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E3	9-Mar-90	12:30 PM										
E3	10-Mar-90	11:10 AM		0	10	24.2		8.5				
E4	9-Mar-90	10:07 AM	120	0	8	1	1120	7.7**	7.1	24	25	
E4	9-Mar-90	10:07 AM		120	8	1	1120	8.8**				
E4	9-Mar-90	11:35 AM										
E4	10-Mar-90	10:56 AM		0	9.2	0.1	1210	8.7				
E5	9-Mar-90	9:40 AM	80	0	7.5		850	6.6**	7.2	14	45	
E5	9-Mar-90	9:40 AM		80	7.5		850	7.8**				
E5	9-Mar-90	11:23 AM										
E5	10-Mar-90	10:42 AM		0	9		1020	8.1				
E6	9-Mar-90	2:34 PM		0	13		530	8.3**	7.9	25		
E6	10-Mar-90	4:00 PM		0								17
E7	9-Mar-90	3:00 PM		0	13		383	12**	8.1	6.5		
E8	9-Mar-90	3:15 PM		0	10		340	12.5**	7.9	6.4		
								** DO meter erratic				
E1	5-Apr-90	11:54 AM	160	0	11.2	34.5		8	7.8	2.6	>160	
E1	5-Apr-90	11:54 AM		160	11	34.5		7.8				
E2	5-Apr-90	11:26 AM	210	0	11.9	33.8		7.5	8	3.7	130	
E2	5-Apr-90	11:26 AM		210	11.2	34.4		7.9				
E2	5-Apr-90	2:32 PM		0	13.5	32.5		7.9	7.6			
E2	5-Apr-90	6:16 PM		0	14	29.8		9.95	8.2			
E2	5-Apr-90	10:20 PM		0	10.2	34.3		8.8	8			
E2	6-Apr-90	6:00 AM		0	14	27		7.9				
E2	6-Apr-90	10:40 AM		0	10.5	34.7		7.6	7.9			
E3	5-Apr-90	11:12 AM	42	0	13.1	31.2		7.4	8.1	7.3	>42	
E3	5-Apr-90	11:12 AM		42	13.1	31.2		7.4				
E3	5-Apr-90	10:50 AM										
E4	5-Apr-90	10:15 AM	110	0	13.4	10.5		5.2	7.7	18	30	
E4	5-Apr-90	10:15 AM		110	13.8	14.1		4.4				
E5	5-Apr-90	9:20 AM	80	0	14	5	5800	5.6	7.5	32	23	
E5	5-Apr-90	9:20 AM		80	14.3	5	5800	4.8				
E5	5-Apr-90	3:03 PM		0	15.1	1.7	2310	5.7	8			
E5	5-Apr-90	6:50 PM		0	14.3	1.2	1680	5.4	7.9			
E5	5-Apr-90	10:55 PM		0	14	2.7	3500	4.4	7.8			
E5	6-Apr-90	6:25 AM		0	15	1	1600	1.1				
E5	6-Apr-90	11:23 AM		0	13.3	5.2	7100	4.2	7.6			
E6	5-Apr-90	8:00 AM		0	12.8		700	1.2	7.3			
E6	5-Apr-90	3:25 PM		0	15.3		720	8	7.3	22		1
E6	5-Apr-90	7:23 PM		0	15		720	7.8	8.3			
E6	5-Apr-90	11:16 PM		0	13.9		720	1.55	7.7			
E6	6-Apr-90	6:40 AM		0	14		650	1.5				
E6	6-Apr-90	11:43 AM		0	12.5		700	1.9	7.6			
E7	5-Apr-90	1:27 PM		0	14.2		520	5.2	7.5	27		some
E8	5-Apr-90	1:50 PM		0	12.5		500	7.6	7	4		none

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E1	24-May-90	11:12 AM	135	0	9.5	34.9		8.5	7.9	4.4	>135	
E2	24-May-90	11:48 AM	120	0	11.8	35.4		7.5	8	5.8	80	
E3	24-May-90	2:40 PM	95	0	15	35.7		7.7	8.3	22	35	
E3	24-May-90	2:40 PM		95	15	35.7		7.7				
E3	24-May-90	2:15 PM										
E4	24-May-90	12:45PM	74	0	17.1	26.2		7.3	8.2	28	37	
E4	24-May-90	12:45 PM		74	17.1	26.2		7.3				
E5	24-May-90	1:35 PM	70	0	17.5	22.5		4.7	7.9	31	42	
E5	24-May-90	1:35 PM		70	17.5	22.5		4.7				
E6	24-May-90	9:55 AM		0	12.8		590	4.1	7.3	50		0
E7	24-May-90	9:15AM		0	10.8		570	5	7.2	8.3		0.5
E8	24-May-90	9:35AM		0	11.9		510	6.8	7.3	4.2		0
E5	31-May-90	6:08AM		0		1		2.9				
E5	31-May-90	6:42AM		0				2.6				
E6	31-May-90	6:30AM		0				0.6				1.1
E6	31-May-90	7:00AM		0				2.4				
E1	25-Jun-90	1:05PM	140	0	12	32.5		8.5	7.8	1.9	>140	
E2	25-Jun-90	1:45PM	120	0	14.3	33.9		6.8	7.6	6.2	70	
E3	25-Jun-90	4:35PM	100	0	18	33.8		6.5	8	22	30	
E3	25-Jun-90	4:35PM		100	18	33.8		6.5				
E4	25-Jun-90	3:55PM	100	0	22	30		4.9	7.9	92	10	
E4	25-Jun-90	3:55PM		100				4.9				
E5	25-Jun-90	3:05PM	62	0	21.2	24.3		3.3	7.8	120	5	
E5	25-Jun-90	3:05PM		62	21.2	24.3		3.2				
E5	26-Jun-90	5:50 AM		0	16.5	26.2		3.1	8.7			
E6	25-Jun-90	11:15AM		0	16	0.8	1140	19	9.1	57		
E7	25-Jun-90	10:35AM		0	11.5	0.9	1120	0.7	7.2	93		
E8	25-Jun-90	10:40AM		0	13.3	0.2	580	5.2	7.4	4		
E1	26-Jul-90	2:15PM	175	0	11.2	32		7.4	8.1	1.6	170	
E2	26-Jul-90	2:20PM	183	0	12.7	32		8	8	2.2	100	
E3	26-Jul-90	4:45PM	80	0	16.4	32		8.4	8.5	8.8	65	
E3	26-Jul-90	4:45PM		80	16.4	32		8.4				
E4	26-Jul-90	4:04PM	110	0	21	35		5.7	8.1	50	12	
E4	26-Jul-90	4:04PM		110	21	35		5.5				
E5	26-Jul-90	3:25PM	84	0	21.7	34.3		11.1	8.7	35	12	
E5	26-Jul-90	3:25PM		84	21.7	34.3		11.1				
E6	26-Jul-90	11:35 AM		0	20.5		1920	>>20	9.8			
E7	26-Jul-90		dry									
E8	26-Jul-90		dry									
E3	10-Sep-90	2:42PM		0	16.5	27.2		9.2				
E3	10-Sep-90	2:42PM		bottom				9.2				
E5	10-Sep-90	3:47PM		0	19.5	33.9		10.5				

Appendix WQ1. Water Quality in Estero Americano and Americano Creek
Part 2. Field Parameters

Station	Date	Time	Water Column Depth cm	Samp. Dep. cm	Temp. °C	Salinity ppt	Conduct.	DO	pH	Turbid.	Secchi cm	Flow cfs
E5	10-Sep-90	3:47PM		bottom	19.5	33.9		10.5				
E1	18-Sep-90	11:22 AM	210	0	10.3	30.3		8.6	7.5	2.4	>210	
E2	18-Sep-90	12:45 PM	215	0	10.4	30		8	7.6	2.2	160	
E2	18-Sep-90	12:45 PM		215	10.4	30		8				
E3	18-Sep-90	2:40 PM	115	0	14	30.3		7.6	7.3	8.8	65	
E3	18-Sep-90	2:40 PM		115	14	30.3						
E4	18-Sep-90	2:12 PM	120	0	16.1	33		8	8	37	20	
E4	18-Sep-90	2:12 PM		120	16.1	33						
E5	18-Sep-90	1:43 PM	105	0	16.2	34.5		10.4	7.9	37	20	
E5	18-Sep-90	1:43 PM		105	16.2	34.5						

* indicates value below MDL, number to left is one half MDL
ND= Non Detectable

Station	Date	Time	bar open or closed	depth cm	sample depth	secchi cm	Temp °C	Sal ppt	Conduct.	DO ppm	pH	Turbid FTU	Chla µg/l	Flow cfs	F Coli MPN/100ml	TDS
S-2	5-Jul-89	10:20 AM	o	195	surface	170	18.4	29		8.4	8.2	4.4	2.69			
S-2	5-Jul-89	10:20 AM	o		bottom		17	29.5		9.2						
S-2	18-Sep-89	10:05 AM	o		bottom		15.3	37		7.4						
S-2	18-Sep-89	10:05 AM	o		surface		15.3	37		6.4	8.2	2.1	0.833			
S-2	28-Nov-89	1:48 PM	o	187	0	175	10.8	30.4		7.5	7.4	3.8	0.92			
S-2	28-Nov-89	1:48 PM	o		187		10.8	32		7.9						
S-2	8-Feb-90	~1:00 PM	c	>200	0	38	7.5	6.5		17.2	8.3	16	113.86			
S-2	8-Feb-90	~1:00 PM	c		100		7.5	14.5		12.2						
S-2	8-Feb-90	~1:00 PM	c		200		7.5	24		2						
S-2	8-Feb-90	~1:00 PM	c		275			26.6		1.2						
S-2	10-Mar-90	1:28 PM	o	200	0	55	11	17.2		9	7.7	10	5.3			
S-2	10-Mar-90	1:28 PM	o		50			17								
S-2	10-Mar-90	1:28 PM	o		100			30		7.4						
S-2	10-Mar-90	1:28 PM	o		200		9	31		7.3						
S-2	6-Apr-90	1:04 PM	o	195	0	140	13.7	10.5	12500	7.9	8.3	3.8	11.76			
S-2	6-Apr-90	1:04 PM	o		195		12.9	30.2		2		2.4	5.3			
S-2	25-May-90	11:10 AM	c	250	0	100	15	18.7		8.9	8.3	5	9.42			
S-2	25-May-90	11:10 AM	c		100		14	19.2		7.6						
S-2	25-May-90	11:10 AM	c		200		13.8	19.2		7.2						
S-2	26-Jun-90	3:00 PM	c	>200	0	120	18.5	15.3		8.6	8.1	4.6	15.18			
S-2	26-Jun-90	3:00 PM	c		100		18.5	15.3								
S-2	26-Jun-90	3:00 PM	c		200		15.8	16.2		6.2						
S-2	27-Jul-90	1:20 PM	c	215	0	130	17	16.4		7.6	8.4	4.1	12.53			
S-2	27-Jul-90	1:20 PM	c		100		16.5	16.3		7.6						
S-2	27-Jul-90	1:20 PM	c		200		16	16.5		6.5						
S-2	19-Sep-90	5:40 PM	c	~150	0	~50	15.9	17.6		8.5	8.2	2.7	4			
S-2	19-Sep-90	5:40 PM	c		150		15	17.6		8.6						
S-2	16-Nov-90	3:30 PM		150	0	>150	12	19.5		9.8	8.4		3			
S-2	16-Nov-90	3:30 PM		150	150		12	20		9.8						
S-4	16-May-88	9:05 AM	?		0		17.9	15.5		4.7	7.25	11	9.48		130	
S-4	15-Jun-88	10:43 AM	?		0		20	17.2	26200	5.5	8	4.4	9.59			20000
S-4	21-Jul-88	12:07 PM	?		0		21.1	21		5.9	8.07	4.1	lost			23000
S-4	29-Aug-88	5:25 PM	?		0		22	23.2		6.3	7.95	7.5	4.16		ND	30000
S-4	28-Sep-88	10:30 AM	?		0		18.8	28.2		5.4	8.2	7.1	4.22			30000
S-4	25-Oct-88	3:40 PM	?		0		14.8	24.9	31800	5	8.4	4.7	4.11			29000
S-4	22-Nov-88	2:25 PM	?		0		14.2	20.2		18.9	8.8				2400	
S-4	20-Dec-88	11:20 AM	?		0		8.5	21.1		11.6	8.7	12	177.33			
S-4	20-Jan-89	12:10 PM	o		0		11	7.8	10000	12.3	8.75	13	64.55			
S-4	17-Feb-89	12:50 PM	o		0		13	7	9000	20	8.8	27	242.35			
S-4	6-Mar-89	2:45 PM	o		0			1.1	1600	7	7.2	51	8.54			
S-4	4-May-89	5:23 PM	o		0		21	12.2		14.6	9.2	15	110.92		380	
S-4	7-Jun-89	12:58 PM	o		0		18.5	22.8		8.4	8.5	15	31.35			
S-4	5-Jul-89	12:25 PM	o		0		additional info see note									
S-4	5-Jul-89	12:25 PM	o		bottom		20.5	26.2		5.7						
S-4	18-Sep-89	10:50 AM	o		bottom		15.5	38		7.5						
S-4	5-Jul-89	12:25 PM	o		120	80	21	26.2		5.9	8.2	8.3	4.25			
S-4	18-Sep-89	10:50 AM	o		surface		15.5	38		7.2	8.2	2.2	1.212		79	
S-4	28-Nov-89	12:50 PM	o		0											

Station	Date	Time	TSS	NO3 mg-N/L	NH3 mg-N/L	un-ionized NH3 mg-N/L	NO2 mg-N/L	Total P mg-P/L	Diss P mg-P/L	DOC mg/l	Tot. org. C	Cd mg/l	Cr mg/l	Cu mg/l
										a=acute c=chronic violations				
S-2	5-Jul-89	10:20 AM		0.03	ND			0.34	0.31					
S-2	5-Jul-89	10:20 AM												
S-2	18-Sep-89	10:05 AM												
S-2	18-Sep-89	10:05 AM	14	ND	0.09			1.1	0.96	5.1		ND	ND	0.003
S-2	28-Nov-89	1:48 PM	8.4	0.23	0.56	0.0018868		0.1 *	0.24	2		0.00005 *	0.006	0.001
S-2	28-Nov-89	1:48 PM												
S-2	8-Feb-90	~1:00 PM	19	0.84	1.2	0.0290104		1	0.76					
S-2	8-Feb-90	~1:00 PM												
S-2	8-Feb-90	~1:00 PM												
S-2	8-Feb-90	~1:00 PM												
S-2	10-Mar-90	1:28 PM	10	0.67	0.73	0.0052624		0.71	0.51					
S-2	10-Mar-90	1:28 PM												
S-2	10-Mar-90	1:28 PM												
S-2	10-Mar-90	1:28 PM												
S-2	6-Apr-90	1:04 PM	16	0.015 *	0.23	0.0084054		0.5	0.49					
S-2	6-Apr-90	1:04 PM	48	0.04	0.15	0.0045673		0.22	0.26					
S-2	25-May-90	11:10 AM	25	0.16	0.025 *	0.0009177		0.64	0.58					
S-2	25-May-90	11:10 AM												
S-2	25-May-90	11:10 AM												
S-2	26-Jun-90	3:00 PM	29	0.015 *	0.19	0.0061994		1.3	1.3					
S-2	26-Jun-90	3:00 PM												
S-2	26-Jun-90	3:00 PM												
S-2	27-Jul-90	1:20 PM	5.6	0.07	0.05	0.0027325		1.6	1.4					
S-2	27-Jul-90	1:20 PM												
S-2	27-Jul-90	1:20 PM												
S-2	19-Sep-90	5:40 PM	3.2	0.015 *	0.025 *	0.0007906		2.1	1.9					
S-2	19-Sep-90	5:40 PM												
S-2	16-Nov-90	3:30 PM	18	0.015 *	0.074	0.0027164		2.7	2.4					
S-2	16-Nov-90	3:30 PM												
S-4	16-May-88	9:05 AM		0.3	0.22	0.0008954	0.08	0.7	0.57					
S-4	15-Jun-88	10:43 AM		ND	0.23	0.00644	ND	1.6	0.9					
S-4	21-Jul-88	12:07 PM		0.09	0.27	0.008856	ND	0.95	0.95					
S-4	29-Aug-88	5:25 PM		ND	0.16	0.004384	0.03	1.9	1.8					
S-4	28-Sep-88	10:30 AM			0.11	0.00418	ND		2.4					
S-4	25-Oct-88	3:40 PM		ND	0.19	0.008493	0.04	2.6	2.4					ND
S-4	22-Nov-88	2:25 PM	73	0.12	8.5	0.85 a	ND	4.6	2					
S-4	20-Dec-88	11:20 AM		0.09	1.1	0.05995 c	ND	2.6	2.2					
S-4	20-Jan-89	12:10 PM		0.73	2.4	0.18744 a	0.1	2.1	2					
S-4	17-Feb-89	12:50 PM		0.07	0.85	0.0884 c		2.3	1.7					
S-4	6-Mar-89	2:45 PM		0.61	1.1			1.1	0.78					
S-4	4-May-89	5:23 PM		0.57	ND	0.0061		0.94	0.51					
S-4	7-Jun-89	12:58 PM		ND	0.07	0.005012								
S-4	5-Jul-89	12:25 PM				0.00222								
S-4	5-Jul-89	12:25 PM				0.00073								
S-4	18-Sep-89	10:50 AM												
S-4	5-Jul-89	12:25 PM		0.17	0.05			0.69	0.63					
S-4	18-Sep-89	10:50 AM	ND	ND	ND			1.3	1					
S-4	28-Nov-89	12:50 PM												

Station	Date	Time	Pb mg/l	Ag mg/l	Zn mg/l	dissCd mg/l	dissCr mg/l	dissCu mg/l	dissPb mg/l	dissAg mg/l	dissZn mg/l
S-2	5-Jul-89	10:20 AM									
S-2	5-Jul-89	10:20 AM									
S-2	18-Sep-89	10:05 AM									
S-2	18-Sep-89	10:05 AM	ND		ND	ND	ND	0.003	ND		ND
S-2	28-Nov-89	1:48 PM	0.0005 *	0.002	0.011	0.00005 *	0.005	0.004	0.0005 *	0.0019	0.0054
S-2	28-Nov-89	1:48 PM									
S-2	8-Feb-90	~1:00 PM									
S-2	8-Feb-90	~1:00 PM									
S-2	8-Feb-90	~1:00 PM									
S-2	8-Feb-90	~1:00 PM									
S-2	10-Mar-90	1:28 PM									
S-2	10-Mar-90	1:28 PM									
S-2	10-Mar-90	1:28 PM									
S-2	10-Mar-90	1:28 PM									
S-2	6-Apr-90	1:04 PM									
S-2	6-Apr-90	1:04 PM									
S-2	25-May-90	11:10 AM									
S-2	25-May-90	11:10 AM									
S-2	25-May-90	11:10 AM									
S-2	26-Jun-90	3:00 PM									
S-2	26-Jun-90	3:00 PM									
S-2	26-Jun-90	3:00 PM									
S-2	27-Jul-90	1:20 PM									
S-2	27-Jul-90	1:20 PM									
S-2	27-Jul-90	1:20 PM									
S-2	19-Sep-90	5:40 PM									
S-2	19-Sep-90	5:40 PM									
S-2	16-Nov-90	3:30 PM									
S-2	16-Nov-90	3:30 PM									
S-4	16-May-88	9:05 AM									
S-4	15-Jun-88	10:43 AM									
S-4	21-Jul-88	12:07 PM									
S-4	29-Aug-88	5:25 PM									
S-4	28-Sep-88	10:30 AM									
S-4	25-Oct-88	3:40 PM	ND					0.001 *	0.005 *		
S-4	22-Nov-88	2:25 PM									
S-4	20-Dec-88	11:20 AM									
S-4	20-Jan-89	12:10 PM									
S-4	17-Feb-89	12:50 PM									
S-4	6-Mar-89	2:45 PM									
S-4	4-May-89	5:23 PM									
S-4	7-Jun-89	12:58 PM									
S-4	5-Jul-89	12:25 PM									
S-4	5-Jul-89	12:25 PM									
S-4	18-Sep-89	10:50 AM									
S-4	5-Jul-89	12:25 PM									
S-4	18-Sep-89	10:50 AM									
S-4	28-Nov-89	12:50 PM									

* indicates value below MDL, number to left is one half MDL
ND= Non Detectable

Station	Date	Time	bar open or closed	depth cm	sample depth	secchi cm	Temp °C	Sal ppt	Conduct.	DO ppm	pH	Turbid FTU	Chla µg/l	Flow cfs	F Coli MPN/100ml	TDS
S-4	28-Nov-89	1:34 PM	o	158	0	98	11.1	27		4.4	7.1	6.2	3.16			
S-4	28-Nov-89	1:34 PM	o		158		11.1	26.8		4.3						
S-4	8-Feb-90	2:50 PM	c	>200	0	25	9	3.9		10.6	7.9	28	149.36		350	
S-4	8-Feb-90	2:50 PM	c		100		8.5	12		4.8						
S-4	8-Feb-90	2:50 PM	c		200		8.5	23		0.7						
S-4	10-Mar-90	2:32 PM	o	150	0	40	11	3.1		8.7	7.7	16	21.43			
S-4	10-Mar-90	2:32 PM	o		150		10	22		2.5						
S-4	6-Apr-90	2:38 PM	o		0	60	14	4		6.6	8.6	4.7	10.43			
S-4	6-Apr-90	2:38 PM	o		50		15	4		6.5			12.25			
S-4	6-Apr-90	2:38 PM	o		100		15	19		2.1						
S-4	6-Apr-90	2:38 PM	o		150		15	30		2.1		2.6				
S-4	25-May-90	12:35 PM	c	163	0	85	15.4	16.1		6.4	8.4	7.2	8.19			
S-4	25-May-90	12:35 PM	c		163		15	18		4.6						
S-4	26-Jun-90	4:48 PM	c	165	0	65	18.3	12.9		9.3	8.7	6.5	44.12			
S-4	26-Jun-90	4:48 PM	c		100		18.3	12.9		9.4						
S-4	26-Jun-90	4:48 PM	c		165		18.3	12.9		9.2						
S-4	27-Jul-90	12:55 PM	c	180	0	60	16.5	13.4		9.1	8.8	7.6	27.06			
S-4	27-Jul-90	12:55 PM	c		100			13.6		8.8						
S-4	27-Jul-90	12:55 PM	c		150			14		4						
S-4	19-Sep-90	7:20 PM	c	165	0	120	16	15.2		5.3	8.1	5.4	3.9			
S-4	19-Sep-90	7:20 PM	c		162		16	15.2		5.3						
S-4	16-Nov-90	4:20 PM		130	0	>130	12.3	18.2		8.4	8.4		2.2			
S-4	16-Nov-90	4:20 PM		130	130		12	18.2		8.5						
S-4	6-May-94						17	14.5	20500	6.7	8.5		0.01*			15600
S-6t	5-Jul-89	11:40 AM	o	125	0	40	20	22.2		10.4	9	22	80.42			
S-6	5-Jul-89	11:40 AM	o		bottom		20	23		7.2						
S-6	18-Sep-89	11:15 AM	o		bottom		17	35.8		4.1						
S-6	5-Jul-89	11:40 AM	o		125	40	20	22.2		10.4	9	22	80.42			
S-6	18-Sep-89	11:15 AM	o		surface		17	35.8		4.1	8.2	5.4	9.098			
S-6	28-Nov-89	1:15 PM	o	145	0	45	10.1	19.2		2.1	7	16	36.73			
S-6	28-Nov-89	1:15 PM	o		145		9.2	19.9		1.6						
S-6	8-Feb-90	2:12 PM	c	>200	0	18	8.3	0.5	650	6.5	7.4	52	33.91			
S-6	8-Feb-90	2:12 PM	c		50			0								
S-6	8-Feb-90	2:12 PM	c		100			18.5		0.7						
S-6	8-Feb-90	2:12 PM	c		150			23.3								
S-6	8-Feb-90	2:12 PM	c		200		8.2	26.2		0.3						
S-6	10-Mar-90	~1:00 PM	o	160	0	30	11		700	8.8	7.6	24	22.17			
S-6	10-Mar-90	~1:00 PM	o		160		11		750	8.6						
S-6	6-Apr-90	7:00 AM	o		0		14	1.5	2300	4						
S-6	6-Apr-90	2:00 PM	o	170	0	65	14.5	2	2580	8.3	8.2	4.5	22.97			
S-6	6-Apr-90	2:00 PM	o		170		14	29		0.65		2.3	17.67			
S-6	25-May-90	11:55 AM	c	194	0	60	18	13.5		>20	9.4	6.6	88.67		41	
S-6	25-May-90	11:55 AM	c		100		15	15		8						
S-6	25-May-90	11:55 AM	c		194		15	15		6.7						
S-6	26-Jun-90	3:48 PM	c	>200	0	50	22	8.4		16.2	9.2	15	91.11			
S-6	26-Jun-90	3:48 PM	c		100		19	9		2.5-3.0						
S-6	26-Jun-90	3:48 PM	c		>200		17.5	13		0.3		88	96.44			
S-6	27-Jul-90	12:25 PM	c	210	0	40	18	11.3	15500	16.5	9.3	6.4	168.59			

Station	Date	Time	TSS	NO3 mg-N/L	NH3 mg-N/L	un-ionized NH3 mg-N/L	NO2 mg-N/L	Total P mg-P/L	Diss P mg-P/L	DOC mg/l	Tot. org. C	Cd mg/l	Cr mg/l	Cu mg/l
												a=acute c=chronic violations		
S-4	28-Nov-89	1:34 PM	9.6	0.35	1.3	0.0022346		0.9	0.6					
S-4	28-Nov-89	1:34 PM												
S-4	8-Feb-90	2:50 PM	29	0.94	2.5	0.0264437		1.7	1.1	26		0.0006	0.0046	0.0089
S-4	8-Feb-90	2:50 PM												
S-4	8-Feb-90	2:50 PM												
S-4	10-Mar-90	2:32 PM	20	0.87	1.2	0.0093708		0.92	0.9	18		0.003	0.0026	0.0055
S-4	10-Mar-90	2:32 PM	37	0.47	1.1	0.007089		0.84	0.75	9.7		0.021	0.0042	0.0023
S-4	6-Apr-90	2:38 PM	20	0.04	0.53	0.0389183		0.65	0.59	14		0.004	0.0061	0.0027
S-4	6-Apr-90	2:38 PM												
S-4	6-Apr-90	2:38 PM												
S-4	6-Apr-90	2:38 PM												
S-4	25-May-90	12:35 PM	23	0.29	0.12	0.0056647		1.1	0.97	13		0.00005 *	0.0029	0.0008
S-4	25-May-90	12:35 PM												
S-4	26-Jun-90	4:48 PM	16	0.015 *	0.1	0.0110904		2.2	2.1	21		0.0007	0.0044	0.0006
S-4	26-Jun-90	4:48 PM												
S-4	26-Jun-90	4:48 PM												
S-4	27-Jul-90	12:55 PM	14	0.015 *	0.05	0.0063399		2.1	1.9	20		0.00005 *	0.0032	0.0089
S-4	27-Jul-90	12:55 PM												
S-4	27-Jul-90	12:55 PM												
S-4	19-Sep-90	7:20 PM	4.6	0.18	0.14	0.003653		2	2	22		0.00005 *	0.021	0.00005 *
S-4	19-Sep-90	7:20 PM												
S-4	16-Nov-90	4:20 PM	9.8	0.066	0.13	0.004772		2.4	2.4	26		0.0022	0.0005 *	0.00005 *
S-4	16-Nov-90	4:20 PM												
S-4	6-May-94		8	0.03 *	0.05 *			0.29	0.16		12	0.00025 *	0.0025 *	0.0025 *
S-6t	5-Jul-89	11:40 AM		0.03	ND			1.2	0.88					
S-6	5-Jul-89	11:40 AM												
S-6	18-Sep-89	11:15 AM												
S-6	5-Jul-89	11:40 AM		0.03	ND			1.2	0.88					
S-6	18-Sep-89	11:15 AM	14	0.05	0.78			2.2	1.5	12		ND	ND	0.002
S-6	28-Nov-89	1:15 PM	24	0.65	3.3	0.0042653		2.5	1.7	22		0.00005 *	0.004	0.00025*
S-6	28-Nov-89	1:15 PM												
S-6	8-Feb-90	2:12 PM	37	1.5	2.8	0.0087057		1.8	1.5	35		0.00005 *	0.0078	0.01200
S-6	8-Feb-90	2:12 PM												
S-6	8-Feb-90	2:12 PM												
S-6	8-Feb-90	2:12 PM												
S-6	8-Feb-90	2:12 PM												
S-6	10-Mar-90	~1:00 PM	23	1.2	0.95	0.0059022		1.4	1.2	21		0.0005	0.0026	0.0056
S-6	10-Mar-90	~1:00 PM												
S-6	6-Apr-90	7:00 AM												
S-6	6-Apr-90	2:00 PM	11	0.05	0.58	0.0190937		0.63	0.49	12		0.0027	0.0005 *	0.0029
S-6	6-Apr-90	2:00 PM	50	0.015 *	1.2	0.0314519		1.6	1.2	4.8		0.0003	0.0038	0.00005 *
S-6	25-May-90	11:55 AM	28	0.015 *	0.06	0.0230808		1.7	1.4	14		0.00005 *	0.0029	0.0013
S-6	25-May-90	11:55 AM												
S-6	25-May-90	11:55 AM												
S-6	26-Jun-90	3:48 PM	17	0.015 *	0.08	0.028414		2.3	1.7	19		0.0006	0.002	0.0015
S-6	26-Jun-90	3:48 PM												
S-6	26-Jun-90	3:48 PM	2 *	0.015 *	4.4	1.2446506		2.5	3.2	20		0.00005 *	0.0021	0.00005 *
S-6	27-Jul-90	12:25 PM	24	0.015 *	0.05	0.0170017		2.5	2.2	26		0.00005 *	0.0022	0.007

Station	Date	Time	Pb mg/l	Ag mg/l	Zn mg/l	dissCd mg/l	dissCr mg/l	dissCu mg/l	dissPb mg/l	dissAg mg/l	dissZn mg/l
S-4	28-Nov-89	1:34 PM									
S-4	28-Nov-89	1:34 PM									
S-4	8-Feb-90	2:50 PM	0.0005	0.000025 *	0.023	0.00005 *	0.0021	0.0066	0.00005 *	0.000025 *	0.011
S-4	8-Feb-90	2:50 PM									
S-4	8-Feb-90	2:50 PM									
S-4	10-Mar-90	2:32 PM	0.00005 *	0.00005 *	0.007	0.002	0.0018	0.0044	0.00005 *	0.00005 *	0.0035
S-4	10-Mar-90	2:32 PM	0.0006	0.00005 *	0.013	0.021	0.0029	0.0011	0.00005 *	0.00005 *	0.0063
S-4	6-Apr-90	2:38 PM	0.0007	0.0001	0.0074	0.00005 *	0.0005 *	0.0017	0.00005 *	0.0001	0.0032
S-4	6-Apr-90	2:38 PM									
S-4	6-Apr-90	2:38 PM									
S-4	6-Apr-90	2:38 PM									
S-4	25-May-90	12:35 PM	0.0008	0.000025 *	0.0005 *						
S-4	25-May-90	12:35 PM									
S-4	26-Jun-90	4:48 PM	0.00005 *	0.000025 *	0.0005 *						
S-4	26-Jun-90	4:48 PM									
S-4	26-Jun-90	4:48 PM									
S-4	27-Jul-90	12:55 PM	0.00005 *	0.0001	0.011						
S-4	27-Jul-90	12:55 PM									
S-4	27-Jul-90	12:55 PM									
S-4	19-Sep-90	7:20 PM	0.00005 *	0.000025 *	0.0005 *						
S-4	19-Sep-90	7:20 PM									
S-4	16-Nov-90	4:20 PM	0.00005 *	0.0005 *	0.013						
S-4	16-Nov-90	4:20 PM									
S-4	6-May-94		0.001 *	0.0005 *	0.005 *						
S-6	5-Jul-89	11:40 AM									
S-6	5-Jul-89	11:40 AM									
S-6	18-Sep-89	11:15 AM									
S-6	5-Jul-89	11:40 AM									
S-6	18-Sep-89	11:15 AM	ND		ND	ND	ND	ND	ND		0.02
S-6	28-Nov-89	1:15 PM	0.0005 *	0.002	0.0084	0.00005 *	0.004	0.002	0.0005 *	0.0019	0.004
S-6	28-Nov-89	1:15 PM									
S-6	8-Feb-90	2:12 PM	0.00110	0.000025 *	0.024	0.00005 *	0.00180	0.00660	0.00005 *	0.000025 *	0.021000
S-6	8-Feb-90	2:12 PM									
S-6	8-Feb-90	2:12 PM									
S-6	8-Feb-90	2:12 PM									
S-6	8-Feb-90	2:12 PM									
S-6	10-Mar-90	~1:00 PM	0.0006	0.00005 *	0.01	0.0005 *	0.001	0.0036	0.00005 *	0.00005 *	0.007
S-6	10-Mar-90	~1:00 PM									
S-6	6-Apr-90	7:00 AM									
S-6	6-Apr-90	2:00 PM	0.00005 *	0.000025 *	0.0003	0.00005 *	0.0005 *	0.0019	0.00005 *	0.000025 *	0.0005 *
S-6	6-Apr-90	2:00 PM	0.00005 *	0.0002	0.002	0.0003	0.0051	0.00005 *	0.00005 *	0.0001	0.0005 *
S-6	25-May-90	11:55 AM	0.0008	0.000025 *	0.0005 *						
S-6	25-May-90	11:55 AM									
S-6	25-May-90	11:55 AM									
S-6	26-Jun-90	3:48 PM	0.00005 *	0.000025 *	0.005						
S-6	26-Jun-90	3:48 PM									
S-6	26-Jun-90	3:48 PM	0.00005 *	0.000025 *	0.0005 *						
S-6	27-Jul-90	12:25 PM	0.00005 *	0.000025 *	0.0005 *						

* indicates value below MDL, number to left is one half MDL.
ND= Non Detectable

Station	Date	Time	bar open or closed	depth cm	sample depth	secchi cm	Temp °C	Sal ppt	Conduct.	DO ppm	pH	Turbid FTU	Chla µg/l	Flow cfs	F Coli MPN/100ml	TDS
S-6	27-Jul-90	12:25 PM	c		100		18	12.7		0.9						
S-6	27-Jul-90	12:25 PM	c		200		18	12.8		0.8						
S-6	19-Sep-90	6:35 PM	c	170	0	22	15.2	13.5		3.2	8.5	17	163			
S-6	19-Sep-90	6:35 PM	c		170		15.2	14.2		0.6						
S-6	16-Nov-90	4:00 PM		162	0	40	12.3	16		>20	8.8		200.7			
S-6	16-Nov-90	4:00 PM		162	162		13	17.7		5.5						
S-8	28-Nov-89	5:15 PM	o		0		10.9		700	9.6	7.5	7.8	5.02	0.1		580
S-8	16-Jan-90	AM	o				11		307	8.7	7					330
S-8	8-Feb-90	3:20 PM	c		0		6.8		357	8.4	7.5	32	33.67		1600	380
S-8	10-Mar-90	3:40 PM	o		0		9.8		388	9.8	8	21	21.55	8		320
S-8	6-Apr-90	6:55 AM	o		0		14		550	1.1						
S-8	6-Apr-90	3:45 PM	o		0		14		500	9.5	8.2	6.3	27.71	5		370
S-8	25-May-90	1:45 PM	c		0		17	0.2	600	9.5	8.6				35000	390
S-8	26-Jun-90	6:05 PM	c		0		19.5	<1	770	14	8.9	19	144.46			550
S-8	26-Jul-90	12:00 PM	c	dry												
S-10	16-May-88	9:47 AM	?		0		15	0.5		2.5	7.95	38	987.4		220	730
S-10	15-Jun-88	9:15 AM	?		0		16	0	1020	5.1	7.6	35?	471.2			900
S-10	21-Jul-88	10:18 AM	?		0		21	0	1180	?	7.95	57	lost			970
S-10	29-Aug-88	6:00 PM	?		0		17.5	0.5	1280	2.05	8.57	47	887.65		>/=2400	1100
S-10	28-Sep-88	4:05 PM	?		0		23.5	0	1000	2.1	7.75	52	959.00			1300
S-10	22-Nov-88	9:45 AM	?		0		12.9		780	3.8	7.5	37	189.15		350	690
S-10	20-Dec-88	12:25 PM	?		0		8.5			5.7	7.6*	52	18.92			630
S-10	20-Jan-89	7:45 AM	o		0		7.5	0.2	810	2.3	7.5	23	10.88			870
S-10	17-Feb-89	7:38 AM	o		0		9.8	0	810	3.5	7.6	27	81.34		>2400	750
S-10	6-Mar-89	3:45 PM	o		0			0	462	1.15*	7.5	58	98.86			610
S-10	4-May-89	6:25 PM	o		0		21		980	9.2	8.7	33	200.13		3020	750
S-10	7-Jun-89	11:25 AM	o		0		14.8	0.7	990	5.8	7.9	35	301.40			780
S-10	5-Jul-89	7:40 AM	o		0		14.7	0.8	103	3.7	7.8	51	383.75			860
S-10	18-Sep-89	8:50 AM	o		0		13.5		1080	2.6	7.7	54	725		4600	970
S-10	23-Oct-89	5:52 PM	o		0		14.1		322	7.4	7.4					280
S-10	28-Nov-89	8:53 AM	o		0		8		680	1.6	7.3	260	41.14			900
S-10	16-Jan-90	AM	o				9.2		590	1.5	7.1					550
S-10	7-Feb-90	7:45 AM	c		0		3.8		570	4.6	7.1	31	14.20		16000	610
S-10	10-Mar-90	4:20 PM	o		0		12		900	4.4	8	23	38.18			700
S-10	6-Apr-90	4:05 PM	o		0		13		1000	2.8	7.9	20	23.4	0		750
S-10	25-May-90	2:30 PM	c		0		12	0.8	1080		8.2	50			350	850
S-10	26-Jun-90	6:28 PM	c		0		14.1		970	7.3	8.3	38	492.43			830
S-10	26-Jul-90	10:55 AM	c		0		15.2		1080	8.3	8.1	37	403.72		540	910
S-10	6-May-94		?				17		550	4.7	8.2		0.029			400
S-10	6-May-94		?				17		550	4.7	8.2		0.029			400

Station	Date	Time	TSS	NO3 mg-N/L	NH3 mg-N/L	un-ionized NH3 mg-N/L	NO2 mg-N/L	Total P mg-P/L	Diss P mg-P/L	DOC mg/l	Tot. org. C	Cd mg/l	Cr mg/l	Cu mg/l
						a=acute c=chronic violations								
S-6	27-Jul-90	12:25 PM												
S-6	27-Jul-90	12:25 PM												
S-6	19-Sep-90	6:35 PM	22	0.015 *	0.07	0.0041096		2.4	1.9	31		0.00005 *	0.0085	0.00005 *
S-6	19-Sep-90	6:35 PM												
S-6	16-Nov-90	4:00 PM	47	0.015 *	0.16	0.0143939		2.7	2.4	36		0.0022	0.0005 *	0.00005 *
S-6	16-Nov-90	4:00 PM												
S-8	28-Nov-89	5:15 PM	7.2	0.05	0.11	0.0006204		0.4	0.52					
S-8	16-Jan-90	AM	36	3	1.9	0.003515		2.4	1.6					0.014
S-8	8-Feb-90	3:20 PM	38	1.3	2.4	0.00912 c		1.9	1.4	32		0.0006	0.0058	0.011
S-8	10-Mar-90	3:40 PM	22	1.3	0.35	0.00588		1.3	0.97	22		0.0005	0.0026	0.0058
S-8	6-Apr-90	6:55 AM				0.00089								
S-8	6-Apr-90	3:45 PM	13	0.1	0.025 *			0.52	0.35	14		0.0005	0.0005 *	0.0045
S-8	25-May-90	1:45 PM	53	0.015 *	0.17	0.01717		1	0.57	16		0.0004	0.0055	0.0033
S-8	26-Jun-90	6:05 PM	42	0.015 *	0.1	0.03195		1.5	0.54	24		0.00005 *	0.0005 *	0.0028
S-8	26-Jul-90	12:00 PM												
S-10	16-May-88	9:47 AM		ND	1.8	0.03726 c	ND	3.5	1.3			ND	ND	ND
S-10	15-Jun-88	9:15 AM		ND	8.4	0.083328 c	ND	3.5	2.3					
S-10	21-Jul-88	10:18 AM		3.6*	ND *		ND	1.9	0.4					
S-10	29-Aug-88	6:00 PM		1.1	0.21	0.01911	ND	2	0.67			ND	ND	ND
S-10	28-Sep-88	4:05 PM			0.54	0.012582	ND		0.82					
S-10	22-Nov-88	9:45 AM	29	1.3	ND *		0.08	1.8	0.48			ND	0.04	0.006
S-10	20-Dec-88	12:25 PM		0.14	8.3	0.047393 c	ND	4.2	3.2					
S-10	20-Jan-89	7:45 AM		0.07	21	0.08799 a	ND	5.3	3.7					
S-10	17-Feb-89	7:38 AM		0.05	18	0.11538 a		4.7	3	9.2		ND	ND	0.01
S-10	6-Mar-89	3:45 PM		0.37	8.1			3.5	2.5	64		ND	ND	0.016
S-10	4-May-89	6:25 PM		1.7	2.7	0.4239 a		2.7	1.4	44		ND	ND	0.005
S-10	7-Jun-89	11:25 AM		3.1	3.3	0.06105 c				55		ND	ND	0.008
S-10	5-Jul-89	7:40 AM		0.67	3.1	0.04588 c		3.3	1.7	56		ND	ND	0.009
S-10	18-Sep-89	8:50 AM	98	1.2	0.39	0.004017		3.1	0.82	42		ND	ND	0.004
S-10	23-Oct-89	5:52 PM	22	2.5	0.025 *			0.9	0.63		24			0.009
S-10	28-Nov-89	8:53 AM	280	1.4	7.4	0.020054 c		4.2	3.6	59		0.0002	0.04	0.026
S-10	16-Jan-90	AM	43	0.68	8.1	0.015633 c		4.1	2.9					0.011
S-10	7-Feb-90	7:45 AM	18	2.6	4	0.00516 c		1.8	1.3	32		0.0002	0.0064	0.011
S-10	10-Mar-90	4:20 PM	26	0.89	9.7	0.18042 a		3.9	2.8	44		0.0005	0.0017	0.012
S-10	6-Apr-90	4:05 PM	21	0.09	3.8	0.0608 c		3.6	2.6	33		0.0004	0.0005 *	0.0029
S-10	25-May-90	2:30 PM	120	0.015 *	1.3	0.03783 c		3.3	1.2	37		0.0003	0.0079	0.0068
S-10	26-Jun-90	6:28 PM	130	0.32	1.2	0.05052 c		3.7	2	44		0.0003	0.0022	0.0056
S-10	26-Jul-90	10:55 AM	130	2.1	0.14			2.4	1	48		0.0003	0.005	0.009
S-10	6-May-94		20	0.04	0.24			2.2	1.8		28	0.00025 *	0.0025 *	0.006
S-10	6-May-94		20	0.04	0.24			2.2	1.8		28	0.00025 *	0.0025 *	0.006

Station	Date	Time	Pb mg/l	Ag mg/l	Zn mg/l	dissCd mg/l	dissCr mg/l	dissCu mg/l	dissPb mg/l	dissAg mg/l	dissZn mg/l
S-6	27-Jul-90	12:25 PM									
S-6	27-Jul-90	12:25 PM									
S-6	19-Sep-90	6:35 PM	0.00005 *	0.000025 *	0.0005 *						
S-6	19-Sep-90	6:35 PM									
S-6	16-Nov-90	4:00 PM	0.00005 *	0.0005 *	0.000025 *						
S-6	16-Nov-90	4:00 PM									
S-8	28-Nov-89	5:15 PM									
S-8	16-Jan-90	AM						0.0048			
S-8	8-Feb-90	3:20 PM	0.0011	0.0001	0.025	0.0001	0.0005 *	0.0062	0.0052	0.0001	0.013
S-8	10-Mar-90	3:40 PM	0.001	0.0007	0.025	0.0005 *	0.0008	0.0038	0.00005 *	0.00005 *	0.003
S-8	6-Apr-90	6:55 AM									
S-8	6-Apr-90	3:45 PM	0.0063	0.000025 *	0.013	0.0004	0.0005 *	0.002	0.0015	0.000025 *	0.01
S-8	25-May-90	1:45 PM	0.0037	0.000025 *	0.005						
S-8	26-Jun-90	6:05 PM	0.0073	0.000025 *	0.014						
S-8	26-Jul-90	12:00 PM									
S-10	16-May-88	9:47 AM	0.004		0.02						
S-10	15-Jun-88	9:15 AM									
S-10	21-Jul-88	10:18 AM									
S-10	29-Aug-88	6:00 PM	ND		ND						
S-10	28-Sep-88	4:05 PM									
S-10	22-Nov-88	9:45 AM	ND		ND						
S-10	20-Dec-88	12:25 PM									
S-10	20-Jan-89	7:45 AM									
S-10	17-Feb-89	7:38 AM	ND		0.07	ND	ND	0.003	ND		ND
S-10	6-Mar-89	3:45 PM	0.002		0.03	ND	ND	0.011			0.05
S-10	4-May-89	6:25 PM	ND		0.11	ND	ND	0.003	ND		ND
S-10	7-Jun-89	11:25 AM	ND		0.021	ND	ND	0.002	ND		ND
S-10	5-Jul-89	7:40 AM	ND		0.02	ND	ND	ND	ND		ND
S-10	18-Sep-89	8:50 AM	ND		0.04	ND	ND	ND	ND		0.08
S-10	23-Oct-89	5:52 PM						0.004			
S-10	28-Nov-89	8:53 AM	0.0005 *	0.00005 *	0.055	0.00005 *	0.01	0.026	0.0005 *	0.00005 *	0.027
S-10	16-Jan-90	AM						0.0029			
S-10	7-Feb-90	7:45 AM	0.001	0.0002	0.025	0.0001	0.0027	0.0048	0.0009	0.0002	0.015
S-10	10-Mar-90	4:20 PM	0.0021	0.00005 *	0.037	0.0005 *	0.0009	0.0049	0.00005 *	0.00005 *	0.012
S-10	6-Apr-90	4:05 PM	0.002	0.000025 *	0.012	0.0002	0.0005 *	0.0029	0.00005 *	0.000025 *	0.0013
S-10	25-May-90	2:30 PM	0.0054	0.000025 *	0.0018						
S-10	26-Jun-90	6:28 PM	0.0047	0.000025 *	0.045						
S-10	26-Jul-90	10:55 AM	0.00005 *	0.000025 *	0.068						
S-10	6-May-94		0.001 *	0.0005 *	0.005 *						
S-10	6-May-94		0.001 *	0.0005 *	0.005 *						

ZOOPLANKTON AND FISH LARVAE APPENDIX

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-1									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Protozoa										
Tintinnids							2.895	0.515		
Foraminifera				0.668						
Noctiluca						0.625				
Ctenophore										
Cnidaria				1.526	0.342		0.312			
Leptomedusa type	0.743		0.142		0.136	1.182	6.724			
Anthomedusa type								0.258		
other medusae	0.557				2.797					
Hydroid polyp										
Leptomedusa polyp										
Coral polyp		0.260				0.299				
Siphonophore										
Aschelminthes					0.682			0.139		
roundworm										
Unknown "worm"										
Rotifera										
Brachionus										
Synchatea										
Mollusca										
Bivalves	0.186	0.520					0.268		0.332	0.148
Monticulidae										
Modiolus sp(p).										
Gastropods	0.390	0.468	0.282	0.449	0.428	2.994	1.137	0.593	0.664	0.890
Gastropod eggs										
Nudibranchs										
Phoronida actinotroch										
Bryozoa larvae										
Bryozoan colony										
Annelida										
Hirudinea							0.134			
Nemertean										
Polychaetes							0.268		0.664	
Polychaete larvae	0.371	0.338		0.228	0.136	0.892		0.694		
Oligochaete										
Nemertea										
Arthropoda										
Crustacea										0.297
nauplii	0.186		0.142							
Cladocera									0.664	
Evadne			7.195	0.222						
Podon	0.168		4.797	0.238	0.682					
Copepoda										
Corycaeus										
Oithona		0.168				0.299				
Oncaea										
unk. cyclopoid							0.134			
Cyclopoid copepodites										
Acartia clausi	0.278		14.954	42.917	4.940	36.662	2.368	0.515	0.332	0.445
Acartia danae							0.517			0.148
Calanus sp.						0.892				
Metridia lucens	0.835									
Epilabidocera longipedata				0.459						
Eucalanus	0.186									
Eurytemora americana										
Pseudodiaptomus euryhalinus										
Temorites sp(p)										
Rhincalanus nasutus				0.891						
Tortanus discaudatus				0.484	0.682					
Mostrillidae, unident.										
unknown calanoid			0.142							
Calanoid copepodites	0.743	0.520						0.139		
Cal. copepodites w/long rami								0.139		
Harpacticoid "A"		0.260								
Harpacticoid "B"										
Harpacticoid "C"										
Schizopero knabeni										
Caligus		0.260								
other parasitic copepods		0.613								
unknown copepodites										
Ostracoda	0.371	0.446					0.414	0.139		
Podocopida										
Leptostraca	0.186									

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-1									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Cirripedia										
Barnacle nauplii	0.130	0.260		0.228	0.273	2.366				0.148
Barnacle cypris										
Isopoda	0.186	0.780			0.136		0.134			0.297
Sphaeromatidae										
Idoteidae										
Amphipoda										
Anisogammarus confervicolus	0.186									
Corophium	0.186						0.134		0.332	0.148
Caprellidae						0.892				
Grandidiella japonica										
Ampithoidae										0.148
Aoridae									0.332	
Atylidae							7.348			
Hyalidae							0.134		0.332	
Ischyroceridae										
Photidae										
Pleustidae							0.414			0.148
Ampeliscidae										
Talitridae										
unk. amphipods	0.743	0.130		0.446	4.524	0.446		0.130		
Cumacea						0.178	2.585			0.445
Mysidacea										
Neomysis mercedis				0.222			1.345			
Euphausiacea						0.535				
Decapoda										
Brachyura										
Cancer antennarius/gracilis(1)	1.114		0.282			1.464				
Cancer antennarius stg 2 zoea	0.316									
Cancer antennarius stg 3 zoea	0.371									
Cancer productus stg 1 zoea	0.371					0.892				
Grapsidae zoea	0.186					0.892	0.517			0.297
Majidae zoea	0.149			0.238		0.318				
Pinnotheridae zoea	0.965	0.468	1.693	3.620	0.342	0.582	2.378	0.258	0.697	1.667
Xanthidae zoea										
Unknown brachyuran zoea				0.678		0.892				
Unk. Megalopa										
Megalopa A										
Megalopa B										
Megalopa C										
Megalopa D						0.892				
very young crab			0.142			0.268				
Hemigrapsis oregonensis										
Hemigrapsus nudus										
Pachygrapsus crassipes										
Anomura										
Anomuran megalopa										
Porcellanidae zoea	0.334			0.178				0.515		
Hippidea zoea				0.228						
Emerita analoga zoea										
Paguridea zoea				0.222						
Paguridae megalopa										
Thalassinidea zoea	0.334			0.891						
Callianassidae						0.892				
Caridea										
Penaeidae										
Crangonidae(zoea and older)			0.488							
Caridean zoea and older				0.267			0.312		0.332	0.445
Hippolytidae zoea						0.268				
Crangon nigromaculata										
Heptacarpus pictus										
Heptacarpus taylori				0.891						
Unknown caridean type zoea	0.186					0.299				
Unknown zoea	0.557	0.780				0.300				
Arachnid										
Pycnogonid										0.148
Halacaridea										0.148
Insect larvae							0.268			
Echinodermata										
bipinnaria larvae										
pluteus larvae										
Chaetognatha	0.557									
Urochordata										
Larvacea		0.140	0.423	0.222	0.247	1.746				
Number of invertebrate taxa	30	16	12	23	14	26	22	12	10	16
Total Invertebrates per m3	12.066	6.407	30.682	56.413	16.348	57.969	30.737	4.034	4.678	5.967
Copepoda per m3	2.042	1.820	15.096	44.751	5.622	37.853	3.019	0.793	0.332	0.593
Decapoda per m3	4.882	1.247	2.605	7.213	0.342	7.960	3.207	0.773	1.028	2.408
Mycidacea per m3	0.000	0.000	0.000	0.222	0.000	0.000	1.345	0.000	0.000	0.000
Other per m3	5.142	3.340	12.981	4.227	10.384	12.156	23.166	2.466	3.318	2.966

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-1								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Protozoa									
Tintinnids									
Foraminifera						0.427	0.192	0.767	
Noctiluca									
Ctenophore									
Cnidaria									
Leptomedusa type		0.625							
Anthomedusa type	0.187	0.375	0.176	1.730	2.246				
other medusae						0.641			
Hydroid polyp		P	P			P	P		
Leptomedusa polyp									
Coral polyp									
Siphonophore									
Aschelminthes									
roundworm					0.287				
Unknown "worm"									
Rotifera									
Brachionus									
Synchatea									
Mollusca									
Bivalves									
Monticutidae				0.192		0.150			
Modiolus sp(p).		0.125	0.423						0.194
Gastropods		0.125		0.192		0.214	0.768		0.136
Gastropod eggs						P	P		
Nudibranchs									0.194
Phoronida actinotroch									
Bryozoa larvae									
Bryozoan colony									
Annelida									
Hirudinea				0.192					
Nemertean									
Polychaetes							0.115		0.969
Polychaete larvae		0.375	0.176						
Oligochaete									
Nemertea							0.192		
Arthropoda									
Crustacea									
nauplii				14.993					
Cladocera									
Evadne									0.213
Podon	0.187								0.194
Copepoda									
Corycaeus		0.250							
Oithona									0.194
Oncaea									
unk. cyclopoid									
Cyclopoid copepodites									
Acartia clausi	4.785	16.624	1.234	66.559	7.662	1.624		0.153	0.426
Acartia danae				0.192					
Calanus sp.		0.250		0.769				0.767	0.388
Metridia lucens						0.855			
Epilabidocera longipedata	0.544					0.641			
Eucalanus									
Eurytemora americana									
Pseudodiaptomus euryhalinus									
Temorites sp(p)									
Rhincalanus nasutus									
Tortanus discaudatus	0.163				0.287				
Mostrillidae, unident.		0.875	0.352			0.641			0.194
unknown calanoid									
Calanoid copepodites			0.230						
Cal. copepodites w/long rami						0.169			
Harpacticoid "A"									
Harpacticoid "B"									
Harpacticoid "C"									
Schizopero knabeni						0.214			
Caligus									
other parasitic copepods									
unknown copepodites									
Ostracoda	0.163								
Podocopida			0.176						
Leptostraca									

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-1								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Cirripedia						0.214		0.232	
Barnacle nauplii									
Barnacle cypris									
Isopoda	0.217								
Sphaeromatidae		0.125	0.749				0.384		0.969
Idoteidae						0.214			
Amphipoda				0.192		0.214	0.192		0.388
Anisogammarus confervicolus									
Corophium				0.192		0.214			
Caprellidae									
Grandidiella japonica						0.214			0.194
Ampithoidae									0.388
Aoridae						0.214			
Atylidae	0.217						0.192		
Hyalidae				0.192			0.192		
Ischyroceridae			0.749						
Photidae					0.287		0.192		
Pleustidae							0.192		
Ampeliscidae						0.214			
Talitridae	0.217		0.529						
unk. amphipods						0.192	0.192		
Cumacea									
Mysidacea						0.192	0.576		
Neomysis mercedis									
Euphausiacea			0.352						
Decapoda									
Brachyura									
Cancer antennarius/gracilis(1)								0.153	
Cancer antennarius stg 2 zoea				1.538	3.369				0.194
Cancer antennarius stg 3 zoea									
Cancer productus stg 1 zoea									
Grapsidae zoea	0.163								
Majidae zoea			0.934	1.730	17.966	0.641			
Pinnotheridae zoea	6.253		0.176						
Xanthidae zoea		8.499	0.546	0.577	298.687	0.214			0.194
Unknown brachyuran zoea			0.123					0.767	
Unk. Megalopa									
Megalopa A		0.125				0.427	0.192	0.767	
Megalopa B									
Megalopa C									
Megalopa D									
very young crab									
Hemigrapsis oregonensis									
Hemigrapsus nudus									
Pachygrapsus crassipes									
Anomura									
Anomuran megalopa									0.194
Porcellanidae zoea									
Hippidea zoea							0.192		
Emerita analoga zoea									
Paguridea zoea									
Paguridae megalopa			0.176		8.150				
Thalassinidea zoea									
Callianassidae									
Caridea									
Penaeidae						0.427			
Crangonidae(zoea and older)						0.534			
Caridean zoea and older	0.326								
Hippolytidae zoea			0.493						
Crangon nigromaculata							0.192		
Heptacarpus pictus								0.767	
Heptacarpus taylori									
Unknown caridean type zoea									
Unknown zoea			0.123						
Arachnid									
Pycnogonid									
Halacaridea									
Insect larvae									0.581
Echinodermata									
bipinnaria larvae									
pluteus larvae									
Chaetognatha									
Urochordata		0.250	0.150						
Larvacea						0.214			
Number of invertebrate taxa	12	14	20	14	9	27	17	8	18
Total invertebrates per m3	13.424	28.623	7.869	89.241	339.141	9.915	3.958	4.376	6.201
Copepoda per m3	5.492	17.998	1.816	67.520	8.149	4.144	0.000	0.921	1.201
Decapoda per m3	6.742	8.624	2.573	3.844	328.172	2.244	0.576	2.455	0.581
Mycidacea per m3	0.000	0.000	0.000	0.000	0.000	0.192	0.576	0.000	0.000
Other per m3	1.190	2.000	3.480	17.876	2.820	3.334	2.805	1.000	4.418

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-2									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Protozoa										
Tintinnids										
Foraminifera									0.316	
Noctiluca				1.975	0.390					
Ctenophore						0.243				
Cnidaria										
Leptomedusa type	0.743	0.149		1.947	0.835	0.273				
Anthomedusa type		0.595	0.242		0.371	2.793	0.217	0.186	0.316	
other medusae				0.996						
Hydroid polyp										
Leptomedusa polyp										
Coral polyp										
Siphonophore					0.278	0.132				
Aschelminthes										
roundworm										
Unknown "worm"										
Rotifera										
Brachionus										
Synchatea										
Mollusca										
Bivalves	0.186									
Macoma sp.										
Modiolus sp. (p)										
Gastropods	0.743	0.427		0.457	0.195	1.251	0.255	0.186		0.157
Gastropod eggs										
Nudibranch										
Phoronida actinotroch										0.261
Bryozoa larvae										
Bryozoan colony			0.242							
Annelida										
Hirudinea										
Nemertean										
Polychaetes									0.316	0.261
Polychaete larvae	0.371	0.149		0.183	0.557	0.132				
Oligochaete										0.522
Arthropoda										
Crustacea										
nauplii		0.149		0.183						0.261
Cladocera										
Evadne			3.268							
Podon	0.557		3.471							
Copepoda										
Corycaeus										
Oithona		0.297								
Oncaea										
unk. cyclopoid										
Cyclopoid copepodites										
Acartia clausi	0.928		19.623	15.547	6.422	28.298	3.326		0.631	0.261
Acartia danae							0.128			
Calanus sp.				0.996		0.282				
Metridia lucens	0.111						0.128			
Epilabidocera longipedata			0.484	0.191	0.278					
Eucalanus		0.149	0.242			0.142				
Eurytemora affinis										
Eurytemora americana			0.242							
Pseudodiaptomus euryhalinus										
Temorites sp(p)										
Rhincalanus nasutus										
Tortanus discaudatus				0.183						
unknown calanoid										
Calanoid copepodites				0.366						
Cal. copepodites wflong rami	0.371									
Harpacticoida unident.										
Harpacticoid "A"										
Harpacticoid "B"										
Harpacticoid "C"										
Caligus		0.297		0.182						
other parasitic copepods										
unknown copepodites										
Ostracoda								0.615	0.316	
Podocopida										

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-2									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Leptostraca										0.261
Cirripedia										
Barnacle nauplii	0.928				0.278	9.187				
Barnacle cypris										
Isopoda		0.297							0.316	
Idoteidae										
Amphipoda										
Anisogammarus confervicolus									0.126	0.261
Corophium									0.379	
Caprellidae							0.128			
Ampithoidae									0.126	0.261
Aoridae									0.316	
Atylidae							0.128			
Hyalidae	1.000						0.128			
Pleustidae							0.519			
Ampeliscidae							0.153		0.316	
unk. amphipods										
Talitridae								17.228		
unk. amphipods		0.149		0.191	0.418			0.154	0.631	
Cumacea							1.584			
Mysidacea								1.182	0.126	
Neomysis mercedis					0.278					
Euphausiacea						0.447	0.383			
Decapoda										
Brachyura										
Cancer antennarius/gracilis(1)	0.817									
Cancer antennarius stg 2 zoea	0.260	0.149								
Cancer antennarius stg 3 zoea										
Cancer *productus stg* 1 zoea	0.186									
Grapsidae zoea		0.149				0.142				0.261
Majidae zoea	0.743	0.149		0.183		0.154				
Pinnotheridae zoea	0.613	0.470	0.484	1.284	0.111	2.664		0.461	0.600	0.289
Xanthidae zoea						0.527				
Unknown brachyuran zoea				0.183						
Unk. Megalopa						0.928				
Megalopa A										
Megalopa B										
Megalopa C										
Megalopa D										
very young crab			0.242							
Hemigrapsis oregonensis										
Hemigrapsus nudus										
Pachygrapsus crassipes										
Anomura										
Anomuran megalopa										
Porcellanidae zoea	0.130			0.996						
Hippidea zoea	0.186	0.149		0.366						
Emerita analoga zoea										
Paguridea zoea				0.271						
Paguridae megalopa										
Thalassinidea zoea	0.743	0.130								
Callianassidae										
Caridea										
Crangonidae(zoea and older)			0.371							
Penaeidae										
Caridean zoea and older			0.484	0.182		0.928			0.126	
Hippolytidae zoea										
Crangon nigromaculata										
Heptacarpus pictus										
Heptacarpus taylori										
Unknown caridean type zoea	0.186			0.633		0.659		0.154		
Unknown zoea	0.743	0.149				0.132				
Arachnid										
Pycnogonid										
Halacaridea										
Insect larvae										
Echinodermata							0.519			
bipinnaria larvae										
pluteus larvae										
Chaetognatha										
Urochordata										
Larvacea			0.242		0.278	0.264				
Number of invertebrate taxa	20	17	13	21	13	20	13	8	15	11
Total # invertebrates per m3	10.541	3.999	29.637	27.494	10.691	49.577	7.595	20.167	4.955	3.057
Copepoda per m3	1.411	0.744	20.591	17.465	6.700	28.722	3.582	0.000	0.631	0.261
Decapoda per m3	4.604	1.342	1.581	4.097	0.111	6.133	0.000	0.615	0.726	0.550
Mycidacea per m3	0.000	0.000	0.000	0.000	0.278	0.000	1.584	1.182	0.126	0.000
Other per m3	4.527	1.914	7.465	5.931	3.601	14.721	2.429	18.370	3.472	2.246

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-2							
	18-Sep-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Protozoa								
Tintinnids								
Foraminifera						0.183		
Noctiluca								
Ctenophore		0.129						
Cnidaria								
Leptomedusa type		0.485		0.468				0.189
Anthomedusa type	0.267	0.220		0.693	0.126	0.721		0.170
other medusae								
Hydroid polyp		P						P
Leptomedusa polyp								
Coral polyp								
Siphonophore								
Aschelminthes								
roundworm								
Unknown "worm"								
Rotifera								
Brachionus								
Synchatea								
Mollusca								
Bivalves	0.345							
Macoma sp.			0.493					
Modiolus sp. (p)		0.162						
Gastropods	0.267	0.162						
Gastropod eggs				0.937	P	P		P
Nudibranch								
Phoronida actinotroch								
Bryozoa larvae								
Bryozoan colony								
Annelida								
Hirudinea								
Nemertean								
Polychaetes				0.234			0.713	
Polychaete larvae								
Oligochaete								
Arthropoda								
Crustacea								
nauplii								
Cladocera								
Evadne	0.689							0.159
Podon								
Copepoda								
Corycaeus		0.162						
Oithona						0.183	0.713	0.755
Oncaea								
unk. cyclopoid								
Cyclopoid copepodites								
Acartia clausi	1.723	4.687	0.856	1.454		0.366		0.264
Acartia danae		0.646						
Calanus sp.		0.162		0.468				
Metridia lucens								
Epilabidocera longipedata								
Eucalanus								
Eurytemora affinis						0.342		
Eurytemora americana								
Pseudodiaptomus euryhalinus								
Temorites sp(p)								
Rhincalanus nasutus			0.164					
Tortanus discaudatus		0.178	0.164					
unknown calanoid			0.329					
Calanoid copepodites								
Cal. copepodites w/long rami								
Harpacticoida unident.						0.198		
Harpacticoid "A"								
Harpacticoid "B"								
Harpacticoid "C"								
Caligus						0.183	0.713	
other parasitic copepods								
unknown copepodites								
Ostracoda								
Podocopida				0.468				

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-2							
	18-Sep-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Leptostraca								
Cirripedia								
Barnacle nauplii								
Barnacle cypris								
Isopoda								
Idoteidae							0.178	
Amphipoda								
Anisogammarus confervicolus		0.162		0.234				
Corophium			0.164					
Caprellidae		0.226						
Ampithoidae								
Aoridae								
Atylidae								
Hyalidae	0.138		0.329					
Pleustidae								
Ampeliscidae								
unk. amphipods		0.162						
Talitridae	0.689			0.234	0.632	0.366		
unk. amphipods								
Cumacea	0.689			0.234				
Mysidacea			0.164					
Neomysis mercedis	0.276					0.183		
Euphausiacea								
Decapoda								
Brachyura								
Cancer antennarius/gracilis(1)				0.937				
Cancer antennarius stg 2 zoea								
Cancer antennarius stg 3 zoea								
Cancer productus stg 1 zoea								
Grapsidae zoea	0.689	0.299	0.822	0.345	0.253	0.721		0.189
Majidae zoea				0.234				
Pinnotheridae zoea	1.999	0.517	0.116		0.126	0.144		0.328
Xanthidae zoea		0.162	0.987					
Unknown brachyuran zoea								
Unk. Megalopa								
Megalopa A								
Megalopa B								
Megalopa C								
Megalopa D								
very young crab								
Hemigrapsis oregonensis								
Hemigrapsus nudus								
Pachygrapsus crassipes								
Anomura								
Anomuran megalopa						0.183		
Porcellanidae zoea			0.329					
Hippidea zoea								
Emerita analoga zoea			0.164					
Paguridea zoea				0.234		0.182		
Paguridae megalopa					0.632			
Thalassinidea zoea								
Callianassidae								
Caridea								
Crangonidae(zoea and older)		0.162	0.362					
Penaeidae					0.316			
Caridean zoea and older						0.183		
Hippolytidae zoea		0.646						
Crangon nigromaculata								
Heptacarpus pictus								
Heptacarpus taylori								
Unknown caridean type zoea		0.323	0.987					
Unknown zoea								
Arachnid								
Pycnogonid								
Halacaridea								
Insect larvae	1.337							
Echinodermata								
bipinnaria larvae								
pluteus larvae								
Chaetognatha		0.162	0.164	0.234				
Urochordata								
Larvacea		0.162						0.189
Number of invertebrate taxa	12	22	16	15	7	15	4	10
Total # invertebrates per m3	9.108	9.973	6.595	7.411	2.085	4.136	2.318	2.242
Copepoda per m3	1.723	5.834	1.513	1.923	0.000	1.272	1.427	1.019
Decapoda per m3	2.688	2.109	3.766	1.751	1.327	1.412	0.000	0.516
Mycidacea per m3	0.276	0.000	0.164	0.000	0.000	0.183	0.000	0.000
Other per m3	4.422	2.030	1.151	3.738	0.758	1.270	0.892	0.707

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-3								
	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89	18-Sep-89
Protozoa									
Tintinnids									
Foraminifera	0.223	0.171	3.425		15.567		0.365	0.138	
Noctiluca		1.289							
Ctenophore									
Cnidaria									
Leptomedusa type		1.335							
Anthomedusa type	0.149	0.891		0.142	0.184	0.183	0.459		
other medusae									
Hydroid polyp									
Leptomedusa polyp									
Coral polyp									
Siphonophore		0.184							
Aschelminthes									
roundworm				0.710					
Unknown "worm"									
Nemertea unident.									
Rotifera									
Brachionus									
Synchatea									
Mollusca									
Bivalves									0.132
Modiolus sp. (p)									
Monticutidae									
Gastropods	0.743		0.342	0.426				0.466	
Gastropod eggs									
Nudibranch			0.114						
Phoronida actinotroch									
Bryozoa larvae									
Bryozoan colony		0.171							
Annelida									
Hirudinea									
Nemertean									
Polychaetes					0.367			0.233	
Polychaete larvae	0.446	0.176	0.114	0.303					
Oligochaete				0.284	0.459	0.183	0.688	0.415	
Arthropoda									
Crustacea									
nauplii	0.743								
Cladocera									
Evadne	0.743				0.826				
Podon	0.446	0.171							
Copepoda									
Corycaeus		0.171							
Oithona									
Oncaea									
unk. cyclopoid									
Cyclopoid copepodites									
Acartia clausi	5.950	39.442	14.519	20.591			0.459	0.138	1.355
Acartia danae									
Calanus sp.									
Metridia lucens									
Epilabidocera longipedata	0.743	0.891							
Eucalanus									
Eurytemora affinis									
Eurytemora americana					0.275				
Pseudodiaptomus euryhalinus					0.919			0.466	
Temorites sp(p)					1.118				
Rhincalanus nasutus									
Tortanus discaudatus									
unknown calanoid	0.743								
Calanoid copepodites	0.149								
Cal. copepodites w/long rami			0.161						
Harpacticoid "A"			0.114						
Harpacticoid "B"									
Harpacticoid "C"									
Caligus		0.891							
other parasitic copepods							0.459		
unknown copepodites									
Ostracoda	0.595		3.197		24.697	6.712	2.598	0.276	
Podocopida									
Leptostraca									

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-3								
	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89	18-Sep-89
Cirripedia									
Barnacle nauplii	0.743	0.171	0.114	0.142					
Barnacle cypris				0.142					
Isopoda			0.928						
Amphipoda									
Anisogammarus confervicolus					0.184		0.162	1.290	0.132
Corophium spinicorne									
Corophium	0.650				3.397		3.653	0.322	
Caprellidae									0.263
Ampithoidae					2.754		0.459	0.876	
Aoridae									
Atylidae									
Hyalidae									
Pleustidae								0.466	
Ampeliscidae					0.184			0.466	
Talitridae									
unk. amphipods	0.928	0.343	1.377			1.628			
Cumacea			19.293	0.568	1.990				
Campylaspis sp(p).									
Cyclaspis sp(p).									
Mysidacea									
Neomysis mercedis			0.353		0.826	0.529	0.244	1.746	
Acanthomysis sp(p)									
Euphausiacea									
Decapoda									
Brachyura									
Cancer antennarius/gracilis(1)	0.223		0.161						
Cancer antennarius stg 2 zoea									
Cancer antennarius stg 3 zoea									
Cancer productus stg 1 zoea									
Grapsidae zoea	0.743						0.459	1.746	0.395
Majidae zoea	0.743								
Pinnotheridae zoea	1.114	1.236				1.173	0.459	0.566	0.152
Xanthidae zoea									
Unknown brachyuran zoea			0.114						
Unk. Megalopa				0.009					
Megalopa A		0.176							
Megalopa B		0.891							
Megalopa C									
Megalopa D									
very young crab			0.114						
Hemigrapsis oregonensis									
Hemigrapsus nudus									
Pachygrapsus crassipes									
Anomura									
Anomuran megalopa									
Porcellanidae zoea		0.343				0.183			0.132
Hippidea zoea	0.743								
Emerita analoga zoea									0.132
Paguridea zoea									
Thalassinidea zoea	0.743			0.710					
Callianassidae									
Caridea									
Crangonidae(zoea and older)	0.176								
Caridean zoea and older								0.466	0.263
Hippolytidae zoea									
Crangon nigromaculata									
Heptacarpus pictus			0.928	0.009					
Heptacarpus taylori									
Palaemon ritteri									
Unknown caridean type zoea		0.176	0.928	0.142		0.236			
Unknown zoea									
Arachnid									
Pycnogonid									
Halacaridea									
Insect larvae					1.118				
Echinodermata									
bipinnaria larvae									
pluteus larvae									
Chaetognatha									
Urochordata									
Larvacea	0.743	0.171							
Number of invertebrate taxa	23	20	18	13	16	8	12	16	9
Total # Invertebrates per m3	19.214	49.294	46.298	24.178	54.864	10.827	10.462	10.074	2.954
Copepoda per m3	7.584	41.395	14.795	20.591	2.312	0.000	0.917	0.604	1.355
Decapoda per m3	4.483	2.823	2.246	0.870	0.000	1.592	0.917	2.778	1.073
Mycidacea per m3	0.000	0.000	0.353	0.000	0.826	0.529	0.244	1.746	0.000
Other per m3	7.148	5.076	28.904	2.717	51.726	8.706	8.384	4.946	0.527

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-3							
	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Protozoa								
Tintinnids								
Foraminifera			0.144			0.815		1.527
Noctiluca								
Ctenophore	0.185							
Cnidaria								
Leptomedusa type				0.282				0.741
Anthomedusa type	0.370		0.144	0.282	0.189	0.815		3.185
other medusae								
Hydroid polyp	0.185				P	P		
Leptomedusa polyp								
Coral polyp								
Siphonophore								
Aschelminthes								
roundworm								
Unknown "worm"								
Nemertea unident.		0.147						
Rotifera								
Brachionus								
Synchatea								
Mollusca								
Bivalves			0.144					
Modiolus sp. (p)	0.185							
Monticulidae								0.436
Gastropods		0.147						
Gastropod eggs			P		P	P		
Nudibranch								
Phoronida actinotroch								
Bryozoa larvae								
Bryozoan colony								
Annelida								
Hirudinea								
Nemertean								
Polychaetes		0.736	0.528	0.313			0.859	
Polychaete larvae	0.185							
Oligochaete				0.313			0.429	
Arthropoda								
Crustacea								
nauplii								
Cladocera								
Evadne			0.481					
Podon								
Copepoda								
Corycaeus								
Oithona								
Oncaea								
unk. cyclopoid								
Cyclopoid copepodites								
Acartia clausi	3.954	0.633		0.188		0.815		1.385
Acartia danae								
Calanus sp.								
Metridia lucens								
Epilabidocera longipedata								
Eucalanus								
Eurytemora affinis					0.189			
Eurytemora americana								
Pseudodiaptomus euryhalinus						0.122		
Temorites sp(p)					0.189			
Rhincalanus nasutus								
Tortanus discaudatus	0.554	0.147						
unknown calanoid		0.147					0.429	
Calanoid copepodites	0.370							
Cal. copepodites w/long rami								
Harpacticoid "A"								
Harpacticoid "B"								
Harpacticoid "C"								
Caligus							0.859	0.436
other parasitic copepods								0.139
unknown copepodites								
Ostracoda								
Podocopida			0.481	0.313	0.378	0.326	0.344	0.353
Leptostraca								

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-3							
	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Cirripedia								
Barnacle *naupii*								
Barnacle cypris								
Isopoda		0.147				0.475		
Amphipoda								
Anisogammarus confervicolus	0.185		0.528		0.378	0.285		
Corophium spinicorne			0.481	0.157	0.568	0.122	0.859	
Corophium	0.924	1.155						
Caprellidae								
Ampithoidae								
Aoridae								
Atylidae		0.441						
Hyalidae		0.235						
Pleustidae								
Ampeliscidae								
Talitridae			0.144					
unk. amphipods								
Cumacea			0.481			0.575	0.215	0.219
Campylaspis sp(p).	0.777	1.559						
Cyclaspis sp(p).								
Mysidacea								
Neomysis mercedis	1.213		0.289			1.182	0.172	1.439
Acanthomysis sp(p)		0.147						
Euphausiacea								
Decapoda								
Brachyura								
Cancer antennarius/gracilis(1)				0.940				0.139
Cancer antennarius stg 2 zoea								
Cancer antennarius stg 3 zoea								
Cancer productus stg 1 zoea								
Grapsidae zoea					0.114		0.429	0.139
Majidae zoea	0.129							
Pinnotheridae zoea	0.352	0.883		1.659	0.378	0.245	0.429	0.219
Xanthidae zoea	1.127	0.162						0.872
Unknown brachyuran zoea								
Unk. Megalopa	0.185	0.130						
Megalopa A								
Megalopa B								
Megalopa C								
Megalopa D								
very young crab								
Hemigrapsis oregonensis								
Hemigrapsus nudus								
Pachygrapsus crassipes								
Anomura								
Anomuran megalopa								
Porcellanidae zoea	0.185	0.588				0.475		0.219
Hippidea zoea								
Emerita analoga zoea	0.166					0.475		0.219
Paguridea zoea				0.344		0.122	0.129	
Thalassinidea zoea								
Callianassidae								
Caridea								
Crangonidae(zoea and older)		0.839						
Caridean zoea and older		0.633						
Hippolytidae zoea								
Crangon nigromaculata								
Heptacarpus pictus								
Heptacarpus taylori								
Palaemon ritteri		0.147						
Unknown caridean type zoea								
Unknown zoea								
Arachnid								
Pycnogonid								
Halacaridea								
Insect larvae	0.185							
Echinodermata								
bipinnaria larvae								
pluteus larvae								
Chaetognatha	0.185	0.147						
Urochordata								
Larvacea		0.280						
Number of invertebrate taxa	20	21	12	10	10	16	11	16
Total # invertebrates per m3	11.599	9.450	3.848	4.791	2.384	6.851	5.153	11.666
Copepoda per m3	4.878	0.927	0.000	0.188	0.378	0.938	1.288	1.960
Decapoda per m3	2.144	3.381	0.000	2.943	0.492	1.317	0.968	1.806
Mycidacea per m3	1.213	0.000	0.289	0.000	0.000	1.182	0.172	1.439
Other per m3	3.363	5.142	3.559	1.660	1.514	3.415	2.705	6.461

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-4									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Protozoa										
Tintinnids										
Foraminifera			0.175				0.913			
Noctiluca					0.458					
Ctenophore										
Cnidaria										
Leptomedusa type	0.371									
Anthomedusa type			0.354							
other medusae										
Hydroid polyp										
Leptomedusa polyp										
Coral polyp										
Siphonophore										
Aschelminthes										
roundworm		0.241								
Unknown "worm"										
Rotifera										
Brachionus										
Synchatea										
Mollusca										
Bivalves		0.965								
Gastropods	0.186			0.897		0.427		0.179		
Nudibranch										
Phoronida actinotroch										
Bryozoa larvae										
Bryozoan colony										
Annelida										
Hirudinea										
Nemertean										
Polychaetes									1.187	
Polychaete larvae	0.186	0.965			0.119	0.186				
Oligochaete							3.660		0.494	0.264
Arthropoda										
Crustacea										
nauplii										
Cladocera										
Evadne							22.279			
Podon										
Copepoda										
Corycaeus										
Oithona										
Oncaea										
unk. cyclopoid							1.552			
Cyclopoid copepodites										
Acartia clausi		0.145	0.385	2.592		1.538			0.247	
Acartia danae										
Calanus sp.										
Metridia lucens										
Epilabidocera longipedata										
Eucalanus										
Eurytemora affinis										
Eurytemora americana							0.456			
Pseudodiaptomus euryhalinus				0.179						
Temorites sp(p)							1.917			
c.f. Temorites										
Rhincalanus nasutus										
Tortanus discaudatus				0.897						
unknown calanoid										
Calanoid copepodites			0.175	0.179	3.652					
Cal. copepodites w/long rami					0.458					
Harpacticoida										
Harpacticoid "A"										
Harpacticoid "B"	0.371	0.965								
Harpacticoid "C"	0.186									
Caligus		0.897	0.875	0.188						
other parasitic copepods		0.557								
unknown copepodites										
Ostracoda		0.194				0.137	0.821	0.179	0.594	
Podocopida										
Leptostraca										

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-4									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Cirripedia										
Barnacle nauplii				0.897						
Barnacle cypris		0.928								0.632
Isopoda		0.483								
Amphipoda									0.615	0.796
Anisogammarus confervicolus		0.173								
Corophium	0.743	0.965					0.183		0.368	0.218
Corophium spinicorne										
Grandidierella japonica										
Caprellidae										
Ampithoidae										
Aoridae										
Atylidae										
Hyalidae										
Pleustidae										
Ampeliscidae										
Ampithoidae										
Talitridae										
unk. amphipods					0.371					
Cumacea						0.854				
Campylaspis sp (p).										
Mysidacea										
Neomysis mercedis		1.351		0.897	0.244			0.985	0.963	0.527
Euphausiacea										
Decapoda										
Brachyura										
Cancer antennarius/gracilis(1)					0.458					
Cancer antennarius stg 2 zoea										
Cancer antennarius stg 3 zoea										
Cancer productus stg 1 zoea										
Grapsidae zoea		1.689		0.897			0.913		0.494	0.264
Majidae zoea					0.135					
Pinnotheridae zoea	0.371		0.567	0.413	0.183		0.274		0.164	
Xanthidae zoea					0.458					
Unknown brachyuran zoea										
Unk. Megalopa			0.560							
Megalopa A				0.179	0.135	0.928				
Megalopa B										
Megalopa C				0.897						
Megalopa D					0.458					
very young crab										
Hemigrapsis oregonensis										
Hemigrapsus nudus		0.278								
Pachygrapsus crassipes		0.928								
Anomura										
Anomuran megalopa										
Porcellanidae zoea					0.458					
Hippidea zoea			0.354	0.897						
Emerita analoga zoea										
Paguridea zoea				0.897						
Thalassinidea zoea		0.483		0.179		0.854				
Callianassidae										
Caridea										
Crangonidae(zoea and older)										
Caridean zoea and older			0.928							
Hippolytidae zoea										
Crangon nigromaculata										
Heptacarpus pictus										
Heptacarpus taylori										
Unknown caridean type zoea				0.448						
Unknown zoea										
Arachnid							0.913			0.264
Pycnogonid										
Halacaridea										
Insect larvae							2.647	0.179		0.264
Corbidae, unident.										
Echinodermata										
bipinnaria larvae										
pluteus larvae										
Chaetognatha										
Urochordata										
Larvacea										
Number of invertebrate taxa	7	17	9	16	13	7	12	4	9	8
Total invertebrates per m3	2.413	12.207	4.374	11.532	7.589	4.924	36.527	1.523	5.125	3.228
Copepoda per m3	0.557	2.564	1.436	4.035	4.110	1.538	3.925	0.000	0.247	0.000
Decapoda per m3	0.371	3.378	2.409	4.807	2.286	1.782	1.187	0.000	0.658	0.264
Mycidacea per m3	0.000	1.351	0.000	0.897	0.244	0.000	0.000	0.985	0.963	0.527
Other per m3	1.485	4.914	0.529	1.794	0.949	1.604	31.415	0.538	3.258	2.437

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-4								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Protozoa									
Tintinnids									
Foraminifera									
Noctiluca									
Ctenophore									
Cnidaria									0.219
Leptomedusa type									
Anthomedusa type						0.177			
other medusae									
Hydroid polyp									
Leptomedusa polyp									
Coral polyp									
Siphonophore									
Aschelminthes									
roundworm									
Unknown "worm"									
Rotifera									
Brachionus									
Synchatea									
Mollusca									
Bivalves									
Gastropods									
Nudibranch									
Phoronida actinotroch									
Bryozoa larvae									
Bryozoan colony									
Annelida									
Hirudinea									
Nemertean									
Polychaetes	0.168	0.339	0.349				0.674		
Polychaete larvae									
Oligochaete									
Arthropoda									
Crustacea									
nauplii									
Cladocera									
Evadne			0.376	0.134					
Podon	0.168								
Copepoda									
Corycaeus									
Oithona				0.425	0.194				
Oncaea			0.152						
unk. cyclopoid									
Cyclopoid copepodites									
Acartia clausi	1.294	22.615		0.224			0.518		0.654
Acartia danae									
Calanus sp.									
Metridia lucens									
Epilabidocera longipedata									
Eucalanus									
Eurytemora affinis				1.588			0.518		
Eurytemora americana			0.349						
Pseudodiaptomus euryhalinus							44.617	1.322	
Temorites sp(p)									
c.f. Temorites				0.693					
Rhincalanus nasutus									
Tortanus discaudatus			0.152						
unknown calanoid			0.457						
Calanoid copepodites									
Cal. copepodites w/long rami									
Harpacticoida							0.518		
Harpacticoid "A"									
Harpacticoid "B"									
Harpacticoid "C"									
Caligus								0.449	
other parasitic copepods								0.630	0.872
unknown copepodites									0.654
Ostracoda									
Podocopida				0.678		0.778			
Leptostraca									

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-4								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Cirripedia									
Barnacle nauplii									
Barnacle cypris									
Isopoda	0.168		0.152					0.126	0.219
Amphipoda									
Anisogammarus confervicolus		0.339	0.152	0.224			0.136	0.126	
Corophium			0.751						
Corophium spinicorne				0.224		0.177	0.622	3.715	
Grandidierella japonica							0.518	0.630	
Caprellidae									
Ampithoidae									
Aoridae									
Atylidae									
Hyalidae									
Pleustidae		0.677							
Ampeliscidae									
Ampithoidae							0.155	0.126	
Taliridae									
unk. amphipods							0.518	0.630	
Cumacea									
Campylaspis sp (p).			0.183						
Mysidacea									
Neomysis mercedis		0.226			0.388	1.221	1.882	0.882	0.219
Euphausiacea									
Decapoda									
Brachyura									
Cancer antennarius/gracilis(1)									
Cancer antennarius stg 2 zoea									
Cancer antennarius stg 3 zoea									
Cancer productus stg 1 zoea									
Grapsidae zoea	0.168								
Majidae zoea									
Pinnotheridae zoea	0.555	0.135				0.177		0.567	0.219
Xanthidae zoea			0.152						
Unknown brachyuran zoea									
Unk. Megalopa		1.354				0.177	0.518	0.630	0.872
Megalopa A									
Megalopa B									
Megalopa C									
Megalopa D									
very young crab									
Hemigrapsis oregonensis									
Hemigrapsus nudus									
Pachygrapsus crassipes									
Anomura									
Anomuran megalopa	0.543								
Porcellanidae zoea			0.152						
Hippidea zoea									
Emerita analoga zoea	0.845								
Paguridea zoea									
Thalassinidea zoea									
Callianassidae									
Caridea									
Crangonidae(zoea and older)			0.698						
Caridean zoea and older	0.168								
Hippolytidae zoea									
Crangon nigromaculata									
Heptacarpus pictus									
Heptacarpus taylori									
Unknown caridean type zoea			0.349						
Unknown zoea									
Arachnid									
Pycnogonid									
Halacaridea				0.224					
Insect larvae				0.179	0.317				
Corixidae, unident.			0.183						
Echinodermata									
bipinnaria larvae									
pluteus larvae		0.169							
Chaetognatha									
Urochordata									
Larvacea									
Number of invertebrate taxa	9	8	15	10	3	6	12	12	8
Total invertebrates per m3	4.079	25.854	4.610	4.592	0.900	2.707	51.196	9.832	3.929
Copepoda per m3	1.294	22.615	1.111	2.929	0.194	0.000	46.172	2.401	2.181
Decapoda per m3	2.280	1.490	1.352	0.000	0.000	0.354	0.518	1.196	1.091
Mycidacea per m3	0.000	0.226	0.000	0.000	0.388	1.221	1.882	0.882	0.219
Other per m3	0.504	1.524	2.147	1.662	0.317	1.132	2.624	5.353	0.438

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - 1990.

	Station E-5							
	15-Jun-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Protozoa								
Tintinnids								
Foraminifera					0.179			
Noctiluca								
Ctenophore								
Cnidaria								
Leptomedusa type								
Anthomedusa type		0.132						
other medusae								
Hydroid polyp								
Leptomedusa polyp								
Coral polyp								
Siphonophore								
Ascheiminthes								
roundworm								
Unknown "worm"	0.876							
Rotifera								
Brachionus								
Synchatea								
Mollusca								
Bivalves								
Gastropods								
Nudibranch								
Phoronida actinotroch								
Bryozoa larvae								
Bryozoan colony								
Annelida								
Hirudinea								
Nemertean					0.179			
Polychaetes					0.359			0.466
Polychaete larvae			0.186	0.371				
Oligochaete				0.215	12.378	0.832	6.486	5.895
Arthropoda								
Crustacea								
naupili								
Cladocera								
Evadne					25.114			
Podon					0.897			
Copepoda								
Corycaeus								
Oithona								
Oncaea								
unk. cyclopoid					1.794			
Cyclopoid copepodites								
Acartia clausi		5.850	0.477	0.775	0.179			
Acartia danae								
Calanus sp.								
Metridia lucens								
Epilabidocera longipedata								
Eucalanus								
Eurytemora affinis								
Eurytemora americana				1.472	0.179			
Pseudodiaptomus euryhalinus		1.687	0.159				0.463	
Temorites sp(p)					2.153			
c.f. Temorites sp.								
Rhincalanus nasutus								
Tortanus discaudatus								
unknown calanoid								
Calanoid copepodites								
Cal. copepodites w/long rami				0.141				
Harpacticoida unident.								
Harpacticoid "A"								
Harpacticoid "B"								
Harpacticoid "C"								
Caligus								
other parasitic copepods								
unknown copepodites								
Ostracoda	0.876			0.775	0.179	243.948	15.165	2.643
Podocopida								
Leptostraca								

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - 1990.

	Station E-5							
	15-Jun-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Cirripedia								
Barnacle nauplii								
Barnacle cypris								
Isopoda						98.617		0.116
Amphipoda								
Aniseogammarus confervicolus	7.885						0.463	0.233
Corophium spinicorne								
Corophium	6.133			0.173			13.312	0.915
Grandidierella japonica								
Caprellidae								
Ampithoidae								0.233
Aoridae								
Atylidae								
Hyalidae								
Pleustidae								
Ampeliscidae								
Talitridae								
unk. amphipods	0.876		0.371	0.775				
Cumacea			0.794	5.454				
Mysidacea								
Neomysis mercedis	26.775	0.112	1.569			457.792	8.618	4.778
Euphausiacea								
Decapoda								
Brachyura								
Cancer antennarius/gracilis(1)								
Cancer antennarius stg 2 zoea								
Cancer antennarius stg 3 zoea								
Cancer productus stg 1 zoea								
Grapsidae zoea								0.466
Majidae zoea								
Pinnotheridae zoea		0.225						
Xanthidae zoea								
Unknown brachyuran zoea								
Unk. Megalopa								
Megalopa A		5.175	0.752					
Megalopa B								
Megalopa C								
Megalopa D								
very young crab								
Hemigrapsis oregonensis								
Hemigrapsus nudus								
Pachygrapsus crassipes								
Anomura								
Anomuran megalopa								
Porcellanidae zoea								
Hippidea zoea								
Emerita analoga zoea								
Paguridea zoea								
Thalassinidea zoea								
Callianassidae								
Caridea								
Crangonidae(zoea and older)								
Caridean zoea and older								
Hippolytidae zoea								
Crangon nigromaculata			0.186					
Heptacarpus pictus								
Heptacarpus taylori								
Unknown caridean type zoea								
Unknown zoea								
Arachnid					0.359			
Pycnogonid								
Halacaridea								
Insect larvae					2.511	162.978		
Corbidae, unident.								
Echinodermata								
bipinnaria larvae								
pluteus larvae								
Chaetognatha								
Urochordata								
Larvacea								
Number of invertebrate taxa	6	6	8	9	13	5	6	9
Total invertebrates per m3	43.422	13.180	4.493	10.150	46.462	964.168	44.507	15.744
Copepoda per m3	0.000	7.537	0.635	2.388	4.305	0.000	0.463	0.000
Decapoda per m3	0.000	5.400	0.937	0.000	0.000	0.000	0.000	0.466
Mycidacea per m3	26.775	0.112	1.569	0.000	0.000	457.792	8.618	4.778
Other per m3	16.647	0.132	1.351	7.762	42.156	506.376	35.426	10.500

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - 1990.

	Station E-5								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Protozoa									
Tintinnids									
Foraminifera									
Noctiluca									
Ctenophore									
Cnidaria									
Leptomedusa type									
Anthomedusa type		0.189							
other medusae									0.227
Hydroid polyp		P							
Leptomedusa polyp									
Coral polyp									
Siphonophore									
Aschelminthes									
roundworm									
Unknown "worm"									
Rotifera									
Brachionus									
Synchatea									
Mollusca									
Bivalves									
Gastropods	0.294			0.244					
Nudibranch									
Phoronida actinotroch									
Bryozoa larvae									
Bryozoan colony									
Annelida									
Hirudinea									
Nemertean									
Polychaetes		0.378	0.333		0.399	0.482	0.977		
Polychaete larvae									
Oligochaete	0.698		0.367					0.650	
Arthropoda									
Crustacea									
nauplii				0.976					
Cladocera									0.819
Evadne			0.833	0.785					
Podon									
Copepoda									
Corycaeus									
Oithona				2.925					
Oncaea									
unk. cyclopoid			0.167						
Cyclopoid copepodites									
Acartia clausi	0.279	2.152		0.195			0.752		0.227
Acartia danae									
Calanus sp.									
Metridia lucens									
Epilabidocera longipedata									
Eucalanus									
Eurytemora affinis				1.584			0.752		
Eurytemora americana									
Pseudodiaptomus euryhalinus	0.698	0.132	0.333			0.482	64.724	0.519	0.162
Temorites sp(p)									
c.f. Temorites sp.				3.315					
Rhincalanus nasutus									
Tortanus discaudatus		0.378							
unknown calanoid									
Calanoid copepodites									
Cal. copepodites w/long rami									
Harpacticoida unident.							0.752		
Harpacticoid "A"									
Harpacticoid "B"									
Harpacticoid "C"									
Caligus								0.584	0.227
other parasitic copepods	0.698							0.650	0.227
unknown copepodites									
Ostracoda	0.698								
Podocopida				0.317	0.160	0.843		0.130	
Leptostraca									

Appendix P1. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - 1990.

	Station E-5								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Cirripedia									
Barnacle nauplii									
Barnacle cypris									
Isopoda	0.294							0.650	0.682
Amphipoda									
Anisogammarus confervicolus		0.189			0.997	0.248	0.153	0.650	
Corophium spinicorne				0.976	0.199	0.248	0.926	0.650	
Corophium	0.140	0.378	0.846						
Grandidierella japonica							0.752		
Caprellidae									
Ampithoidae							0.226		
Aoridae									
Atylidae									
Hyalidae									
Pleustidae									
Ampeliscidae									
Talitridae				0.244					
unk. amphipods		0.189							
Cumacea				0.244			0.752		
Mysidacea									
Neomysis mercedis	0.140	0.812				0.193	1.579	0.584	0.760
Euphausiacea									
Decapoda									
Brachyura									
Cancer antennarius/gracilis(1)				0.244					
Cancer antennarius stg 2 zoea									
Cancer antennarius stg 3 zoea									
Cancer productus stg 1 zoea									
Grapsidae zoea	0.698								0.455
Majidae zoea									
Pinnotheridae zoea	0.140								
Xanthidae zoea									
Unknown brachyuran zoea									
Unk. Megalopa		1.529				0.248	0.752		0.114
Megalopa A									
Megalopa B									
Megalopa C									
Megalopa D									
very young crab									
Hemigrapsis oregonensis		0.378			0.399				
Hemigrapsus nudus									
Pachygrapsus crassipes									
Anomura									
Anomuran megalopa	0.294								
Porcellanidae zoea									
Hippidea zoea									
Emerita analoga zoea									
Paguridea zoea									
Thalassinidea zoea									
Callianassidae									
Caridea									
Crangonidae(zoea and older)									
Caridean zoea and older									
Hippolytidae zoea									
Crangon nigromaculata									
Heptacarpus pictus									
Heptacarpus taylori									
Unknown caridean type zoea									
Unknown zoea									
Arachnid									
Pycnogonid									
Halacaridea					0.199				
Insect larvae			0.333	0.146	0.439	0.248			0.227
Corixidae, unident.		0.189	0.833						
Echinodermata									
bipinnaria larvae									
pluteus larvae									
Chaetognatha									
Urochordata									
Larvacea									
Number of invertebrate taxa	12	13	8	13	7	8	12	9	11
Total invertebrates per m3	5.068	6.892	4.046	12.195	2.792	2.989	73.096	5.066	4.128
Copepoda per m3	1.675	2.662	0.500	8.020	0.000	0.462	66.979	1.753	0.844
Decapoda per m3	1.131	1.907	0.000	0.244	0.399	0.248	0.752	0.000	0.568
Mycidacea per m3	0.140	0.812	0.000	0.000	0.000	0.193	1.579	0.584	0.760
Other per m3	2.122	1.511	3.546	3.931	2.393	2.067	3.786	2.729	1.956

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-1									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Bay pipefish										
Bay pipefish larvae										
Gobiidae larvae	0.186	0.520				0.535		0.466		
Arrow Goby										
Bay, arrow or yellowfin goby										
Tidewater goby										
Clevlandia/Ilypnus/Quietula *									0.332	0.297
Longjaw mudsucker										
Topsmelt										0.148
Jack- or topsmelt larvae	0.186									
Northern anchovy larvae	0.130	0.520			0.247	0.268				
Pacific herring						0.714				
short bellied rock fish		0.635								
3-Spine Stickleback										
3-Spine Stickleback larvae										
Shiner Surfperch										
Osmeridae (yolksac larvae)									0.995	0.148
Staghorn sculpin										
Surfsmelt larvae								0.895		
Plainfin midshipman										
unknown fish larvae						0.178				
fish eggs	0.334	1.318	2.963	0.668	0.760	0.299		0.139	0.332	
Number of vertebrate taxa	4	4	1	1	2	5	0	3	3	3
Total larval and juvenile fish per m3	0.501	1.875	0.000	0.000	0.247	1.696	0.000	1.361	1.327	0.593

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-1								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Bay pipefish		0.875							
Bay pipefish larvae									
Gobiidae larvae									
Arrow Goby			0.176		1.965	0.641			
Bay, arrow or yellowfin goby			0.150						
Tidewater goby									
Clevlandia/Ilypnus/Quietula *	0.187	0.250		0.769			0.999		1.425
Longjaw mudsucker									
Topsmelt									
Jack- or topsmelt larvae									
Northern anchovy larvae								0.767	
Pacific herring			0.352						
short bellied rock fish			0.150						
3-Spine Stickleback									
3-Spine Stickleback larvae									
Shiner Surfperch									
Osmeridae (yolksac larvae)									
Staghorn sculpin									
Surfsmelt larvae									
Plainfin midshipman									
unknown fish larvae						0.855			
fish eggs	0.544							28.790	
Number of vertebrate taxa	2	1	4	1	1	2	1	2	1
Total larval and juvenile fish per m3	0.187	1.125	0.828	0.769	1.965	1.496	0.999	0.767	1.425

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-2									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Bay pipefish										
Bay pipefish larvae										
Gobiidae larvae	0.557	0.297	0.242	0.118		0.186		0.186		
Arrow Goby										
Bay, arrow or yellowfin goby										
Tidewater goby										
Clevlandia/Ilypnus/Quietula *							0.383		0.947	0.522
Longjaw mudsucker										
Topsmelt										
Jack- or topsmelt larvae	0.557									
Northern anchovy larvae					0.278	0.160				
Pacific herring						1.318				
Pacific Herring larvae										
short bellied rock fish										
3-Spine Stickleback										
3-Spine Stickleback larvae										
Shiner Surfperch										
Osmeridae (yolksac larvae)							0.255		0.631	
Staghorn sculpin						0.264				
Surfsmelt larvae										
Plainfin midshipman										
unknown fish larvae					0.278					
fish eggs	0.557	0.689	4.958	0.183	0.644	0.395			0.631	
Number of vertebrate taxa	3	2	2	2	3	5	2	1	3	1
Total larval and juvenile fish per m3	1.671	0.986	5.200	0.301	1.201	2.322	0.639	0.186	2.209	0.522

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-2							
	18-Sep-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Bay pipefish								
Bay pipefish larvae								
Gobiidae larvae			0.329		0.541	0.252	0.713	
Arrow Goby								
Bay, arrow or yellowfin goby								
Tidewater goby								
Clevlandia/Ilypnus/Quietula *	0.689							
Longjaw mudsucker								
Topsmelt								
Jack- or topsmelt larvae								
Northern anchovy larvae								
Pacific herring								
Pacific Herring larvae			0.164					
short bellied rock fish								
3-Spine Stickleback								
3-Spine Stickleback larvae								
Shiner Surfperch								
Osmeridae (yolksac larvae)								
Staghorn sculpin								
Surfsmelt larvae								
Plainfin midshipman								
unknown fish larvae								0.189
fish eggs	0.276	1.816	0.658	0.468	0.632	0.913	23.611	0.658
Number of vertebrate taxa	2	1	3	1	2	2	2	2
Total larval and juvenile fish per m3	0.965	1.816	1.151	0.468	1.173	1.165	24.325	0.847

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-3								
	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89	18-Sep-89
Bay pipefish									0.013
Bay pipefish larvae									
Gobiidae larvae	0.074	0.027	0.019			1.372			
Arrow Goby									
Bay, arrow or yellowfin goby									
Tidewater goby									
Clevlandia/Ilypnus/Quietula *							3.612	5.112	
Longjaw mudsucker									
Topsmelt									
Jack- or topsmelt larvae						0.156	0.041		
Northern anchovy larvae			0.009	0.001					
Pacific herring				0.003		0.110			
short bellied rock fish									
3-Spine Stickleback									
3-Spine Stickleback larvae									
Shiner Surfperch									
Osmeridae (yolksac larvae)									0.013
Staghorn sculpin			0.056		0.241				
Cottidae larvae, unident.									
Surfsmelt larvae									
Plainfin midshipman									
unknown fish larvae									
fish eggs	4.010	0.171	0.571	0.003			0.041	0.046	0.079
Number of vertebrate taxa	2	2	4	3	1	3	3	2	3
Total larval and juvenile fish per m3	0.074251	0.198	0.654	0.007	0.241	1.637	3.693	5.158	0.105

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-3							
	26-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Bay pipefish					0.189			
Bay pipefish larvae								
Gobiidae larvae				0.344	1.760	4.564	0.730	0.436
Arrow Goby					0.189			0.436
Bay, arrow or yellowfin goby			0.481		0.189	0.475		
Tidewater goby								
Clevlandia/Ilypnus/Quietula *								
Longjaw mudsucker								
Topsmelt		0.147						0.194
Jack- or topsmelt larvae		0.147			0.189	0.164		
Northern anchovy larvae	0.924	0.441						
Pacific herring		0.260						
short bellied rock fish								
3-Spine Stickleback								
3-Spine Stickleback larvae								
Shiner Surfperch								
Osmeridae (yolksac larvae)								
Staghorn sculpin								
Cottidae larvae, unident.		0.147						
Surfsmelt larvae			1.776	2.972	0.189			0.436
Plainfin midshipman								
unknown fish larvae	0.185							
fish eggs	0.554			0.313	0.189		6.527	0.174
Number of vertebrate taxa	3	5	2	3	7	3	2	5
Total larval and juvenile fish per m3	1.663	1.142	2.258	3.630	2.895	5.203	7.257	1.677

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-4									
	14-Apr-88	15-Jun-88	30-Aug-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Bay pipefish		0.026								0.026
Bay pipefish larvae										
Gobiidae larvae		1.025		0.161	0.805	0.084		7.905		
Arrow Goby					0.009					
Bay, arrow or yellowfin goby			1.714							
Tidewater goby			0.044							
Clevlandia/Ilypnus/Quietula *									9.743	3.742
Longjaw mudsucker										
Topsmelt			0.009							
Jack- or topsmelt larvae		0.019						0.575	2.006	2.240
Northern anchovy larvae					0.019	0.046		1.805		
Pacific herring						2.090			0.061	
short bellied rock fish										
3-Spine Stickleback										0.026
3-Spine Stickleback larvae										
Shiner Surfperch										
Osmeridae (yolksac larvae)										
Staghorn sculpin						0.019				
Cottidae larvae										
Surfsmelt larvae										
Plainfin midshipman										
unknown fish larvae		0.009								
fish eggs										
Number of vertebrate taxa	0	4	3	1	3	4	0	3	3	4
Total larval and juvenile fish per m3	0.000	1.060	1.767	0.161	0.833	2.239	0.000	10.284	11.811	6.035

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - September 1990.

	Station E-4								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Bay pipefish							0.518	0.157	
Bay pipefish larvae									
Gobiidae larvae		4.643	0.349			0.319	8.839	23.363	8.484
Arrow Goby						0.778	1.943		0.436
Bay, arrow or yellowfin goby					0.194				
Tidewater goby									0.153
Clevlandia/Ilypnus/Quietula *	2.118								
Longjaw mudsucker									
Topsmelt						0.539	0.959	0.189	0.139
Jack- or topsmelt larvae	0.034	0.474				0.142	0.777		
Northern anchovy larvae		0.254							
Pacific herring									
short bellied rock fish									
3-Spine Stickleback									
3-Spine Stickleback larvae									
Shiner Surfperch									
Osmeridae (yolksac larvae)	0.017								
Staghorn sculpin									
Cottidae larvae		0.135							
Surfsmelt larvae					0.738				0.219
Plainfin midshipman									
unknown fish larvae									
fish eggs									
Number of vertebrate taxa	3	4	1	0	2	4	5	3	5
Total larval and juvenile fish per m3	2.169	5.506	0.349	0.000	0.932	1.777	13.037	23.709	9.430

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - 1990.

	Station E-5							
	15-Jun-88	26-Oct-88	21-Dec-88	17-Feb-89	6-Mar-89	4-May-89	8-Jun-89	5-Jul-89
Bay pipefish								0.051
Bay pipefish larvae								
Gobiidae larvae		1.216	1.008	0.074				
Arrow Goby	0.019							
Bay, arrow or yellowfin goby								
Tidewater goby								
Clevlandia/Ilypnus/Quietula *							2.316	7.623
Longjaw mudsucker								
Topsmelt								0.229
Jack- or topsmelt larvae							0.463	0.305
Northern anchovy larvae								
Pacific herring				0.780				
short bellied rock fish								
3-Spine Stickleback								0.102
3-Spine Stickleback larvae								
Shiner Surfperch								
Osmeridae (yolksac larvae)								
Staghorn sculpin				0.074				
Surfsmelt larvae			0.019					
Plainfin midshipman								
unknown fish larvae								
fish eggs								
Number of vertebrate taxa	1	1	2	3	0	0	2	5
Total larval and juvenile fish per m3	0.019	1.216	1.027	0.928	0.000	0.000	2.780	8.309

Appendix P2. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero Americano, April 1988 - 1990.

	Station E-5								
	18-Sep-89	28-Nov-89	7-Feb-90	9-Mar-90	5-Apr-90	24-May-90	25-Jun-90	26-Jul-90	18-Sep-90
Bay pipefish							0.752	0.974	
Bay pipefish larvae									
Gobiidae larvae		0.736				0.964	11.727	0.987	1.278
Arrow Goby					0.140	0.248	2.819	0.650	0.682
Bay, arrow or yellowfin goby								5.627	1.723
Tidewater goby									
Clevlandia/Ilypnus/Quietula *	65.457								
Longjaw mudsucker	1.745	0.189							
Topsmelt						0.722	1.397	3.959	0.455
Jack- or topsmelt larvae	0.209					0.124	0.113	0.130	
Northern anchovy larvae		0.945							
Pacific herring									
short bellied rock fish									
3-Spine Stickleback								0.650	
3-Spine Stickleback larvae									
Shiner Surfperch									
Osmeridae (yolksac larvae)									
Staghorn sculpin									
Surfsmelt larvae									0.227
Plainfin midshipman	0.070								
unknown fish larvae									
fish eggs									
Number of vertebrate taxa	4	3	0	0	1	4	5	7	5
Total larval and juvenile fish per m3	67.481	1.870	0.000	0.000	0.140	2.058	16.807	12.976	4.365

Appendix P3. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; unshaded dates: bar open.

	Station S-2							
	5-Jul-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Protozoa								
Tintinnids								
Foraminifera								
Noctiluca								
Ctenophore								
Cnidaria								
Leptomedusa type				0.409				
Anthomedusa type								
other medusae								
Hydroid polyp								
Leptomedusa polyp								
Coral polyp								
Siphonophore (gonophore)								
Aschelminthes								
roundworm					0.374			
Unknown "worm"								
Rotifera								
Brachionus								
Synchatea								
Mollusca								
Bivalves								
Montacutidae				0.204				
Gastropods								
Gastropoda eggs				0.102				
Opisthobranchia								
Nudibranchs								
Phoronida actinotroch								
Bryozoa larvae								
Bryozoan colony								
Annelida								
Hirudinea								
Polychaetes								
Polychaete larvae				0.102				
Oligochaete								
Nemertean								
Arthropoda								
Crustacea								
nauplii								
Cladocera							0.081	
Evadne		0.129	8.049					
Podon								
Copepoda								
Corycaeus								
Oithona			0.033	0.817				
Oncaea		0.022						1.454
unk. cyclopoid								
Cyclopoid copepodites								
Acartia clausi			0.033					
Acartia danae								
Calanus sp.								
Metridia lucens								
Epilabidocera longipedata								
Eucalanus								
Eurytemora affinis			21.695	133.724				
Eurytemora americana		2.544						
Eurytemora sp. "copepodites"								
Pseudodiaptomus euryhalinus		0.022						
Temorites sp(p)		0.410	0.099					
Rhincalanus nasutus								
Centropages c.f. abdominalis								
Tortanus discaudatus								
Monstrillidae, unident.								
unknown calanoid							0.012	
Calanoid copepodites								
Cal. copepodites w/long rami								
Parathalestris californica								
Schizopero knabeni					0.819			
Zaus spp.								
Harpacticoida unident.								
Harpacticoid "A"								
Harpacticoid "B"								
Harpacticoid "C"								
Caligus								
other parasitic copepods				0.204				
unknown copepodites								
Ostracoda								
Podocopida								
Leptostraca								
Nebalia pugettensis								

Appendix P3. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; unshaded dates: bar open.

	Station S-2							
	5-Jul-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Cirripedia								
Barnacle nauplii								
Barnacle cypris								
Isopoda								
Sphaeromatidae				0.204	0.071	0.023	0.093	
Idoteidae								
Amphipoda								
Anisogammarus confervicolus		0.280	0.017	0.204	0.107			0.018
Corophium					0.659			0.036
Grandidriella japonica								
Caprellidae								
Ampeliscidae								
Ampithoidae								
Aoridae								
Atylidae								
Hyalidae								
Ischyroceridae								
Photidae								
Pleustidae								
Talitridae								
unk. amphipods								
Cumacea								
Mysidacea								
Neomysis mercedis								
Euphausiacea								
Decapoda								
Brachyura								
Cancer antennarius/gracilis(1)								
Cancer antennarius stg 2 zoea								
Cancer antennarius stg 3 zoea								
Cancer productus stg 1 zoea								
Grapsidae zoea								
Majidae zoea								
Pinnotheridae zoea				1.328				
Xanthidae zoea								
Unknown brachyuran zoea								
Megalopa								
Megalopa A								
Megalopa B								
Megalopa C								
Megalopa D								
very young crab								
Hemigrapsis oregonensis								
Hemigrapsus nudus								
Pachygrapsus crassipes								
Anomura								
Anomuran megalopa								
Emerita analoga zoea								
Porcellanidae zoea								
Hippidea zoea								
Paguridea zoea								
Thalassinidea zoea								
Callianassidae								
Caridea								
Crangonidae(zoea and older)								
Hippolytidae zoea								
Caridean zoea and older								
Crangon nigromaculata								
Heptacarpus pictus								
Heptacarpus taylori								
Unknown caridean type zoea		0.022						
Unknown zoea								
Arachnid								
Pycnogonid								
Halacaridea								
Insect, unident.		0.022						
Insect larvae	0.044	0.043					0.012	
Corixidae, unident.								
Echinodermata		0.129						
bipinnaria larvae								
pluteus larvae								
Chaetognatha								
Urochordata								
Larvacea								
Number of invertebrate taxa	1	10	6	10	5	1	4	3
Total invertebrates per m3	0.044	3.623	29.926	137.300	2.029	0.023	0.197	1.507
Copepoda per m3	0.000	2.997	21.861	134.746	0.819	0.000	0.012	1.454
Decapoda per m3	0.000	0.022	0.000	1.328	0.000	0.000	0.000	0.000
Mycidacea per m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other per m3	0.044	0.604	8.065	1.226	1.210	0.023	0.185	0.054

Appendix P3. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; Unshaded dates: bar open.

	Station S-4								
	5-Jul-89	29-Nov-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Protozoa									
Tintinnids									
Foraminifera		0.016							
Noctiluca									
Ctenophore									
Cnidaria									
Leptomedusa type		0.143							
Anthomedusa type		0.413						0.443	100.597
other medusae									
Hydroid polyp	P								
Leptomedusa polyp									
Coral polyp									
Siphonophore (gonophore)									
Aschelminthes									
roundworm									
Unknown "worm"									
Rotifera									
Brachionus									
Synchatea									
Mollusca									
Bivalves									
Montacutidae									
Gastropods				0.017					
Gastropoda eggs									
Opisthobranchia									
Nudibranchs									
Phoronida actinotroch									
Bryozoa larvae									
Bryozoan colony	P								
Annelida									
Hirudinea									
Polychaetes		0.032							
Polychaete larvae									
Oligochaete									
Nemertean									
Arthropoda									
Crustacea									
nauplii									
Cladocera									
Evadne			2.189						
Podon									
Copepoda									
Corycaeus									
Oithona					58.552				
Oncaea									
unk. cyclopoid									
Cyclopoid copepodites									0.963
Acartia clausi		0.032	0.075	0.033					
Acartia danae									
Calanus sp.									
Metridia lucens									
Epilabidocera longipedata									
Eucalanus									
Eurytemora affinis				1.838	6475.214				
Eurytemora americana		0.064	8.076						
Eurytemora sp. "copepodites"					123.993				
Pseudodiaptomus euryhalinus									
Temorites sp(p)			1.962						
Rhincalanus nasutus									
Centropages c.f. abdominalis				0.066					
Tortanus discaudatus									
Monstrillidae, unident.									
unknown calanoid									
Calanoid copepodites									0.321
Cal. copepodites w/long rami									
Parathalestris californica									
Schizopero knabeni									
Zaus spp.									
Harpacticoida unident.									
Harpacticoid "A"									
Harpacticoid "B"									
Harpacticoid "C"									
Caligus									
other parasitic copepods									
unknown copepodites									
Ostracoda	0.083								
Podocopida									

Appendix P3. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; Unshaded dates: bar open.

	Station S-4								
	5-Jul-89	29-Nov-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Leptostraca									
Nebalia pugettensis									
Cirripedia									
Barnacle nauplii									
Barnacle cypris									
Isopoda	0.041	0.191							
Sphaeromatidae					1.722		0.012	0.043	0.481
Idoteidae									
Amphipoda									
Anisogammarus confervicolus	0.096	2.735	0.019	0.017					
Corophium	0.399	0.254							
Grandidriella japonica									
Caprellidae									
Ampeliscidae									
Ampithoidae									
Aoridae									
Atylidae				0.017					
Hyalidae									
Ischyroceridae									
Photidae									
Pleustidae									
Talitridae									
unk. amphipods									
Cumacea							0.012		
Mysidacea									
Neomysis mercedis									
Euphausiacea									
Decapoda									
Brachyura									
Cancer antennarius/gracilis(1)									
Cancer antennarius stg 2 zoea									
Cancer antennarius stg 3 zoea									
Cancer productus stg 1 zoea									
Grapsidae zoea		0.016		0.116					
Majidae zoea									
Pinnotheridae zoea									
Xanthidae zoea									
Unknown brachyuran zoea									
Megalopa									
Megalopa A									
Megalopa B									
Megalopa C									
Megalopa D									
very young crab									
Hemigrapsis oregonensis									
Hemigrapsus nudus									
Pachygrapsus crassipes									
Anomura									
Anomuran megalopa									
Emerita analoga zoea									
Porcellanidae zoea									
Hippidea zoea									
Paguridea zoea									
Thalassinidea zoea									
Callianassidae									
Caridea									
Crangonidae(zoea and older)									
Hippolytidae zoea									
Caridean zoea and older									
Crangon nigromaculata									
Heptacarpus pictus									
Heptacarpus taylori									
Unknown caridean type zoea									
Unknown zoea									
Arachnid			0.151						
Pycnogonid									
Halacaridea									
Insecta, unident.			0.755						
Insect larvae			0.094				0.048	0.757	0.160
Echinodermata									
bipinnaria larvae									
pluteus larvae									
Chaetognatha									
Urochordata									
Larvacea									
Number of invertebrate taxa	6	10	8	7	4	0	3	3	5
total # invertebrates per m3	0.619	3.895	13.321	2.103	6659.482	0.000	0.072	1.242	102.522
Copepoda per m3	0.000	0.095	10.113	1.938	6657.760	0.000	0.000	0.000	1.284
Decapoda per m3	0.000	0.016	0.000	0.116	0.000	0.000	0.000	0.000	0.000
Mycidacea per m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other per m3	0.619	3.784	3.208	0.050	1.722	0.000	0.072	1.242	101.239

Appendix P3. Invertebrates (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990. Shaded dates: bar closed; unshaded dates: bar open.

	Station S-6							
	5-Jul-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Protozoa								
Tintinnids								
Foraminifera								
Noctiluca								
Ctenophore								
Cnidaria								
Leptomedusa type								
Anthomedusa type				1.521				
other medusae								
Hydroid polyp	P							
Leptomedusa polyp								
Coral polyp								
Siphonophore (gonophore)								
Aschelminthes								
roundworm								
Unknown "worm"								
Rotifera								
Brachionus								
Synchatea								
Mollusca								
Bivalves								
Montacutidae								
Gastropods				0.072				
Gastropoda eggs								
Opisthobranchia								
Nudibranchs								
Phoronida actinotroch								
Bryozoa larvae								
Bryozoan colony	P							
Annelida								
Hirudinea								
Polychaetes								
Polychaete larvae								
Oligochaete								
Nemertean								
Arthropoda								
Crustacea								
nauplii							0.012	
Cladocera								
Evadne		5.019	4.141	0.579				
Podon								
Copepoda								
Corycaeus							0.442	
Oithona				3.187				
Oncaea								
unk. cyclopoid								
Cyclopoid copepodites								
Acartia clausi								
Acartia danae								
Calanus sp.								
Metridia lucens								
Epilabidocera longipedata								
Eucalanus								
Eurytemora affinis				168.320				
Eurytemora americana								
Eurytemora sp. "copepodites"								
Pseudodiaptomus euryhalinus								
c.f. Temorites sp.			0.164					
Rhincalanus nasutus								
Centropages c.f. abdominalis								
Tortanus discaudatus								
Monstrillidae, unident.								
unknown calanoid							0.024	
Calanoid copepodites								
Cal. copepodites w/long rami								
Parathalestris californica								
Schizopero knabeni								
Zaus spp.								
Harpacticoida unident.								
Harpacticoid "A"								
Harpacticoid "B"								
Harpacticoid "C"								
Caligus							0.012	
other parasitic copepods								
unknown copepodites								
Ostracoda	0.516							
Podocopida				0.217	0.021			

Appendix P3. Invertebrates (Numbers per *cubic meter*) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990. Shaded dates: bar closed; unshaded dates: bar open.

	Station S-6							
	5-Jul-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Leptostraca								
Nebalia pugettensis								
Cirripedia								
Barnacle nauplii								
Barnacle cypris								
Isopoda	0.227							
Sphaeromatidae			0.018	0.217		0.040	0.048	0.018
Idoteidae								
Amphipoda								
Aniscgammarus confervicolus			0.018			0.066	0.012	0.018
Corophium	0.547			0.072				
Grandidriella japonica								
Caprellidae								
Ampeliscidae								
Ampithoidae								
Aoridae								
Atylidae								
Hyalidae								
Ischyroceridae								
Photidae								
Pleustidae								
Talitridae							0.012	
unk. amphipods								
Cumacea								
Mysidacea	0.010							
Neomysis mercedis				0.217				0.018
Euphausiacea								
Decapoda								
Brachyura								
Cancer antennarius/gracilis(1)								
Cancer antennarius stg 2 zoea								
Cancer antennarius stg 3 zoea								
Cancer productus stg 1 zoea								
Grapsidae zoea								
Majidae zoea								
Pinnotheridae zoea								
Xanthidae zoea								
Unknown brachyuran zoea								
Megalopa								
Megalopa A								
Megalopa B								
Megalopa C								
Megalopa D								
very young crab								
Hemigrapsis oregonensis								
Hemigrapsus nudus								
Pachygrapsus crassipes								
Anomura								
Anomuran megalopa								
Emerita analoga zoea								
Porcellanidae zoea								
Hippidea zoea								
Paguridea zoea								
Thalassinidea zoea								
Callianassidae								
Caridea								
Crangonidae(zoea and older)								
Hippolytidae zoea								
Caridean zoea and older								
Crangon nigromaculata								
Heptacarpus pictus								
Heptacarpus taylori								
Unknown caridean type zoea								
Unknown zoea								
Arachnid	0.021							
Pycnogonid								
Halacaridea								
Insect larvae	0.021		0.036	0.072	0.084	4.294	2.855	
Echinodermata								
bipinnaria larvae								
pluteus larvae								
Chaetognatha								
Urochordata								
Larvacea								
Number of invertebrate taxa	8	1	5	10	2	3	8	3
Total invertebrates per m3	1.342	5.019	4.378	174.476	0.106	4.400	3.416	0.053
Copepoda per m3	0.000	0.000	0.164	171.507	0.000	0.000	0.478	0.000
Decapoda per m3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mycidacea per m3	0.010	0.000	0.000	0.217	0.000	0.000	0.000	0.018
Other per m3	1.331	5.019	4.214	2.752	0.106	4.400	2.938	0.035

Appendix P4. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; unshaded dates: bar open.

	Station S-2							
	5-Jul-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Bay pipefish								
Bay pipefish larvae								
Gobiidae larvae								
Arrow Goby								
Bay,arrow or yellowfin goby								
Tidewater goby								
Topsmelt								
Jack- or topsmelt larvae								
Northern anchovy larvae								
Pacific Herring larvae								
short bellied rock fish								
3-Spine Stickleback								
3-Spine Stickleback larvae								
Shiner Surfperch								
Staghorn sculpin								
Surfsmelt larvae			0.050					
Cyprinidae larvae								
unknown fish larvae			0.232					
fish eggs								
Clevlandia/Ilypnus/Quietula								
Osmeridae(yolksac larvae)								
Number of Vertebrate taxa	0	0	2	0	0	0	0	0
Total larval and juvenile fish per m3	0.000	0.000	0.282	0.000	0.000	0.000	0.000	0.000

Appendix P4. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; Unshaded dates: bar open.

	Station S-4								
	5-Jul-89	29-Nov-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Bay pipefish									
Bay pipefish larvae									
Gobiidae larvae									
Arrow Goby									
Bay,arrow or yellowfin goby									
Tidewater goby									
Topsmelt									
Jack- or topsmelt larvae	0.013761								
Northern anchovy larvae									
Pacific Herring larvae									
short bellied rock fish									
3-Spine Stickleback									
3-Spine Stickleback larvae									
Shiner Surfperch									
Staghorn sculpin									
Surfsmelt larvae				0.149					
Cyprinidae larvae									
unknown fish larvae			0.019				0.012		
fish eggs		0.111							
Clevlandia/Ilypnus/Quietula									
Osmeridae(yolksac larvae)									
Number of vertebrate taxa	1	1	1	1	0	0	1	0	0
Total larval and juvenile fish per m3	0.014	0.111	0.019	0.149	0.000	0.000	0.012	0.000	0.000

Appendix P4. Larval and Juvenile Fish (Numbers per cubic meter) Collected in Half-meter Nets of 505-Micron Mesh in Estero de San Antonio, July 1989 - September 1990.
Shaded dates: bar closed; unshaded dates: bar open.

	Station S-6							
	5-Jul-89	8-Feb-90	10-Mar-90	6-Apr-90	25-May-90	26-Jun-90	27-Jul-90	19-Sep-90
Bay pipefish	0.01032							
Bay pipefish larvae								
Gobiidae larvae				0.145		0.199	0.048	
Arrow Goby								
Bay,arrow or yellowfin goby				0.435				
Tidewater goby								1.256
Topsmelt								
Jack- or topsmelt larvae								
Northern anchovy larvae								
Pacific Herring larvae								
short bellied rock fish								
3-Spine Stickleback	0.01032				0.021			
3-Spine Stickleback larvae								
Shiner Surfperch								
Staghorn sculpin								
Surfsmelt larvae			0.055					
Cyprinidae larvae	0.02064							
unknown fish larvae								
fish eggs	P							
Clevlandia/Ilypnus/Quietula								
Osmeridae(yolksac larvae)								
Number of vertebrate taxa	4	0	1	2	1	1	1	1
Total larval and juvenile fish per m3	0.041	0.000	0.055	0.579	0.021	0.199	0.048	1.256

NEKTON/EPIBENTHIC INVERTEBRATE APPENDIX

Appendix E1. Epibenthic and nektonic invertebrates collected in Estero Americano otter trawls, 1988-90 (numbers per tow).

DATE	30-Mar-88					13-Apr-88					16-Jun-88					29-Aug-88					25-Oct-88				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5
NUMBER OF TOWS	1	1	0	1	0	2	2	1	1	0	2	1	0	1	0	1	1	1	1	2	1	1	1	1	1
Mysidacea (mysids)																									
Archeomysis grebnitskii						1															2				
Holmesimysis costata																									
Neomysis mercedis	1	xxx		8500		11	xxx	xxx	xxx				xxb	24	xxxb			1					24		
Neomysis rayi																									
Caridia (shrimps)																									
Crangon alaskensis elongata	1					1										5	1				10				
Crangon franciscorum		7		4			27	4			2	1										1	87	6	
*Crangon nigricauda**	6	22				11	45				12						4	29	18	2	4	23	86	2	
*Heptacarpus brevirostris**						1															2				
Heptacarpus carinatus+*																									
Heptacarpus palpator+*																									
Heptacarpus paludicola+*																									
*Heptacarpus pictus**																	11					27	5		
*Hippolyte californiensis**																	3					1			
Brachyura (crabs)																									
Cancer antennarius+*																									
Cancer anthonyi																									
Cancer gracilis												2									1b			1b	1b
Cancer jordani						1						2									1	1			
Cancer magister (megalopae)						1																			
Cancer magister						1					3	2				5					1	4	2	2	1
Cancer productus												1										2			
Cancer spp. megalopae (not C. magister)																									
Carcinus maenas																									
Hemigrapsis oregonensis	2	2		6		1	11	9	76		2	12	xxxb		xxb	1	45	13	92	70		20	6	11	7
*Pugettia producta**																	1		1b						
*Pugettia richii**																									
Megalopae (not Cancer)+*																									
Anomura (hermit crabs)																									
Isocheles pilosus																									
Pagurus spp.						1					1														
Amphipoda (amphipods)																									
Achella sp.+*																									
Allorchestes angusta+*																									
*Amphithoe lacertosa**		1					20	1						1			3	1			2	14	3		
*Anisogammarus confervicolus**				1			4																		
Atylus tridens+*																									
*Caprella californica**																									
Corophium spinicorne, incl. juv.																									
Grandidierella japonica																									
Isopoda (isopods)																									
Cirolana hartfordi																									
Excirolana sp.+*																									
*Idotea fewkesi***				1							3											1			
*Idotea montereyensis**+*																									
*Idotea resecata***																									
Pycnogonida (sea spiders)																									
Pycnogonum stearnsi																									
Mollusca (molluscs)																									
Hermissenda crassicornis																									
*Lacuna sp.***																									
Nudibranch sp. (?Fiona)																									

Appendix E1. Epibenthic and nektonic invertebrates collected in Estero Americano otter trawls, 1988-90 (numbers per tow).

DATE	20-Dec-88					17-Feb-89					6-Mar-89					9-Apr-89					5-May-89				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5
NUMBER OF TOWS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1
Mysidacea (mysids)																									
Archeomysis grebnitskii	8					2										8									
Holmesimysis costata						1					7														
Neomysis mercedis	2	6	35	8000	2			77	925	43		11	116			4	120						4	8500	350
Neomysis rayi											3	1													
Caridia (shrimps)																									
Crangon alaskensis elongata	14					1										3					15				
Crangon franciscorum				39	39				53			2					1					1	12	2	
*Crangon nigricauda**	38	40	2	62		9	23	8	1		2	2	1			2					4			1	
*Heptacarpus brevirostris**	1					1																			
Heptacarpus carinatus+*																									
Heptacarpus palpator+*																									
Heptacarpus paludicola+*																									
*Heptacarpus pictus**	4	465	10	3		20	42	8			20	1													
*Hippolyte californiensis**																									
Brachyura (crabs)																									
Cancer antennarius+*																									
Cancer anthonyi											1														
Cancer gracilis																									
Cancer jordani		3																							
Cancer magister (megalopae)																									
Cancer magister		1																			2	10			
Cancer productus	1										1														
Cancer spp. megalopae (not C. magister)																									
Carcinus maenas																									
Hemigrapsis oregonensis	1	32	3	5	7	1	8	1	3		1	13		1		3	11				9	3	10	9	2
*Pugettia producta**	2	19																							
*Pugettia richii**	1					1																			
Megalopae (not Cancer)+*																									
Anomura (hermit crabs)																									
Isocheles pilosus											1														
Pagurus spp.		12					5																		
Amphipoda (amphipods)																									
Achelia sp.+*																									
Allorchestes angusta+*																					1				
*Ampithoe lacertosa**	2	75	10	4			43	7				5	1			1	6				1				
*Anisogammarus confervicolus**									1	3						6	11				1		1	1	
Atylus tridens+*																									
*Caprella californica**																									
Corophium spinicorne, incl. juv.																									
Grandidierella japonica																									
Isopoda (isopods)																									
Cirolana hartfordi				1																					
Excirolana sp.+*																									
*Idotea fewkesi***	3															1					3				
*Idotea montereyensis***+*																									
*Idotea resecata***							1	1																	
Pycnogonida (sea spiders)																									
Pycnogonum stearnsi																					1				
Mollusca (molluscs)																									
Hermissenda crassicornis																									
*Lacuna sp.***		3000																							
Nudibranch sp. (?Fiona)																									

Appendix E1. Epibenthic and nektonic invertebrates collected in Estero Americano otter trawls, 1988-90 (numbers per tow).

DATE	8-Jun-89					6-Jul-89					19-Sep-89					28-Nov-89					7-Feb-90				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5
NUMBER OF TOWS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mysidacea (mysids)																									
Archeomysis grebnitskii																					2				
Holmesimysis costata																					3			1	
Neomysis mercedis				900	19			200	1700	700				800	8		3	16	1760	2825		13	214	14	1
Neomysis rayi																					5		3		
Caridia (shrimps)																									
Crangon alaskensis elongata	12					1					9					18					1				
Crangon franciscorum			10						4					1		3	1	80	14	5			9		
*Crangon nigricauda**	11					1					23	8	2		2	70	27	124	11		57	192	2		
*Heptacarpus brevirostris**											8	2				31	5				1				
Heptacarpus carinatus+*																									
Heptacarpus palpator+*																									
Heptacarpus paludicola+*																									
*Heptacarpus pictus**											8	15					16				1	217			
*Hippolyte californiensis**																	1								
Brachyura (crabs)																									
Cancer antennarius+																1b					1				
Cancer anthonyi																									
Cancer gracilis																	1,1b								
Cancer jordani	1					1					2														
Cancer magister (megalopae)																									
Cancer magister	7	3				5	6				4					4		2b	1,1b		1	1		1	
Cancer productus											3					1									
Cancer spp. megalopae (not C. magister)																									
Carcinus maenas		1b																							
Hemigrapsis oregonensis	1	1	62	7	10	6	31	107	229	101	11	78	274	188	27	3	10	5	11	5		7		9	
*Pugettia producta**	3					1					10	1													
*Pugettia richii**				1							2	1				1									
Megalopae (not Cancer)+																		1				1	1		
Anomura (hermit crabs)																									
Isocheles pilosus																									
Pagurus spp.											2											6			
Amphipoda (amphipods)																									
Achelia sp.+*																					1				
Allorchestes angusta+*																					1				
*Ampithoe lacertosa**							20					8					12					23			
*Anisogammarus confervicolus**			1				100		1		3								3			17	15	35	3
Atylus tridens+*																					4				
*Caprella californica**											2														
Corophium spinicorne, incl. juv.																						1	5	1	
Grandidierella japonica																							1		
Isopoda (isopods)																									
Cirolana hartfordi												2		1											
Excirolana sp.+																									
*Idotea fewkesi***											1					1	1				2	1			1
*Idotea montereyensis**+*																			1						
*Idotea resecata**											3	7		1			1								
Pycnogonida (sea spiders)																									
Pycnogonum stearnsi																									
Mollusca (molluscs)																									
Hermissenda crassicornis																									
*Lacuna sp.***																									
Nudibranch sp. (?Fiona)	1					11						1					8								

Appendix E1. Epibenthic and nektonic invertebrates collected in Estero Americano otter trawls, 1988-90 (numbers per tow).

DATE	9-Mar-90					5-Apr-90					24-May-90					25-Jun-90					26-Jul-90				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5	E-1	E-2	E-3	E-4	E-5
NUMBER OF TOWS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mysidacea (mysids)																									
Archeomysis grebnitskii																									
Holmesimysis costata																									
Neomysis mercedis		91	1550	32	1		183	170	144	1270		7	1	825	4				125			5	225	2	120
Neomysis rayi																									
Caridia (shrimps)																									
Crangon alaskensis elongata																1					4				
Crangon franciscorum			23											9			4		4			1		7	
*Crangon nigricauda**	24	95				31	31				18	1				9	1				12	2			
*Heptacarpus brevirostris**						5										1					2				
Heptacarpus carinatus+*																					1				
Heptacarpus palpator+*																									
Heptacarpus paludicola+*																									
*Heptacarpus pictus**	14	17	1			83	44			1	2	5					1				2	3	1		
*Hippolyte californiensis**																									
Brachyura (crabs)																									
Cancer antennarius+*											1b														
Cancer anthonyi																									
Cancer gracilis						1																2			
Cancer jordani						3					1										2				
Cancer magister (megalopae)																									
Cancer magister	3b	1b				2					1	2b				1	1,2b								
Cancer productus		2b				1	4				1					1,13	10b				3,1b	3b			
Cancer spp. megalopae (not C. magister)											1														
Carcinus maenas																									
Hemigrapsis oregonensis	1	9	1	14	2		43		1	3		16	26,20	23,2b	55		4	38	58	7	3	40	202,5	94	33
*Pugettia producta**	1					7					3					27	1			1	5	2			
*Pugettia richii**						1					1					3								1	
Megalopae (not Cancer)+*																									
Anomura (hermit crabs)																									
Isocheles pilosus																									
Pagurus spp.						2																			
Amphipoda (amphipods)																									
Achelia sp.+*																									
Allorchestes angusta+*																									
*Ampithoe lacertosa**		1					2					1				1							1		
*Anisogammarus confervicolus**	1	1	1	2	5		37			1		1													
Atylus tridens+*						1	3																		
*Caprella californica**																									
Corophium spinicorne, incl. juv.				5	8					1		1	2		1				>200						
Grandidierella japonica		1					2																		
Isopoda (isopods)																									
Cirolana hartfordi																									
Excirolana sp.+*													1		1										
*Idotea fewkesi***						1					1					1									1
*Idotea montereyensis***+*																									
*Idotea resecata***																					1				1
Pycnogonida (sea spiders)																									
Pycnogonum stearnsi																									
Mollusca (molluscs)																									
Hermissenda crassicornis																8					1				
*Lacuna sp.***																									
Nudibranch sp. (?Fiona)																1									

Appendix E1. Epibenthic and nektonic invertebrates collected in Estero Americano otter trawls, 1988-90 (numbers per tow).

DATE	18-Sep-90				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5
NUMBER OF TOWS	1	1	1	1	1
Mysidacea (mysids)					
Archeomysis grebnitskii					
Holmesimysis costata					
Neomysis mercedis	1		60	500	85
Neomysis rayi					
Caridia (shrimps)					
Crangon alaskensis elongata	1				
Crangon franciscorum				1	4
*Crangon nigricauda**	28	9	18	4	7
*Heptacarpus brevirostris**	13				
*Heptacarpus carinatus**+	6				
*Heptacarpus palpator**+	2				
*Heptacarpus paludicola**+		2			
*Heptacarpus pictus**	5	54			1
*Hippolyte californiensis**					
Brachyura (crabs)					
Cancer antennarius+	1				
Cancer anthonyi					
Cancer gracilis		4,1b			
Cancer jordani	4	2			
Cancer magister (megalopae)					
Cancer magister		1			
Cancer productus	1	5,13b			
Cancer spp. megalopae (not C. magister)					
Carcinus maenas					
Hemigrapsis oregonensis		117,6	17,25	37	30
*Pugettia producta**	27,2b				
*Pugettia richii**	2				
Megalopae (not Cancer)+					
Anomura (hermit crabs)					
Isocheles pilosus					
Pagurus spp.					
Amphipoda (amphipods)					
*Achelia sp.**+					
*Allorchestes angusta**+					
*Ampithoe lacertosa**	6	50		4	
*Anisogammarus confervicolus**	1				
*Atylus tridens**+					
*Caprella californica**	4	1			1
Corophium spinicorne, incl. juv.		1	3		
Grandidierella japonica					
Isopoda (isopods)					
Cirolana hartfordi					
Excirolana sp.+			3	1	
*Idotea fewkesi***					
*Idotea montereyensis***+					
*Idotea resecata***	1				
Pyonogonida (sea spiders)					
Pycnogonum stearnsi					
Mollusca (molluscs)					
Hermissenda crassicornis					
*Lacuna sp.***					
Nudibranch sp. (?Fiona)		5			

*often associated with macrophytes
**primarily associated with macrophytes
a abundances estimated from drop nets
b abundances estimated from gill nets

Appendix E2. Summary of epibenthic and nektonic invertebrates collected in Estero Americano otter trawls, 1988-90.

DATE	Number of Dates Collected				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5
NUMBER OF DATES SAMPLED	21	21	19	21	18
Mysidacea (mysids)					
Archaeomysis grebnitskii	6				
Holmesimysis costata	3			1	
Neomysis mercedis	5	11	16	17	14
Neomysis rayi	2	1	1		
Caridia (shrimps)					
Crangon alaskensis elongata	16	1			
Crangon franciscorum	2	10	7	12	3
*Crangon nigricauda**	20	16	9	7	3
*Heptacarpus brevirostris**	11	2			
Heptacarpus carinatus+*	2				
Heptacarpus palpator+*	1				
Heptacarpus paludicola+*		1			
*Heptacarpus pictus**	10	14	5	1	2
*Hippolyte californiensis**		3			
Brachyura (crabs)					
Cancer antennarius+*	4				
Cancer anthonyi	1				
Cancer gracilis	2	4		1	1
Cancer jordani	9	4			
Cancer magister (megalopae)	1				
Cancer magister	14	11	2	3	1
Cancer productus	9	7			
Cancer spp. megalopae (not C. magister)	1				
Carcinus maenas		1			
Hemigrapsis oregonensis	15	21	16	19	15
*Pugettia producta**	10	5		1	1
*Pugettia richii**	6	1		2	
Megalopae (not Cancer)+*		1	2		
Anomura (hermit crabs)					
Isocheles pilosus	2				
Pagurus spp.	4	3			
Amphipoda (amphipods)					
Achelia sp.+*	1				
Allorchestes angusta+*	1				
*Ampithoe lacertosa**	6	16	7	3	
*Anisogammarus confervicolus**	5	7	4	7	4
Atylus tridens+*	2	1			
*Caprella californica**	2	1			1
Corophium spinicorne, incl. juv.		3	3	3	3
Grandidierella japonica		2	1		
Isopoda (isopods)					
Cirolana hartfordi		1		2	
Excirolana sp.+*			2	1	1
*Idotea fewkesi***	10	3		1	2
*Idotea montereyensis***+*				1	
*Idotea resecata***	3	3	1	1	1
Pycnogonida (sea spiders)					
Pycnogonum stearnsi	1				
Mollusca (molluscs)					
Hermissenda crassicornis	2				
*Lacuna sp.***		1			
Nudibranch sp. (?Fiona)	3	3			
NUMBER OF SPECIES	35	30	14	18	14

Appendix E3. Epibenthic and nektonic invertebrates collected in Estero De San Antonio otter trawls, 1989-90 (numbers per tow).

DATE	6-Jul-89			18-Sep-89			8-Feb-90			10-Mar-90			4-Apr-90			25-May-90			26-Jun-90			27-Jul-90			19-Sep-90		
STATION NUMBER	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6
NUMBER OF TOWS	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mysidacea (mysids)																											
Neomysis mercedis	6						2			>100		1	5	235		3500	340	6	110	26	6	100	60	6	2	200	4
Caridia (shrimps)																											
Crangon franciscorum	2																										
*Heptacarpus pictus**							11									1											
Brachyura (crabs)																											
Cancer jordani				1																							
Cancer magister																1,5b			2b								
Hemigrapsis oregonensis							1												1						1		
Amphipoda (amphipods)																											
*Anisogammarus confervicolus**	4		4					235	9	8		9	5	5		6		2		5	5	5			325	10	
Corophium spinicorne, incl. juv.	1		44							2			37			6	>1000		>200	2		>1000	220		>1000	1500	
Isopoda (isopods)																											
Gnorosphaeroma sp.									1			2								1							
Insecta																											
Coribidae																											
Cenocorixa blaisdelli																								175			5
Corisella inscripta																					1					1	1
Coleoptera																											
Tropistemus sp. larva																					1						
Diptera																											
Chironomid larvae																										1	
Chironomid pupae																								1			

Appendix E4. Summary of epibenthic and nektonic invertebrates collected in Estero De San Antonio otter trawls, 1989-90.

DATE	Number of Dates Collected		
STATION NUMBER	S-2	S-4	S-6
NUMBER OF DATES SAMPLED	9	7	9
Mysidacea (mysids)			
Neomysis mercedis	8	5	5
Caridia (shrimps)			
Crangon franciscorum	1		
*Heptacarpus pictus**	2		
Brachyura (crabs)			
Cancer jordani	1		
Cancer magister	2		
Hemigrapsis oregonensis	3		
Amphipoda (amphipods)			
*Anisogammarus confervicolus**	6	4	5
Corophium spinicorne, incl. juv.	7	4	1
Isopoda (isopods)			
Gnorimosphaeroma sp.		1	2
Insecta			
Corixidae			
Cenocorixa blaisdelli			2
Corisella inscripta		1	2
Coleoptera			
Tropisternus sp. larva			1
Diptera			
Chironomid larvae		1	
Chironomid pupae			1
NUMBER OF SPECIES	8	6	8

BENTHIC INVERTEBRATE APPENDIX

Appendix B1. Benthic invertebrates collected in Estero Americano
PONAR grabs, 1988-90. (numbers per grab; to obtain no./ m^2,multiply by 43.3)

DATE	13-Apr-88						21-Jul-88					26-Oct-88				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5	E-6	E-2	E-3	E-4	E-5	E-6	E-2	E-3	E-4	E-5	E-6
			ns		ns					ns					ns	ns
Cnidaria																
unidentified Anthozoa							1									
unidentified Pennatulacea*																
Platyhelminthes																
unidentified Turbellaria																
Nematoda																
unidentified Nematoda				2												
Nemertea																
unidentified Nemertea	7	1											1			
Annelida																
Oligochaeta		2		36					112		6					
unidentified Oligochaeta						2115		2				1	2	14		
Polychaeta																
Ameana occidentalis							1									
Armandia brevis		13					2					2	1			
Axiothella rubrocincta												1				
Capitella capitata complex		6											5			
Capitellidae A		10						2				2	53			
Capitellidae B																
Capitellidae, unidentified																
Chaetozone setosa							2									
Chone ecaudata							11					3				
Chone mollis*																
Cirriformia spirabrancha*																
Cistenides californiensis												2				
Dorvillea rudolphi																
Eteone nr. californica		2											3			
Euchone limnicola*																
Eumida spp.																
Glycinde polygnatha		4										6				
Gyptis brevipalpa*																
Hemipodus borealis																
Hesionura spp.	89															
Heteromastus filobranchus*																
Heteromastus sp.*																
Leitoscoloplos elongatus		2														
Lumbrineris spp.																
Mediomastus californiensis		26					5	2				3				
Microphthalmus nr. sczelkowii*																
Neanthes limnicola				1												
Nephtys caecoides		9					4									
Nephtys comuta franciscana																
Nephtys spp. juv																
Nereis sp.							1									
Nereidae								1								
Notomastus tenius																
Owenia collaris																
Pectinaria californiensis*																
Phyllodoce hartmanae		6														
Platynereis bicanaliculata		2										4				
Polydora bracycephala		2														
Polydora ligni																
Polydora socialis		1					1									
Polydora spp.		1														
Pseudopolydora kempi		7					4	129	1			6	317			
Pseudopolydora paucibranchiata		4					72					12	1			
Pygospio elegans													60			
Scoloplos sp.*																
Spiophanes missionensis																
Streblospio benedicti		212		84			189	162	1260		2	191	83	487		

Appendix B1. Benthic invertebrates collected in Estero Americano
PONAR grabs, 1988-90. (numbers per grab; to obtain no./ m^2, multiply by 43.3)

DATE	13-Apr-88						21-Jul-88					26-Oct-88				
STATION NUMBER	E-1	E-2	E-3	E-4	E-5	E-6	E-2	E-3	E-4	E-5	E-6	E-2	E-3	E-4	E-5	E-6
Arthropoda																
Crustacea																
Allorchestes angusta																
Ampelisca abdita		4					4	1				615	7	142		
Ampithoe valida																
Ampithoe lacertosa*																
Ampithoe spp.							1					1				
Anisogammarus confervicolus																
Anisogammarus spp.																
Aoroides columbiae*																
Atylus tridens							3									
Caprella californica																
Corophium spinicorne, incl. juv.		368		281		1	7	196	2			35	426	1		
Cumella vulgaris		14					2					13	31			
Grandidierella japonica		1					11					45	8			
Exosphaeroma sp.*																
Harpacticoid copepoda									2		1					
Hemigrapsis oregonensis							1						1			
Hemigrapsis oregonensis megalopae												1				
Hemigrapsis sp. juvenile		1														
Heptacarpus paludicola*																
Idotea resecata																
Leptochelia dubia*																
Mysidacea																
Neballa pugettensis*																
Neomysis mercedis		1														
Neomysis spp.																
Ostracoda (?Cylindroleberis spp.)								1	3					4		
Pagurus sp.*																
unidentified Amphipoda juveniles		1														
unidentified Isopoda*																
unidentified brachyuran megalopae*																
Insecta																
Chironomus sp. larvae						51										
Mollusca																
Axinopsida serricata*																
Clinocardium nuttalii							5					1				
Composomyax subdiaphana?*																
Cryptomya californica		1										2				
Lacuna marmorata*																
Lyonsia californica												1				
Macoma balthica																
Macoma nasuta		2														
Macoma yoldiformis*																
Macoma spp. juv.							2					18	1			
Mactra spp.																
Musculista senhousia		1											2			
Mya arenaria*																
Mysella tumida																
Mytilus edulis*																
Mytilus spp. juveniles													1			
Odostomia sp.*																
Protothaca staminea												3				
Sphenia fragilis							3					1				
Tellina modesta												1				
Tapes japonica												1				
unidentified Bivalvia		3					2					1				
unidentified Gastropoda							1									
unidentified Tellinidae													1			
Phoronida																
Phoronis spp.							20					20				
Phoronopsis sp.*																
Echinodermata																
unidentified Holothuroidea																

Appendix B1. Benthic invertebrates collected in Estero Americano
PONAR grabs, 1988-90. (numbers per grab; to obtain no./ m^2, multiply by 43.3)

DATE	20-Jan-89					4-May-89						18-Sep-89						
STATION NUMBER	E-2	E-3	E-4	E-5	E-6	E-2	E-2A	E-3	E-3A	E-4	E-5	E-2	E-2A	E-3	E-3A	E-4	E-5	E-6
Cnidaria																		
unidentified Anthozoa																		
unidentified Pennatulacea*																		
Platyhelminthes																		
unidentified Turbellaria												2	1					
Nematoda																		
unidentified Nematoda			2									3			11			
Nemertea																		
unidentified Nemertea																		
Annelida																		
Oligochaeta																		
unidentified Oligochaeta	1	13	24	149		3	2	91	10	68	245			8	375	4		4
Polychaeta																		
Ameana occidentalis	1																	
Armandia brevis	9	2				1						1	8	1				
Axiothella rubrocincta	5	1																
Capitella capitata complex	1					1							63	4	229			
Capitellidae A		167													20			
Capitellidae B	2						4	19	3									
Capitellidae, unidentified							1											
Chaetozone setosa	1											1						
Chone ecaudata	7																	
Chone mollis*																		
Cirriformia spirabrancha*																		
Cistenides californiensis	10																	
Dorvillea rudolphi												1						
Eteone nr. californica		6											1		2			
Euchone limnicola*																		
Eumida spp.	1																	
Glycinde polygnatha	5											7						
Gyptis brevipalpa*																		
Hemipodus borealis							1											
Hesionura spp.																		
Heteromastus filobranchus*																		
Heteromastus sp.*																		
Leitoscoloplos elongatus	1																	
Lumbrineris spp.	1																	
Mediomastus californiensis	6					9	1					5	2					
Microphthalmus nr. sczelkowii*														1				
Neanthes limnicola																		
Nephtys caecoides												1						
Nephtys comuta franciscana	1											1						
Nephtys spp. juv																		
Nereis sp.																		
Nereidae																		
Notomastus tenius	1																	
Owenia collaris	1																	
Pectinaria californiensis*																		
Phyllodoce hartmanae	2																	
Platynereis bicanaliculata	11											1		1				
Polydora bracycephala						1									3			
Polydora ligni																		
Polydora socialis																	1	
Polydora spp.													10		11			
Pseudopolydora kempi	2	184																
Pseudopolydora paucibranchiata	2	2												1				
Pygospio elegans		103																
Scoloplos sp.*																		
Spiophanes missionensis	1																	
Streblospio benedicti	326	174	634	998		4	105			37		10	372	42	147	118	3	

Appendix B1. Benthic invertebrates collected in Estero Americano
PONAR grabs, 1988-90. (numbers per grab; to obtain no./ m^2,multiply by 43.3)

DATE	20-Jan-89					4-May-89						18-Sep-89						
STATION NUMBER	E-2	E-3	E-4	E-5	E-6	E-2	E-2A	E-3	E-3A	E-4	E-5	E-2	E-2A	E-3	E-3A	E-4	E-5	E-6
Arthropoda																		
Crustacea																		
Allorchestes angusta														2				
Ampelisca abdita	1801	2	16			37	7	1				5			1			
Ampithoe valida													2	3				
Ampithoe lacertosa*																		
Ampithoe spp.							2					2	3	4				
Anisogammarus confervicolus							2	2	1				5	8		1		
Anisogammarus spp.						4	4	15	1				2	9				
Aoroides columbiae*																		
Atylus tridens																		
Caprella californica												4						
Corophium spinicorne, incl. juv.	20	131	70	31		386	203	2416	83	142	54	14	21	118	188	14	21	
Cumella vulgaris	41	118				7	1							14	13			
Grandidierella japonica	52					7	7		1			9	16	9	8			
Exosphaeroma sp.*																		
Harpacticoid copepoda															1			
Hemigrapsis oregonensis			2			1			5									
Hemigrapsis oregonensis megalopae														1				
Hemigrapsis sp. juvenile																		
Heptacarpus paludicola*																		
Idotea resecata												2	1					
Leptochelia dubia*																		
Mysidacea										1								
Neballa pugettensis*																		
Neomysis mercedis																		
Neomysis spp.											2							
Ostracoda (?Cylindroleberis spp.)								299			1				197			
Pagurus sp.*																		
unidentified Amphipoda juveniles																		
unidentified Isopoda*																		
unidentified brachyuran megalopae*																		
Insecta											TBI							
Chironomus sp. larvae																		
Mollusca																		
Axinopsida serricata*																		
Clinocardium nuttalli																		
Composomyax subdiaphana?*																		
Cryptomya californica	3																	
Lacuna marmorata*																		
Lyonsia californica	2																	
Macoma balthica	3						1											
Macoma nasuta	5					3												
Macoma yoldiformis*																		
Macoma spp. juv.	4											41	5		1			
Mactra spp.	1																	
Musculista senhousia	1	1																
Mya arenaria*																		
Mysella tumida												1						
Mytilus edulis*																		
Mytilus spp. juveniles	1					2						2						
Odostomia sp.*																		
Prototheca staminea	6											3						
Sphenia fragilis																		
Tellina modesta	8					1						6						
Tapes japonica	1					1												
unidentified Bivalvia	1																	
unidentified Gastropoda																		
unidentified Tellinidae	1																	
Phoronida																		
Phoronis spp.	1					1												
Phoronopsis sp.*																		
Echinodermata																		
unidentified Holothuroidea	1																	

Appendix B1. Benthic invertebrates collected in Estero Americano
PONAR grabs, 1988-90. (numbers per grab; to obtain no./ m^2,multiply by 43.3)

DATE	8-Feb-90						25-May-90						19-Sep-90							
STATION NUMBER	E-2	E-2A	E-3	E-3A	E-4	E-5	E-2	E-2A	E-3	E-3A	E-4	E-5	E-1	E-2	E-2A	E-2B	E-3	E-3A	E-4	E-5
Cnidaria																				
unidentified Anthozoa							8													
unidentified Pennatulacea*																1				
Platyhelminthes																				
unidentified Turbellaria																				
Nematoda																				
unidentified Nematoda						5					1			4						
Nemertea																				
unidentified Nemertea	2	1					1	1		1				2		1				
Annelida																				
Oligochaeta																				
unidentified Oligochaeta		1	40	25	54	478		2	2	34	84	188			1		9	2	10	33
Polychaeta																				
Ameana occidentalis																				
Armandia brevis	1	2					1							16		9				
Axiothella rubrocincta	20	5					5	3						8						
Capitella capitata complex																1				
Capitellidae A									2											
Capitellidae B								12							2					
Capitellidae, unidentified																				
Chaetozone setosa	5						8													
Chone ecaudata							9													
Chone mollis*														52						
Cirriformia spirabrancha*								1												
Cistenides californiensis	1																			
Dorvillea rudolphi	4							1						2						
Eteone nr. californica					1		3			1					4	1				
Euchone limnicola*														6						
Eumida spp.																				
Glycinde polygnatha	1	5					2	3						4		1				
Gyptis brevipalpa*	1																			
Hemipodus borealis																				
Hesionura spp.																				
Heteromastus filobranchus*														2						
Heteromastus sp.*			1														1			
Leitoscoloplos elongatus							7													
Lumbrineris spp.																				
Mediomastus californiensis	105	9		1			263	28	4	1			1	46		5		15		
Microphthalmus nr. sczelkowii*							1													
Neanthes limnicola																				
Nephtys caecoides													3	1	3	6				
Nephtys cornuta franciscana	3						3													
Nephtys spp. juv	1																			
Nereis sp.	1										1	1		2						
Nereidae					1	1														
Notomastus tenius																				
Owenia collaris	2						3							2						
Pectinaria californiensis*														1						
Phyllodoce hartmanae														2						
Platynereis bicanaliculata																3				
Polydora bracycephala																				
Polydora ligni																				
Polydora socialis														2						
Polydora spp.																				
Pseudopolydora kempi				4			2	2	20	23	1				20	19	10	1	2	
Pseudopolydora paucibranchiata							22	1						6	1	1				
Pygospio elegans			2	15				47		2						2				
Scoloplos sp.*	2																			
Spiophanes missionensis								1								1				
Streblospio benedicti	10	51	26	123	927	995	57	9	43	81	251	75	1	34	134	121	56	47	454	602

Appendix B1. Benthic invertebrates collected in Estero Americano
PONAR grabs, 1988-90. (numbers per grab; to obtain no./ m^2, multiply by 43.3)

DATE	8-Feb-90						25-May-90						19-Sep-90							
STATION NUMBER	E-2	E-2A	E-3	E-3A	E-4	E-5	E-2	E-2A	E-3	E-3A	E-4	E-5	E-1	E-2	E-2A	E-2B	E-3	E-3A	E-4	E-5
Arthropoda																				
Crustacea																				
Ailorchestes angusta			1	1												74				
Ampelisca abdita	3	1					28	18	14	9				1092			2	1		
Ampithoe valida										1										
Ampithoe lacertosa*																153				
Ampithoe spp.																				
Anisogammarus confervicolus						2			1											
Anisogammarus spp.			4		1				4			1								
Aoroides columbiae*		1																		
Atylus tridens																				
Caprella californica																				
Corophium spinicorne, incl. juv.		125	539	230	28	44	21	435	51	268	20	92	1	648	333	1	39	10	1	
Cumella vulgaris	1	69	47	36			67	15	1	38				4	3	1	1			
Grandidierella japonica	1	3	39	10			3	18	55	28				26	14	37		2		
Exosphaeroma sp.*				1																
Harpacticoid copepoda											1	2								
Hemigrapsis oregonensis		1													2	42		7		
Hemigrapsis oregonensis megalopae														2						
Hemigrapsis sp. juvenile									1							1				
Heptacarpus paludicola*																				
Idotea resecata																				
Leptochelia dubia*							1													
Mysidacea																				
Nebalia pugettensis*														2		122				
Neomysis mercedis																				
Neomysis spp.											2	1								
Ostracoda (?Cylindroleberis spp.)		2		5	1		5			31	9					1		1	4	1
Pagurus sp.*																2				
unidentified Amphipoda juveniles																				
unidentified Isopoda*										1										
unidentified brachyuran megalopae*																1				
Insecta																				
Chironomus sp. larvae																				
Mollusca																				
Axinopsida serricata*														2						
Clinocardium nuttalii	1																			
Composomyax subdiaphana?*	1																			
Cryptomya californica														2						
Lacuna marmorata*																8				
Lyonsia californica		1												2						
Macoma balthica														2						
Macoma nasuta	2							1						2		9		1		
Macoma yoldiformis*														2						
Macoma spp. juv.	47	5		3			15						2		1	2				
Mactra spp.																				
Musculista senhousia	1						1													
Mya arenaria*															1					
Mysella tumida	2						1							6						
Mytilus edulis*									1											
Mytilus spp. juveniles		2					7						1	6						
Odostomia sp.*	2	1																		
Protothaca staminea	14	2					9	1						10		4				
Sphenia fragilis																				
Tellina modesta	2						5													
Tapes japonica	1																			
unidentified Bivalvia																				
unidentified Gastropoda																				
unidentified Tellinidae	2						4													
Phoronida																				
Phoronis spp.	2													10						
Phoronopsis sp.*													17	4		5				
Echinodermata																				
unidentified Holothuroidea																				

Appendix B2. Benthic invertebrates collected in Estero de San Antonio PONAR grabs, 1990. (numbers per grab; to obtain no./ m^2,multiply by 43.3)

DATE	8-Feb-90			25-May-90			19-Sep-90		
STATION NUMBER	S-2	S-4	S-6	S-2	S-4	S-6	S-2	S-4	S-6
Nematoda	1	2	2		2		7	5	
Nemertea							7		
Annelida									
Oligochaeta	2	189	11	161	165	1	394	883	
Polychaeta									
Capitella capitata complex	8	11		173	8	1			
Cirriformia spirabrancha	2								
Dorvillea rudolphi		1							
Glycinde polygnatha	1								
Polydora ligni				5				124	
Pseudopolydora paucibranchiata					1				
Streblospio benedicti	31	143	3	104	136		284	141	
Eumida sp.	1								
Mysidacea (mysids)									
Neomysis mercedis, incl. juv.				3					
Amphipoda (amphipods)									
Anisogammarus confervicolus, incl. juv.				60	27		44	55	
Corophium spinicorne, incl. juv.				328	158	2	447	906	14
Grandidierella japonica						1			
Isopoda (isopods)									
Gnormosphaeroma ?luteum, incl. juv.							42	56	3
Harpacticoida								5	
Ostracoda	1	17	46		8		45	7	31
Insecta									
Diptera									
Aedes sp. larvae			1						
Chironomid larvae							1	2	
Mollusca									
Mya arenaria	1			1			20		
Margarites sp.	1								

FISH APPENDIX

Appendix F1. Otter Trawl Sampling Effort (Minutes) Estero Americano, November 1989 - September 1990.

DATE	Station				
	E-1	E-2	E-3	E-4	E-5
28 Nov 89	4	4	4	4	4
7 Feb 90	2	4	4	4	2
9 Mar 90	4	4	4	4	2
5 Apr 90	4	4	4	4	3
24 May 90	4	4	2.7	4	2
25 Jun 90	4	4	4	4	2
26 Jul 90	4	4	4	4	2
18 Sep 90	4	4	4	4	2

Appendix F2. Gillnet Sampling Effort (24-hour Sets) Estero Americano, November 1989 - September 1990.

Station				
E-1	E-2	E-3	E-4	E-5
29 Nov 89	29 Nov 89	29 Nov 89	29 Nov 89	29 Nov 89
8 Feb 90	8 Feb 90	8 Feb 90	8 Feb 90	8 Feb 90
10 Mar 90	10 Mar 90	10 Mar 90	10 Mar 90	10 Mar 90
6 Apr 90	6 Apr 90	6 Apr 90	6 Apr 90	6 Apr 90
25 May 90	25 May 90	25 May 90	25 May 90	25 May 90
26 Jun 90	26 Jun 90	26 Jun 90	26 Jun 90	26 Jun 90
27 Jul 90	27 Jul 90	27 Jul 90	27 Jul 90	27 Jul 90
19 Sep 90	19 Sep 90	19 Sep 90	19 Sep 90	19 Sep 90

Appendix F3. Total Catch in Otter Trawls at Estero Americano Stations, November 1989 - September 1990.

Species	Station					Total	% of Total
	E-1	E-2	E-3	E-4	E-5		
Plainfin midshipman			2	3133	594	3729	67.57
Staghorn sculpin	27	31	98	233	337	726	13.15
Arrow goby		8	35	324	133	500	9.06
Shiner surfperch		9	55	22	44	130	2.36
Topsmelt				5	89	94	1.70
Northern anchovy		1	7	38	25	71	1.29
Threespine stickleback			9	1	50	60	1.09
English sole	24	16	2	4	3	49	0.89
unk. smelt		25		3	1	29	0.53
Surfsmelt			21	4		25	0.45
Bay pipefish	6	5	1	2	4	18	0.33
Osmeridae			4	10		14	0.25
Goby larvae		4	2	3	3	12	0.22
Cabezon	8	1				9	0.16
Pacific herring			9			9	0.16
Pacific sanddab	5				2	7	0.13
Penpoint gunnel	5	1				6	0.11
Speckled sanddab	5	1				6	0.11
Starry flounder	1	1	2	1		5	0.09
Tidewater goby				1	3	4	0.07
Crevice kelpfish	2		1			3	0.05
Kelp greenling	2					2	0.04
larval flatfish		2				2	0.04
unk. Cottid	2					2	0.04
unk. sculpin	2					2	0.04
Barred surfperch	1					1	0.02
Cheekspot goby			1			1	0.02
Lingcod	1					1	0.02
Prickly sculpin				1		1	0.02
unk. juv. rockfish					1	1	0.02
Total	91	105	249	3785	1289	5519	100.00

Appendix F4. Otter Trawl Catch (all Species) at Estero Americano Stations, November 1989 - September 1990.

Date	Station					
	E-1	E-2	E-3	E-4	E-5	Total
28 Nov 89	7	7	3	5	9	31
7 Feb 90	10	14	62	23	6	115
9 Mar 90	4	5	51	46	10	116
5 Apr 90	10	14	16	83	92	215
24 May 90	15	21	25	143	313	517
25 Jun 90	33	9	31	257	33	363
26 Jul 90	2	7	34	902	221	1166
18 Sep 90	10	28	27	2326	605	2996
Total	91	105	249	3785	1289	5519

Appendix F5. Total Catch in Gillnets at Estero Americano Stations, November 1989 - September 1990.

Species	Station					Total	% of Total
	E-1	E-2	E-3	E-4	E-5		
Topsmelt	89	7	35	86	98	315	54.03
Jacksmelt	37	49	3			89	15.27
Shiner surfperch	8	9	3	5	36	61	10.46
Staghorn sculpin	4	19	3	1	15	42	7.20
Pacific herring	14	6		5	8	33	5.66
Surfsmelt	2	8	1	1		12	2.06
Leopard shark		9				9	1.54
Bay pipefish			3	2		5	0.86
Opaleye	2	1				3	0.51
Spiny dogfish	2					2	0.34
Steelhead		2				2	0.34
Striped bass		1		1		2	0.34
Buffalo sculpin	1					1	0.17
English sole			1			1	0.17
Kelp surfperch	1					1	0.17
Pacific sanddab	1					1	0.17
Pile surfperch	1					1	0.17
Starry flounder			1			1	0.17
White surfperch	1					1	0.17
Black surfperch	1					1	0.17
Total	164	111	50	101	157	583	100.00

Appendix F6. Gillnet Catch (All Species) at Estero Americano Stations, November 1989 - September 1990.

	Station					
	E-1	E-2	E-3	E-4	E-5	Total
29 Nov 89	10	9		5	12	36
8 Feb 90	1	2				3
10 Mar 90	11	19	2	3		35
6 Apr 90	20	49	14	3	7	93
25 May 90	89		28	34	97	248
26 Jun 90	27	16		49	40	132
27 Jul 90	2	2	3	6		13
19 Sep 90	4	14	3	1	1	23
Total	164	111	50	101	157	583

Appendix F7. Summary of Fish Catch Data in Estero Americano Otter Trawls, November 1989 - September 1990

Station	Date	Tow Length	Name	Total Catch	CPE	Fork Length (mm)		Weight (g)	
						mean	SD	mean	SD
E-1	27 Nov 89	4	Speckled sanddab	5	1.3	84.8	16.3	7.4	4.0
E-1	27 Nov 89	4	unk. Cottid	2	0.5	58.0	4.2	2.9	0.6
E-1	6 Feb 90	2	Cabezon	1	0.5	48.0		2.0	
E-1	6 Feb 90	2	English sole	9	4.5	53.4	15.8	54.0	1.0
E-1	8 Mar 90	4	Cabezon	1	0.3	44.0		1.3	
E-1	8 Mar 90	4	English sole	3	0.8	25.0	3.6	0.1	0.0
E-1	4 Apr 90	4	Bay pipefish	3	0.8	156.0	41.4	1.1	0.7
E-1	4 Apr 90	4	Cabezon	3	0.8	53.0	2.6	2.1	0.4
E-1	4 Apr 90	4	English sole	3	0.8	22.0	1.0	0.2	0.0
E-1	4 Apr 90	4	Penpoint gunnel	1	0.3	47.0		0.4	
E-1	23 May 90	4	Cabezon	3	0.8	87.7	15.5	17.8	1.0
E-1	23 May 90	4	English sole	5	1.3	50.4	23.5	2.4	2.1
E-1	23 May 90	4	Pacific sanddab	3	0.8	65.0	9.2	2.7	1.1
E-1	23 May 90	4	Penpoint gunnel	1	0.3	81.0		2.2	
E-1	23 May 90	4	Staghorn sculpin	3	0.8	90.3	4.9	7.8	1.4
E-1	23 May 90	4	Starry flounder	1	0.3	225.0		175.0	
E-1	24 Jun 90	4	English sole	3	0.8	84.0	5.6	5.9	1.4
E-1	24 Jun 90	4	Kelp greenling	2	0.5	72.0	18.4	4.3	4.0
E-1	24 Jun 90	4	Lingcod	1	0.3	111.0		7.5	
E-1	24 Jun 90	4	Penpoint gunnel	1	0.3	194.0		29.2	
E-1	24 Jun 90	4	Staghorn sculpin	1	0.3	101.0		2.1	
E-1	24 Jun 90	4	unk. sculpin	2	0.5	33.0	15.6		
E-1	25 Jul 90	4	Barred surfperch	1	0.3	69.0		5.1	
E-1	25 Jul 90	4	English sole	1	0.3	67.0		2.8	
E-1	17 Sep 90	4	Bay pipefish	3	0.8	231.3	55.6	4.4	2.4
E-1	17 Sep 90	4	Crevice kelpfish	2	0.5	48.5	27.6	1.4	1.6
E-1	17 Sep 90	4	Pacific sanddab	2	0.5	85.5	7.8	7.1	0.8
E-1	17 Sep 90	4	Penpoint gunnel	3	0.8	93.3	20.2	3.4	2.0
E-2	27 Nov 89	4	Arrow goby	5	1.3	27.8	2.5	0.1	0.0
E-2	27 Nov 89	4	larval flatfish	2	0.5	20.0	0.0	<0.1	0.0
E-2	6 Feb 90	4	Bay pipefish	3	0.8	275.0	5.0		
E-2	6 Feb 90	4	English sole	6	1.5	38.7	9.7	0.7	0.5
E-2	6 Feb 90	4	Speckled sanddab	1	0.3	73.0		3.9	
E-2	6 Feb 90	4	Staghorn sculpin	4	1.0	24.5	5.4	0.2	0.1
E-2	8 Mar 90	4	English sole	4	1.0	45.0		1.1	
E-2	8 Mar 90	4	Staghorn sculpin	1	0.3	50.0	12.3	1.0	0.8
E-2	4 Apr 90	4	Cabezon	1	0.3	42.0		1.5	
E-2	4 Apr 90	4	English sole	5	1.3	49.0	0.9	1.5	0.9
E-2	4 Apr 90	4	Staghorn sculpin	8	2.0	58.3	12.2	2.5	1.5

Appendix F7. Summary of Fish Catch Data in Estero Americano Otter Trawls, November 1989 - September 1990

Station	Date	Tow Length	Name	Total Catch	CPE	Fork Length (mm)		Weight (g)	
						mean	SD	mean	SD
E-2	23 May 90	4	Arrow goby	1	0.3	37.0		0.2	
E-2	23 May 90	4	Bay pipefish	1	0.3	150.0		1.3	
E-2	23 May 90	4	English sole	1	0.3	43.0		0.9	
E-2	23 May 90	4	Northern anchovy	1	0.3	56.0		1.0	
E-2	23 May 90	4	Staghorn sculpin	16	4.0	81.6	9.6	5.7	1.9
E-2	23 May 90	4	Starry flounder	1	0.3	280.0		350.0	
E-2	24 Jun 90	4	Shiner surfperch	8	2.0	96.6	8.5	19.8	7.1
E-2	24 Jun 90	4	Staghorn sculpin	1	0.3	100.0			
E-2	25 Jul 90	4	Bay pipefish	1	0.3	240.0			
E-2	25 Jul 90	4	Goby larvae	4	1.0				
E-2	25 Jul 90	4	Penpoint gunnel	1	0.3	82.0		2.2	
E-2	25 Jul 90	4	Staghorn sculpin	1	0.3	81.0			
E-2	17 Sep 90	4	Arrow goby	2	0.5	31.0	7.1	0.3	0.1
E-2	17 Sep 90	4	Shiner surfperch	1	0.3	68.0		6.6	
E-2	17 Sep 90	4	unk. Smelt	25	6.3	49.6	9.6	0.7	0.3
E-3	27 Nov 89	4	Arrow goby	1	0.3	31.0		0.3	
E-3	27 Nov 89	4	Surf Smelt	2	0.5	116.0	7.1	12.5	3.2
E-3	6 Feb 90	4	Arrow goby	11	2.8	30.3	8.0		
E-3	6 Feb 90	4	English sole	1	0.3	22.0			<.1
E-3	6 Feb 90	4	Staghorn sculpin	50	12.5	22.3	4.1	0.1	0.1
E-3	8 Mar 90	4	Arrow goby	2	0.5	27.5	2.1	0.2	0.1
E-3	8 Mar 90	4	Osmeridae	4	1.0				
E-3	8 Mar 90	4	Shiner surfperch	1	0.3	106.0		17.6	
E-3	8 Mar 90	4	Staghorn sculpin	27	6.8	31.5	7.8	0.4	0.3
E-3	8 Mar 90	4	Starry flounder	1	0.3	295.0		400.0	
E-3	8 Mar 90	4	Surfsmelt	16	4.0	46.3	3.0	0.5	0.1
E-3	4 Apr 90	4	English sole	1	0.3	56.0		2.0	
E-3	4 Apr 90	4	Goby larvae	2	0.5	22.0			
E-3	4 Apr 90	4	Pacific herring	5	1.3	36.7			
E-3	4 Apr 90	4	Staghorn sculpin	5	1.3	48.0	15.3	1.6	1.7
E-3	4 Apr 90	4	Surfsmelt	3	0.8	53.7	3.8		
E-3	24 May 90	2.67	Arrow goby	2	0.7	54.0	0.0		
E-3	24 May 90	2.67	Bay pipefish	1	0.4	210.0		3.8	
E-3	24 May 90	2.67	Cheekspot goby	1	0.4	35.0		0.3	
E-3	24 May 90	2.67	Staghorn sculpin	12	4.5	82.4	16.2	7.0	4.9
E-3	24 May 90	2.67	Threespine stickleback	9	3.4	36.2	10.6	0.6	0.5
E-3	24 Jun 90	4	Crevice kelpfish	1	0.3	35.0			
E-3	24 Jun 90	4	Northern anchovy	7	1.8	41.7	4.5		
E-3	24 Jun 90	4	Pacific herring	2	0.5	45.0			
E-3	24 Jun 90	4	Shiner surfperch	17	4.3	72.3	25.0		
E-3	24 Jun 90	4	Staghorn sculpin	4	1.0	89.0	10.2		

Appendix F7. Summary of Fish Catch Data in Estero Americano Otter Trawls, November 1989 - September 1990

Station	Date	Tow Length	Name	Total Catch	CPE	Fork Length (mm)		Weight (g)	
						mean	SD	mean	SD
E-3	25 Jul 90	4	Arrow goby	10	2.5	23.9	2.4	0.1	0.0
E-3	25 Jul 90	4	Pacific herring	1	0.3	50.0		1.0	
E-3	25 Jul 90	4	Plainfin midshipman	2	0.5	29.0	8.5	0.4	0.4
E-3	25 Jul 90	4	Shiner surfperch	21	5.3	67.4	10.1		
E-3	17 Sep 90	4	Arrow goby	9	2.3	30.4	4.6	0.2	0.0
E-3	17 Sep 90	4	Pacific herring	1	0.3	58.0		1.9	
E-3	17 Sep 90	4	Shiner surfperch	16	4.0	75.8	6.8	8.3	2.3
E-3	17 Sep 90	4	Starry flounder	1	0.3	365.0		650.0	
E-4	27 Nov 89	4	Arrow goby	2	0.5	24.5	2.1	0.1	0.0
E-4	27 Nov 89	4	unk. smelt	3	0.8	55.3	1.5	0.7	0.1
E-4	6 Feb 90	4	Prickly sculpin	1	0.3	145.0		53.4	
E-4	6 Feb 90	4	Staghorn sculpin	20	5.0	30.2	12.6	0.5	0.8
E-4	6 Feb 90	4	Tidewater goby	1	0.3	44.0		0.8	
E-4	6 Feb 90	4	Topsmelt	1	0.3	89.0		4.5	
E-4	8 Mar 90	4	Staghorn sculpin	42	10.5	42.0	10.3		
E-4	8 Mar 90	4	Surfsmelt	3	0.8	70.7	34.1	3.9	5.5
E-4	4 Apr 90	4	English sole	4	1.0	59.5	11.6	2.3	1.3
E-4	4 Apr 90	4	Goby larvae	3	0.8	25.0			
E-4	4 Apr 90	4	Osmeridae	10	2.5				
E-4	4 Apr 90	4	Shiner surfperch	5	1.3	111.2	19.8	29.6	18.6
E-4	4 Apr 90	4	Staghorn sculpin	61	15.3	64.8	8.9		
E-4	23 May 90	4	Northern anchovy	34	8.5	52.2	10.2	1.2	0.7
E-4	23 May 90	4	Shiner surfperch	15	3.8	84.5	36.5	18.0	15.7
E-4	23 May 90	4	Staghorn sculpin	94	23.5	81.5	8.7		
E-4	24 Jun 90	4	Arrow goby	187	46.8	26.3	5.4		
E-4	24 Jun 90	4	Plainfin midshipman	53	13.3	22.5	3.0		
E-4	24 Jun 90	4	Staghorn sculpin	14	3.5	97.0	8.5		
E-4	24 Jun 90	4	Threespine stickleback	1	0.3	49.0			
E-4	24 Jun 90	4	Topsmelt	2	0.5	43.0			
E-4	25 Jul 90	4	Arrow goby	135	33.8	25.1	4.6		
E-4	25 Jul 90	4	Bay pipefish	2	0.5	71.0	2.8	0.1	0.0
E-4	25 Jul 90	4	Plainfin midshipman	760	190.0	34.8	11.6		
E-4	25 Jul 90	4	Shiner surfperch	1	0.3	103.0		25.6	
E-4	25 Jul 90	4	Staghorn sculpin	2	0.5	112.0	5.7		
E-4	25 Jul 90	4	Topsmelt	2	0.5	46.0	0.0		
E-4	17 Sep 90	4	Northern anchovy	4	1.0	49.0	1.4		
E-4	17 Sep 90	4	Plainfin midshipman	2320	580.0	38.6	6.7		
E-4	17 Sep 90	4	Shiner surfperch	1	0.3	87.0		13.6	
E-4	17 Sep 90	4	Starry flounder	1	0.3	130.0		29.3	

Appendix F7. Summary of Fish Catch Data in Estero Americano Otter Trawls, November 1989 - September 1990

Station	Date	Tow Length	Name	Total Catch	CPE	Fork Length (mm)		Weight (g)	
						mean	SD	mean	SD
E-5	27 Nov 89	4	Arrow goby	3	0.8	22.3	0.0		
E-5	27 Nov 89	4	Goby larvae	3	0.8	33.7	1.2		
E-5	27 Nov 89	4	Plainfin midshipman	1	0.3	33.0		0.4	
E-5	27 Nov 89	4	unk. juv. rockfish	1	0.3	21.0		<0.1	
E-5	27 Nov 89	4	unk. smelt	1	0.3				
E-5	6 Feb 90	2	Staghorn sculpin	3	1.5	22.7	0.0		
E-5	6 Feb 90	2	Tidewater goby	3	1.5	49.3	0.1		
E-5	8 Mar 90	2	Staghorn sculpin	10	5.0	41.9	8.3	0.9	0.6
E-5	4 Apr 90	3	Northern anchovy	23	7.7	40.0			
E-5	4 Apr 90	3	Pacific sanddab	1	0.3	63.0		2.5	
E-5	4 Apr 90	3	Shiner surfperch	8	2.7	117.5	10.8	33.7	9.6
E-5	4 Apr 90	3	Staghorn sculpin	57	19.0	59.7	9.7		
E-5	4 Apr 90	3	Threespine stickleback	3	1.0	42.0	10.1	0.6	0.4
E-5	23 May 90	2	Bay pipefish	4	2.0	191.5	19.1	3.3	1.1
E-5	23 May 90	2	English sole	3	1.5	46.3	10.0	1.1	0.7
E-5	23 May 90	2	Northern anchovy	2	1.0	37.0			
E-5	23 May 90	2	Pacific sanddab	1	0.5	68.0		3.3	
E-5	23 May 90	2	Shiner surfperch	36	18.0	99.4	27.8	25.3	13.5
E-5	23 May 90	2	Staghorn sculpin	263	131.5	81.2	9.9	6.8	
E-5	23 May 90	2	Threespine stickleback	4	2.0	56.5	2.4	1.9	0.3
E-5	24 Jun 90	2	Arrow goby	3	1.5	19.7	4.0		
E-5	24 Jun 90	2	Threespine stickleback	29	14.5	33.9	7.5		
E-5	24 Jun 90	2	Topsmelt	1	0.5	32.0			
E-5	26 Jul 90	2	Arrow goby	84	42.0	21.6	5.0		
E-5	26 Jul 90	2	Plainfin midshipman	35	17.5	31.1	9.5		
E-5	26 Jul 90	2	Threespine stickleback	14	7.0	41.9	7.7	0.9	0.5
E-5	26 Jul 90	2	Topsmelt	88	44.0	57.6	11.1		
E-5	17 Sep 90	2	Arrow goby	43	21.5	21.3	4.0		
E-5	17 Sep 90	2	Plainfin midshipman	558	279.0	35.6	7.5	0.7	
E-5	17 Sep 90	2	Staghorn sculpin	4	2.0	126.0	12.0		

Appendix F8. Summary of Fish Catch Data in Estero Americano 24-hour Gillnet Sets, November 1989 - September 1990

Station	Date		Name	Total Catch	Fork Length (mm)		Weight (g)	
					mean	SD	mean	SD
E-1	28 Nov 89		Staghorn sculpin	1	155.0		42.3	
E-1	28 Nov 89		Topsmelt	9	123.7	31.5	27.6	18.1
E-1	7 Feb 90		Buffalo sculpin	1	290.0		530.0	
E-1	9 Mar 90		Jacksmelt	1	305.0		269.7	
E-1	9 Mar 90		Pacific herring	9	172.8	17.3	69.7	4.7
E-1	9 Mar 90		Surfsmelt	1	142.0		21.6	
E-1	5 Apr 90		Jacksmelt	17	194.5	54.0	93.2	8.3
E-1	5 Apr 90		Pacific herring	2	185.0		90.4	
E-1	5 Apr 90		Shiner surfperch	1	138.0			
E-1	24 May 90		Jacksmelt	3	201.0	5.0	78.9	8.2
E-1	24 May 90		Opaleye	1	305.0		774.7	
E-1	24 May 90		Shiner surfperch	5	149.8	42.1	149.8	18.6
E-1	24 May 90		Staghorn sculpin	2	128.5	29.0	26.8	18.2
E-1	24 May 90		Surfsmelt	1	155.0		24.5	
E-1	24 May 90		Topsmelt	76	192.9	23.5	64.2	19.8
E-1	24 May 90		White surfperch	1	112.0		20.0	
E-1	25 Jun 90		Jacksmelt	15	225.8	23.6	88.8	40.4
E-1	25 Jun 90		Opaleye	1	310.0			
E-1	25 Jun 90		Pacific herring	3	176.0	13.9	68.0	21.1
E-1	25 Jun 90		Pile surfperch	1	128.0			
E-1	25 Jun 90		Shiner surfperch	1	109.0		24.4	
E-1	25 Jun 90		Spiny dogfish	2	670.0	0.0	975.0	35.4
E-1	25 Jun 90		Staghorn sculpin	24	106.3			
E-1	25 Jun 90		Topsmelt	4	198.0	7.8		
E-1	26 Jul 90		Black surfperch	1	293.0		652.0	
E-1	26 Jul 90		Kelp surfperch	1	71.0		6.0	
E-1	18 Sep 90		Jacksmelt	1	292.0		216.2	
E-1	18 Sep 90		Pacific sanddab	1	79.0		6.8	
E-1	18 Sep 90		Shiner surfperch	1	109.0			
E-1	18 Sep 90		Staghorn sculpin	1	152.0		38.6	
E-2	28 Nov 89		Staghorn sculpin	7	159.1	8.8	52.9	11.8
E-2	28 Nov 89		Steelhead	1	420.0		880.0	
E-2	28 Nov 89		Topsmelt	1	197.0		77.3	
E-2	7 Feb 90		Pacific herring	1	171.0			
E-2	7 Feb 90		Staghorn sculpin	1	177.0			
E-2	9 Mar 90		Jacksmelt	15	248.7	19.9	127.7	30.2
E-2	9 Mar 90		Pacific herring	2	155.0		48.4	
E-2	9 Mar 90		Steelhead	1	583.0		2106.0	
E-2	9 Mar 90		Topsmelt	1	211.0		85.8	

Appendix F8. Summary of Fish Catch Data in Estero Americano 24-hour Gillnet Sets, November 1989 - September 1990

Station	Date		Name	Total Catch	Fork Length (mm) mean	Fork Length (mm) SD	Weight (g) mean	Weight (g) SD
E-2	5 Apr 90		Jacksmelt	28	238.3	17.8	109.4	31.0
E-2	5 Apr 90		Opaleye	1	~220			
E-2	5 Apr 90		Pacific herring	3	165.0	40.7	59.1	42.2
E-2	5 Apr 90		Shiner surfperch	1	117.0		28.4	
E-2	5 Apr 90		Staghorn sculpin	4	184.3	7.5	79.4	15.8
E-2	5 Apr 90		Striped bass	1	597.0		2700.0	
E-2	5 Apr 90		Surfsmelt	7	146.7	10.4	22.6	4.9
E-2	5 Apr 90		Topsmelt	4	201.7	8.1	67.8	15.2
E-2	24 May 90		no catch					
E-2	25 Jun 90		Jacksmelt	6	247.4	30.1	93.3	14.9
E-2	25 Jun 90		Leopard shark	2	520.0			
E-2	25 Jun 90		Shiner surfperch	3	107.0	11.3	21.0	0.1
E-2	25 Jun 90		Staghorn sculpin	3	130.0	36.8		
E-2	25 Jun 90		Surfsmelt	1	135.0		25.0	
E-2	25 Jun 90		Topsmelt	1	124.0			
E-2	26 Jul 90		Staghorn sculpin	2	141.0			
E-2	18 Sep 90		Leopard shark	7	604.3	136.2	1766.7	1050.4
E-2	18 Sep 90		Shiner surfperch	5	95.0	23.1	17.8	10.9
E-2	18 Sep 90		Staghorn sculpin	2	122.0			
E-3	28 Nov 89		no catch					
E-3	7 Feb 90		no catch					
E-3	9 Mar 90		Surfsmelt	1				
E-3	9 Mar 90		Topsmelt	1				
E-3	5 Apr 90		English sole	1	300.0			
E-3	5 Apr 90		Jacksmelt	3	193.0	9.5	62.7	6.8
E-3	5 Apr 90		Topsmelt	10	194.2	10.1	72.1	11.0
E-3	24 May 90		Bay pipefish	3	213.0	40.8	5.0	3.4
E-3	24 May 90		Shiner surfperch	3	127.0	5.7	50.1	10.9
E-3	24 May 90		Topsmelt	22	200.0			
E-3	25 Jun 90		Plainfin midshipman	1	140.0		34.2	
E-3	25 Jun 90		Topsmelt	20	153.5	33.9		
E-3	26 Jul 90		Staghorn sculpin	1				
E-3	26 Jul 90		Topsmelt	2				
E-3	18 Sep 90		Staghorn sculpin	2				
E-3	18 Sep 90		Starry flounder	1	115.0			
E-4	28 Nov 89		Pacific herring	5	185.0	9.9	74.7	11.5

Appendix F8. Summary of Fish Catch Data in Estero Americano 24-hour Gillnet Sets, November 1989 - September 1990

Station	Date		Name	Total Catch	Fork Length (mm)		Weight (g)	
					mean	SD	mean	SD
E-4	7 Feb 90		no catch					
E-4	9 Mar 90		Shiner surfperch	2	148.0		58.3	
E-4	9 Mar 90		Surfsmelt	1	138.0		22.8	
E-4	5 Apr 90		Shiner surfperch	2	108.0		19.8	
E-4	5 Apr 90		Topsmelt	1	203.0		71.2	
E-4	24 May 90		Bay pipefish	2	185.0	12.7	3.4	0.4
E-4	24 May 90		Shiner surfperch	5	114.5	13.4	33.1	12.6
E-4	24 May 90		Staghorn sculpin	1	96.0		9.4	
E-4	24 May 90		Striped bass	1	306.0		344.1	
E-4	24 May 90		Topsmelt	30	180.0	30.5	60.2	26.1
E-4	25 Jun 90		Topsmelt	49	146.0	27.8	71.8	10.5
E-4	26 Jul 90		Topsmelt	6	165.4	43.3		
E-4	18 Sep 90		Shiner surfperch	1	115.0			
E-5	28 Nov 89		Pacific herring	5	177.6	14.7	81.7	23.4
E-5	28 Nov 89		Staghorn sculpin	7	150.7	8.3	44.4	8.1
E-5	7 Feb 90		no catch					
E-5	9 Mar 90		no catch					
E-5	5 Apr 90		Shiner surfperch	7	118.9	12.9	34.5	10.4
E-5	24 May 90		Pacific herring	3	114.0		17.7	
E-5	24 May 90		Shiner surfperch	29	112.6	8.1	29.6	8.8
E-5	24 May 90		Staghorn sculpin	7	94.0	7.7	8.3	1.3
E-5	24 May 90		Topsmelt	58	158.7	32.3	38.6	26.1
E-5	25 Jun 90		Topsmelt	40	139.9	25.1		
E-5	26 Jul 90		no catch					
E-5	18 Sep 90		Staghorn sculpin	1	127.0			

Appendix F9. Otter Trawl Sampling Effort (Minutes), Estero de San Antonio, February - September 1990

Date	Station		
	S-2	S-4	S-6
8 Feb 90	2.0	4.0	1.3
10 Mar 90	4.0	2.0	2.0
5 Apr 90	2.0	2.0	2.0
25 May 90	2.0	2.0	2.0
26 Jun 90	2.0	2.0	2.0
27 Jul 90	2.0	2.0	2.0
19 Sep 90	2.0	2.0	1.5

Appendix F10. Gillnet Sampling Effort (24-hour Sets), Estero de San Antonio, February - September 1990

Station		
S-2	S-4	S-6
	8 Feb 90	8 Feb 90
10 Mar 90	10 Mar 90	10 Mar 90
5 Apr 90	5 Apr 90	5 Apr 90
25 May 90	25 May 90	25 May 90
26 Jun 90	26 Jun 90	26 Jun 90
27 Jul 90	27 Jul 90	27 Jul 90
19 Sep 90	19 Sep 90	19 Sep 90

Appendix F11. Total Catch in Otter Trawls at Estero de San Antonio, February - September 1990

Species	Station			Total	% of Total
	S-2	S-4	S-6		
Threespine stickleback	110	117	447	674	47.63
Tidewater goby	36	31	556	623	44.03
Staghorn sculpin	31	34	19	84	5.94
Cheekspot goby		11		11	0.78
Prickly sculpin	6	2	1	9	0.64
Arrow goby	2	2		4	0.28
English sole	4			4	0.28
Pacific herring	1	3		4	0.28
Bay pipefish	1	1		2	0.14
Total	191	201	1023	1415	100.00

Appendix F12. Otter Trawl Catch (All Species) at Estero de San Antonio Stations, February - September 1990

	Station			Total
	S-2	S-4	S-6	
8 Feb 90	1	12	4	17
10 Mar 90	61	5	327	393
5 Apr 90	3	6	0	9
25 May 90	20	23	179	222
26 Jun 90	74	48	6	128
27 Jul 90	15	40	470	525
19 Sep 90	17	67	37	121
Total	191	201	1023	1415

Appendix F13. Total Catch in Gillnets at Estero de San Antonio Stations, February - September 1990

Species	Station			Total	% of Total
	S-2	S-4	S-6		
Staghorn sculpin	83	87	1	171	52.29
Pacific herring	88	14	1	103	31.50
Topsmelt	19	2	17	38	11.62
Striped bass	7	2	3	12	3.67
Starry flounder	2			2	0.61
English sole	1			1	0.31
Total	200	105	22	327	100.00

Appendix F14. Gillnet Catch (All Species) at Estero de San Antonio Stations, February - September 1990

	Station			Total
	S-2	S-4	S-6	
8 Feb 90		0	0	0
10 Mar 90	93	10	0	103
6 Apr 90	1	2	3	6
25 May 90	9	4	18	31
26 Jun 90	32	6	1	39
27 Jul 90	55	78	0	133
19 Sep 90	10	5	0	15
Total	200	105	22	327

Appendix F15. Summary of Fish Catch Data in Estero de San Antonio Otter Trawls, February - September 1990

Station	Date	Tow Length	Name	Total Catch	CPE	Fork Length (mm)		Weight (g)	
						mean	SD	mean	SD
S-2	7 Feb 90	2	English sole	1	0.5	30.0		0.2	
S-2	9 Mar 90	4	Pacific herring	1	0.3	195.0		84.5	
S-2	9 Mar 90	4	Prickly sculpin	3	0.8	69.7	31.5	6.7	8.9
S-2	9 Mar 90	4	Staghorn sculpin	21	5.3	41.2	6.4	0.8	0.4
S-2	9 Mar 90	4	Tidewater goby	36	9.0	41.9	3.7		
S-2	4 Apr 90	2	English Sole	3	1.5	44.3	2.1	0.9	0.2
S-2	24 May 90	2	Arrow goby	1	0.5	40.0		0.4	
S-2	24 May 90	2	Prickly sculpin	1	0.5	93.0		11.5	
S-2	24 May 90	2	Staghorn sculpin	1	0.5	80.0		5.1	
S-2	24 May 90	2	Threespine stickleback	17	8.5	32.2	16.0	1.1	0.9
S-2	25 Jun 90	2	Staghorn sculpin	5	2.5	127.6	8.3		
S-2	25 Jun 90	2	Threespine stickleback	69	34.5	33.6	6.4		
S-2	26 Jul 90	2	Arrow Goby	1	0.5	30.0		0.3	
S-2	26 Jul 90	2	Bay Pipefish	1	0.5	165.0		1.6	
S-2	26 Jul 90	2	Prickly Sculpin	1	0.5	31.0		0.2	
S-2	26 Jul 90	2	Staghorn Sculpin	1	0.5	136.0			
S-2	26 Jul 90	2	Threespine stickleback	11	5.5	31.5	8.0		
S-2	18 Sep 90	2	Prickly sculpin	1	0.5	81.0		7.7	
S-2	18 Sep 90	2	Staghorn sculpin	3	1.5	72.7	58.7		
S-2	18 Sep 90	2	Threespine stickleback	13	6.5	38.9	6.1	0.6	
S-4	7 Feb 90	4	Staghorn Sculpin	1	0.3	26.0		0.2	
S-4	7 Feb 90	4	Threespine Stickleback	2	0.5				
S-4	7 Feb 90	4	Tidewater Goby	9	2.3	40.3	3.4	0.6	0.2
S-4	9 Mar 90	2	Prickly sculpin	2	1.0	133.0	15.0	38.3	15.0
S-4	9 Mar 90	2	Staghorn sculpin	2	1.0	49.5	13.4	1.3	0.8
S-4	9 Mar 90	2	Threespine stickleback	1	0.5	28.0		0.1	
S-4	4 Apr 90	2	Arrow goby	2	1.0	44.0	2.8	0.6	0.1
S-4	4 Apr 90	2	Staghorn sculpin	4	2.0	58.8	11.0	2.6	1.8
S-4	24 May 90	2	Cheekspot goby	11	5.5	29.1	3.8	0.2	0.1
S-4	24 May 90	2	Pacific herring	2	1.0	63.5	2.1	2.4	0.4
S-4	24 May 90	2	Threespine stickleback	9	4.5	21.3	5.4	0.2	0.1
S-4	24 May 90	2	Tidewater goby	1	0.5	48.0		1.0	
S-4	25 Jun 90	2	Staghorn sculpin	5	2.5	126.8	4.6		
S-4	25 Jun 90	2	Threespine stickleback	31	15.5	45.0	2.0		
S-4	25 Jun 90	2	Tidewater goby	12	6.0	39.3	6.8		
S-4	26 Jul 90	2	Pacific Herring	1	0.5	60.0		2.7	
S-4	26 Jul 90	2	Staghorn Sculpin	22	11.0	132.6	12.5		
S-4	26 Jul 90	2	Threespine stickleback	16	8.0	39.8	11.1	1.0	8.0
S-4	26 Jul 90	2	Tidewater goby	1	0.5	44.0		0.8	

Appendix F15. Summary of Fish Catch Data in Estero de San Antonio Otter Trawls, February - September 1990

Station	Date	Tow Length	Name	Total Catch	CPE	Fork Length (mm)		Weight (g)	
						mean	SD	mean	SD
S-4	18 Sep 90	2	Bay pipefish	1	0.5	86.0		0.2	
S-4	18 Sep 90	2	Threespine stickleback	58	29.0	39.7	7.5	0.8	
S-4	18 Sep 90	2	Tidewater goby	8	4.0	42.0	4.4	0.7	0.2
S-6	7 Feb 90	1.28	Staghorn sculpin	1	0.8	29.0		0.2	
S-6	7 Feb 90	1.28	Tidewater Goby	3	2.3	39.7	9.9	0.6	0.4
S-6	9 Mar 90	2	Prickly sculpin	1	0.5	100.0		13.2	
S-6	9 Mar 90	2	Staghorn sculpin	18	9.0	49.7	9.0	1.6	
S-6	9 Mar 90	2	Threespine stickleback	10	5.0	41.7	7.6	0.8	0.4
S-6	9 Mar 90	2	Tidewater goby	298	149.0	43.2	3.3	0.8	
S-6	4 Apr 90	2	no catch						
S-6	24 May 90	2	Threespine stickleback	81	40.5	31.1	8.7	0.4	
S-6	24 May 90	2	Tidewater goby	98	49.0	28.0	5.9	0.2	0.3
S-6	25 Jun 90	2	Threespine stickleback	1	0.5	55.0		1.9	
S-6	25 Jun 90	2	Tidewater goby	5	2.5	29.0	5.9	0.3	0.2
S-6	26 Jul 90	2	Threespine stickleback	352	176.0	35.3	8.0		
S-6	26 Jul 90	2	Tidewater goby	118	59.0	31.4	6.7	0.6	0.1
S-6	18 Sep 90	1.5	Threespine stickleback	3	2.0	37.3	0.6	0.4	0.1
S-6	18 Sep 90	1.5	Tidewater goby	34	22.7	33.8	5.6	0.4	0.2

Appendix F16. Summary of Fish Catch Data in Estero de San Antonio 24-hour Gillnet Sets, February - September 1990

Station	Date		Name	Total Catch	Fork Length (mm)		Weight (g)	
					mean	SD	mean	SD
S-2	9 Mar 90		Pacific herring	87	151.6	35.3	55.2	
S-2	9 Mar 90		Starry flounder	1	281.0		321.1	
S-2	9 Mar 90		Striped bass	4	476.3	113.6	1805.0	1410.8
S-2	9 Mar 90		Topsmelt	1	198.0		73.4	
S-2	5 Apr 90		English Sole	1	280.0			
S-2	24 May 90		Staghorn sculpin	7	114.8	3.1	18.3	1.2
S-2	24 May 90		Striped bass	1	380.0		920.0	
S-2	24 May 90		Topsmelt	1	123.0		15.5	
S-2	25 Jun 90		Staghorn sculpin	27	134.3	15.1		
S-2	25 Jun 90		Striped bass	1	502.0		1800.0	
S-2	25 Jun 90		Topsmelt	4	123.0	135.5	6.0	
S-2	26 Jul 90		Pacific herring	1	194.0		91.0	
S-2	26 Jul 90		Staghorn sculpin	44	146.8	15.4		
S-2	26 Jul 90		Starry flounder	1	332.0		520.0	
S-2	26 Jul 90		Striped bass	1	248.0		209.2	
S-2	26 Jul 90		Topsmelt	8	152.0	6.2		
S-2	18 Sep 90		Staghorn sculpin	5	143.0	4.4	41.6	5.2
S-2	18 Sep 90		Topsmelt	5	152.4	27.6	40.1	24.7
S-4	7 Feb 90		no catch					
S-4	9 Mar 90		Pacific herring	10	181.1	16.0	82.7	19.9
S-4	5 Apr 90		Pacific herring	1	116.0			
S-4	5 Apr 90		Striped bass	1	355.0		607.4	
S-4	24 May 90		Pacific herring	1	192.0		71.3	
S-4	24 May 90		Staghorn sculpin	1	106.0		13.2	
S-4	24 May 90		Striped bass	1	490.0		1700.0	
S-4	24 May 90		Topsmelt	1	130.0		18.3	
S-4	25 Jun 90		Staghorn sculpin	6	140.2	9.5		
S-4	26 Jul 90		Staghorn sculpin	78	130.0	17.1		
S-4	18 Sep 90		Pacific herring	2	108.5	2.8	13.3	2.8
S-4	18 Sep 90		Staghorn sculpin	2	146.0	4.2	38.5	3.3
S-4	18 Sep 90		Topsmelt	1	122.0		15.6	
S-6	7 Feb 90		no catch					
S-6	9 Mar 90		no catch					
S-6	5 Apr 90		Striped Bass	3	344.0	12.1	628.0	75.8

Appendix F16. Summary of Fish Catch Data in Estero de San Antonio 24-hour Gillnet Sets, February - September 1990

Station	Date		Name	Total Catch	Fork Length (mm)		Weight (g)	
					mean	SD	mean	SD
S-6	24 May 90		Pacific herring	1	107.0		15.8	
S-6	24 May 90		Topsmelt	17	129.4	8.1	19.0	4.6
S-6	25 Jun 90		Staghorn sculpin	1	155.0			
S-6	26 Jul 90		no catch					
S-6	18 Sep 90		no catch					