

Pacific Oyster Breeding In British Columbia 1977

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ABSTRACT

Heritage, G. D. and N. Bourne. 1979. Pacific oyster breeding in British Columbia, 1977. Fish. Mar. Serv. Tech. Rep. 882: 140 p.

Results of monitoring Pacific oyster breeding in three locations in British Columbia in 1977 are presented. The locations were Pendrell Sound, Hotham Sound and Ladysmith Harbour. Heavy spatting occurred in Pendrell Sound, a light spatfall of commercial intensity occurred in Hotham Sound and an extremely light spatfall occurred in Ladysmith Harbour.

Key words: Natural breeding; seed collection; oyster, Crassostrea gigas; British Columbia.

RÉSUMÉ

Heritage, G. D. and N. Bourne. 1979. Pacific oyster breeding in British Columbia, 1977. Fish. Mar. Serv. Tech. Rep. 882: 140 p.

Le rapport présente les résultats de la surveillance de l'élevage d'huîtres du Pacifique en trois points de la Colombie-Britannique, les chenaux Pendrell et Hotham et le port de Ladysmith. Le naissain était dense dans le chenal Pendrell; un gisement de densité faible mais exploitable a été observé dans le chenal Hotham, mais le port de Ladysmith n'a connu qu'une chute de naissain extrêmement faible.

Mots clés: Élevage naturel; récolte du naissain; huître Crassostrea gigas; Colombie-Britannique.

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INTRODUCTION

Pacific oyster, *Crassostrea gigas* Thunberg, breeding studies were carried out in 1977 by the Pacific Biological Station, Resource Services Branch, Department of Fisheries and Environment and the Province of British Columbia, Marine Resources Branch, Ministry of Recreation and Conservation. Studies were carried out in Pendrell Sound, Hotham Sound and Ladysmith Harbour but as in previous years, most effort was spent in Pendrell Sound. Data collected during sampling in 1977 is stored on computer tapes at the Pacific Biological Station. This report summarizes the data.

PENDRELL SOUND

The sampling program in Pendrell Sound began on June 8 when temperature recorders were installed at Stations 1, 2, and 4 (Fig. 1). Weekly sampling began the following week and on June 19 a floating camp was anchored at Station 2 to serve as a base of operations until August 25.

WEATHER

Weather during the summer of 1977 was favourable for Pacific oyster breeding in British Columbia. Precipitation amounts were slightly above normal in June, however in mid-June warm sunny weather occurred for a two week period. In July frequent showers occurred until the third week and resulted in above normal precipitation for the month, but air temperatures were near normal. August was warm and sunny until the third week, when heavy downpours during the last ten days of the month produced above normal amounts of precipitation.

Daily cloud cover and rainfall observations were made in Pendrell Sound from June 21 to August 24 (Fig. 2). During this period, 20 days were clear, 35 partially overcast and 11 completely overcast. Rainfall occurred most frequently from June 21 to July 16; another period of rainfall was from August 21 to 24. Total precipitation for this period was 145.6 mm; the daily mean for July was 2.73 mm and for the first 24 days in August, 1.52 mm.

Daily meteorological observations were taken at Whaletown on Cortez Island about 31 km from Pendrell Sound (Fig. 2A). There was a close correlation in the amount of cloud cover between the two areas, however precipitation was heavier, in Pendrell Sound than at Whaletown, particularly in June and July.

HYDROGRAPHIC OBSERVATIONS

Continuous water temperature measurements were taken at depths of 1 and 3 m from June 8 to September 7 at Stations 1, 2, and 4 with recording thermographs. Weekly temperature and salinity profiles were taken to a depth of 20 m from June 8 to July 19, then daily or every other day until August 23 with a Beckman RS5-3 portable salinometer.

The warm, sunny weather in mid-June produced surface water temperatures of 20 C or above at Stations 1, 2, and 4 (Fig. 3-5). Water temperatures at the 1 m depth remained at 20 C, or above, for 11 days at Station 1 and 10 days at Stations 2 and 4. During this same period temperatures at the 3 m depth were 20 C, or above, for 11 days at Station 1, 9 days at Station 2 and 2 days at Station 4.

In July, cool, cloudy weather in the early part of the month depressed surface water temperatures. At the 1 m depth at Station 1, water temperatures rose above 20 C briefly on July 9, declined below this temperature until July 20 then rose above 20 C and remained so until August 25. At the 3 m depth a similar trend was observed but maximum water temperatures were lower than at 1 m (Fig. 3). At Station 2 the water temperature trend is similar to that at Station 1; water temperatures at 1 m reached 20 c on July 20 and remained above this temperature until August 25. At 3 m temperatures rose above 20 C briefly on July 10, declined below this temperature, then reached 20 C and remained above this temperature until August 27. At Station 4 water temperatures at 1 and 3 m were similar to those at Station 2.

During the sampling period water temperatures remained at 20 C or above for: 49 days at 1 m and 62 days at 3 m at Station 1; 45 days at 1 m and 47 days at 3 m at Station 2; 43 days at 1 m and 31 days at 3 m at Station 4.

Results of weekly temperature profiles show a thermocline present on June 14 and 21 at Stations 1, 2, and 4 (Tables 1-3). In early July it became obscured by a temperature inversion. Contour plots of daily temperature profiles at Stations 1, 2, 4, 5, and 6 show the thermocline reformed in late July (Fig. 6-10). In early August the thermocline was attenuated. From August 8 to 20 it was well defined and stable at the 2-4 m depth at all sampling stations. The warmest water temperature measured during the summer was 25.1 C at the surface at Station 2 on August 17.

Salinity stratification occurred by June 28 at Stations 1, 2, and 4, (Tables 1-3). At this time surface water salinities began to decrease gradually and the less saline surface layer began to deepen. Salinity contour plots show a distinct halocline in July at Stations 1, 2, 4, 5, and 6 (Fig. 11-15). This halocline became obscure during the first week in August but reformed in the second week and remained well defined until sampling ended. The depth of the halocline ranged from 1 to 5 m at Stations 1, 2, and 4 and from 2-5 m at Station 5 and from 1-4 m at Station 6. Surface salinities remained above 16.9‰ at all Stations during the sampling period.

In early August surface salinities began to rise but declined during the latter half of the month. Salinities normally increase throughout August (Quayle, 1969). The decline experienced this year was probably due to heavy rainfall during late August.

SPAWNING AND LARVAL DEVELOPMENT

Spawning was determined as in previous years (Heritage et al. 1976), observing adults spawning, the presence of "white water" or by the appearance or sudden increase in numbers of straight hinge larvae in the plankton.

Plankton sampling was carried out by three methods in 1977. Qualitative samples were taken by five minute surface plankton tows with a standard net and relative abundance of different bivalve and developmental stages calculated (Heritage et al, 1976). Quantitative samples were taken by two methods. Running pipe samples were taken every second day from July 27 to August 20 at Transects 1, 3, 5, and 7 using a modified multiple depth running pipe sampler (Fig. 16) (Westley, 1954). The sampler took water from three depths, 0.27, 0.85, and 1.74 m below the surface of the water. The sampler was calibrated (litres/second) and the exact time was noted when taking samples. The second quantitative sampling method used was standing pump samples which were taken twice daily at 0700 and 1900 hours (Pacific Standard Time) from July 23 to August 23 at Station 2. The sampler was similar to the one described by Quayle and Terhune (1967). The intake pipe was 5 cm (2 inch) diameter with 48, 4.8 mm (3/16 inch) holes on 5 cm centres and was mounted vertically on the barge with a water meter attached to it (Fig. 17). Water was pumped through a standard plankton net and the volume of water noted. Numbers of each of the five larval developmental stages of C. gigas and the total numbers of M. edulis, B. setacea, O. lurida and clam larvae were counted. Larval density is expressed as numbers per 100 l.

Direct observations of spawning were reported on nine occasions, all during periods of maximum straight hinge larval abundance (Table 4).

Straight hinge Pacific oyster larvae first appeared in samples taken at Station 1 on June 20, at Stations 4 and 5 on June 21, and at Station 6 on June 24 (Fig. 18-21). Relative abundance at all stations was 9. The sudden appearance of these larvae indicated spawning probably occurred about June 17 or 18. Five spawning peaks were evident in samples taken at Stations 1 and 4; the first from June 17-18, the second about July 8, the third and largest about July 22, fourth about August 4 and the fifth about August 21. No surface tows were taken at Stations 5 and 6 between June 21 and July 25 or after August 24 but it appears major spawning occurred in this part of the Sound just before August 4 when a maximum relative abundance of 42 was recorded at these two Stations.

Straight hinge larvae at Station 1 developed to the early umbone stage by June 26 but soon disappeared from the plankton. Larvae from this first spawning apparently suffered heavy mortalities and did not develop

past the early umbone stage. Mortalities were probably caused by adverse weather which produced cooler water temperatures (Fig. 2, Tables 1-3).

Straight hinge larvae from the second spawning had a peak relative abundance of 35 at Stations 1 and 4 on July 9 and 10. Survival again was poor, probably due to adverse weather and a cooling water trend but a few larvae did survive to the eyed stage at Station 1.

The third spawning was the major one and relative abundance of straight hinge larvae reached a maximum of 63 on July 24 at both Stations 1 and 4. (Unfortunately sampling at Stations 5 and 6 did not begin until July 25 but a maximum abundance is noticeable here also). Survival from this spawning was good: relative abundance maxima for early umbone larvae were 35 at Station 1 on August 1, 32 at Station 4 on July 31, 21 at Station 5 on July 28 and 21 at Station 6 on July 29 and 30. Although peaks in abundance of mid umbone larvae were not noticeable at any sampling Stations, maxima of late umbone stage larvae (16-18) were evident at all Stations on August 7-9. By August 12-14 there was a peak in abundance of eyed larvae (16-18) at the four sampling Stations. Assuming spawning occurred on July 22, larval development occurred in 21-24 days which is slightly slower than recorded previously at similar water temperatures during this period (Quayle, 1969).

A fourth peak in straight hinge larval abundance occurred on August 4 and 5 at the sampling Stations; maximum relative abundance 42 at Stations 1 and 4. These larvae developed quickly and maximum relative abundance of early umbone larvae was 40-45 at the four Stations on August 10 and 11. Mid umbone larvae had a peak relative abundance of 36-45 by August 13 and 14, late umbone larvae 32-35 by August 18 and 19. Eyed larvae reached a maximum of 20-35 on August 21 and 22. Assuming spawning occurred on August 4, these larvae developed in a period of 17 to 18 days which is slightly faster than recorded previously at these water temperatures (Quayle, 1969).

Another major spawning occurred about August 21 and another peak in straight hinge larval abundance was observed at all Stations on August 24. Daily sampling terminated on this date and development of these larvae was not followed.

Densities of the five developmental stages of oyster larvae in standing pump samples was generally greater in the evening samples (Fig. 22). This may be due, in part, to tidal action. During both periods of larval maxima, low tides occurred during the early morning and high tides in the late afternoon. The tidal action may tend to flush larvae out of the head of the Sound during the ebb and reconcentrate them with the flood tide. Another explanation for the difference in numbers of larvae between morning and evening samples may be diurnal vertical migration of the larvae. This would tend to concentrate larvae in surface waters during the evening and night and disperse them at lower depths during daylight hours. The mean density of larvae of the morning and evening samples are shown in Fig. 23.

In July, straight hinge larvae reached a maximum mean daily density of 4,719 per 100 ℓ on the 27th in standing pump samples. Early umbone mean density reached a maximum of 300 on August 1. Maximum densities

of mid, late and eyed larvae from this spawning tend to be ill defined but were present in densities of about 100 per 100 ℓ.

In the August 4 spawning, development from the straight hinge to eyed stages is much more evident. Maximum mean counts per 100 ℓ of the five developmental stages were 3,067 straight hinge on August 5, 4,100 early umbone on August 10, 1,850 mid umbone on August 17, 1,850 late umbone on August 18 and 1,500 eyed on August 21.

Another small peak of straight hinge larvae appeared on August 17 but were no longer evident after August 18.

Results of the larval sampling in standing pump samples generally agree with those of five minute surface tows at Station 1. Maximum densities in pump samples tended to be one to three days later than similar maxima in five minute surface tows. This slight difference may be due to vagaries in larval distribution or to difference in sampling methods.

Samples taken with the running pipe sampler show similar trends to those from five minute surface plankton tows and standing pump samples. In the late July spawning, straight hinge larvae had a peak abundance on July 27 at Transects 1 and 7 and on July 29 at Transects 3 and 5 (Fig. 24 and 25). Maximum density was 5,150 larvae per 100 ℓ at Transect 1. Larval density was much reduced in the later developmental stages (Fig. 26-29) but the progression of stages can be seen particularly in the results from Transects 3 and 5.

Larvae from the early August spawning were very numerous in running pipe samples at all Transects (Fig. 25-33). Maximum density of straight hinge larvae occurred on August 4 and 6; peak density 6,064/100 ℓ at Transect 3 (Fig. 25 and 31). Survival of these larvae was good and maximum density of early umbone larvae occurred on August 10; peak density 2,712/100 ℓ at Transect 3 (Fig. 26 and 31). Mid umbone larvae had maximum abundance between August 12-18; 2,068/100 ℓ at Transect 3 (Figs. 27 and 31). Late umbone larvae were most abundant on August 16 and 20; maximum 1,026 at Transect 3 (Figs. 28 and 31). Eyed larvae were also most abundant on August 18-20; maximum again at Transect 3 (Fig. 29 and 31). Development of these larvae occurred in about 17-18 days which is slightly faster than average for these water temperatures.

Results from running pipe samples showed that maximum abundance of larvae in all five development stages tended to be higher in Transects 1 and 3; i.e. towards the head of the Sound (Fig. 30-33). Although density varied between the Transects, maxima of the five developmental stages occurred at similar times indicating that larval growth rates were similar throughout the Sound.

There was general agreement in results of the three larval sampling methods: peaks of maximum abundance of the five larval developmental stages of C. gigas occurred at similar times in all three sampling methods. In the two quantitative sampling methods, densities of oyster larvae were higher in standing pump than in running pipe samples. No conclusive explanation can be given for this. Larvae may have tended to concentrate at Station 2 because of tidal action and were more dispersed

over the length of the transects. The standing pump sampler also samples more of the water column than the running pipe sampler which may influence larval numbers.

SPATFALL

Spatfall was monitored daily at Station 2 from July 28 to September 2 and weekly at Stations 1, 2, 4, 5, 6, 6E, and 10 from July 25 to August 30. All test cultch was Pacific oyster shell.

C. gigas spat were first observed on test cultch immersed on August 4 and removed on August 5; mean 0.2 spat/shell (Fig. 34). Daily spatfall increased gradually until August 18, then rapidly to a maximum daily mean of 4,762 spat/shell on August 20. During the four day period from August 20 and 23, mean daily spatfall was over 1,000 spat/shell. Two spatfall maxima occurred, one about August 13 and the other on August 20. These two maxima occurred at the same time as maximum abundance of late and eyed stage larvae in plankton samples.

Mean weekly and mean cumulative spatfall for the sampling period at various locations in the Sound are shown in Table 5. Settlement was extremely heavy at all sampling stations making accurate spat counts difficult. Final counts in the table were based on estimates of settlement on each shell.

Spatfall began during the week of August 1 to 8 and was heaviest at Station 2. Weekly settlement continued to increase and reached a maximum during the two week period of August 15 to 30. At Stations 1, 2, 4, 6E, and 10 maximum spatfall occurred during the week of August 15 to 22; at Stations 5 and 6 maximum spatfall was during the week of August 22 to 30. No explanation can be given for this difference in timing of maximum spatfall at these locations. Maximum weekly spatfall was 9,496 per shell at Station 6 from August 22 to 30.

Settlement was virtually over by August 30. Cultch exposed on August 30 had only a light spatfall although it was of commercial intensity. This late spatfall was heavier in the central part than in the head of the Sound.

When spatfall is as heavy as in 1977, it is virtually impossible to detect trends in intensity of settlement at different locations in the Sound. Spatfall was very heavy at all Stations except 6E and to a lesser extent at Station 10. In 1974 (Bourne and Heritage, 1979) minimum settlement was also recorded at Station 6E and light spatfall at Station 10.

Growth of Pacific oyster spat was below average in 1977. The largest spat measured 21 mm and mean lengths of the largest spat ranged from 11.2 - 15.7 mm, the largest was at Station 1 (Table 6).

ABUNDANCE OF OTHER BIVALVE SPECIES

Native oyster, Ostrea lurida, larvae were the most abundant bivalve larvae, other than C. gigas in surface plankton tows (Fig. 35-38). A maximum relative abundance of 25 occurred at Station 1 on July 15. During the remainder of the summer relative abundance fluctuated between 0 and 16 at Stations 1, 4, 5, and 6.

Blue mussel, Mytilus edulis, and shipworm Bankia setacea, larvae were present in low numbers during the summer. M. edulis reached a maximum relative abundance of 12 on June 8 and July 29 at Stations 4 and 6 (Fig. 35-38). B. setacea reached a maximum relative abundance of 10 on July 15 and 26 at Stations 1 and 4.

Clam larvae occurred sporadically with relative numbers remaining below 7 in all samples except for one at Station 4 on June 8.

Mean densities of O. lurida, and B. setacea larvae were similar in standing pump samples taken at Station 2 from July 23 to August 23 (Fig. 39). Densities of O. lurida larvae ranged from 8 to 65 larvae/100 l while B. setacea ranged from 3 to 148 larvae/100 l. B. setacea density maxima of 126 and 148 larvae/100 l occurred on August 1 and 17. M. edulis densities in standing pump samples were below 25 larvae/100 l except on August 1 when a maximum of 49 larvae/100 l occurred. Clam densities remained below 10 larvae/100 l during the sampling period.

Running pipe samples taken from July 27 to August 20 had more B. setacea larvae than other bivalve larvae, excluding C. gigas (Fig. 40-43). Densities of B. setacea larvae ranged from 0 to 12/100 l; maxima in Transects 1, 5, and 7 occurred from August 2-4 while at Transect 3 the maximum occurred on August 20. O. Lurida larvae reached a maximum of 7/100 l at Transect 3 on August 12. M. edulis larvae remained below 1.5/100 l and clam larvae were below 0.5/100 l in running pipe samples.

Densities of mussel, shipworm, native oyster and clam larvae were low throughout the summer, but numbers were similar in the four transects, (Fig. 40-43). M. edulis larvae reached a small maximum during the first week of August except at Transect 3. Bankia larvae also had a peak abundance in the first week of August. Another small peak in abundance occurred about August 20 at Transect 3 but was not evident at the other Transects.

Maximum density of O. lurida larvae was from August 4-12 at the three Transects.

Settlement of O. lurida was light; well under 1 spat/shell except for one sample at Station 10 where spatfall was just over 1/shell. The M. edulis set was also light.

PREDATORS

No starfish or flatworms, Pseudostylochus ostreophagus, were observed on test or commercial cultch during the summer. On December 7 commercial cultch samples from Pendrell Sound were examined again for predators. None was found.

HOTHAM SOUND

A float was anchored at Station 1, Hotham Sound on June 9, (Fig. 44). Two 31-day Ryan temperature recorders were suspended from the float at depths of 1 and 3 m.

WEATHER

No weather observations were taken in Hotham Sound during 1977, however, cloud cover and rainfall data for Malibu, Jervis Inlet, 31 km from Hotham Sound are shown in Fig. 45.

From June 9 to September 10, 36 days were clear, 48 were partially overcast and 9 were completely overcast. Total precipitation for this period was 263.7 mm. Frequent rainfall occurred until the end of July. The first three weeks of August had no rainfall but intermittent rainfall occurred from August 20 to September 7.

HYDROGRAPHIC CONDITIONS

Continuous water temperature measurements were taken at depths of 1 and 3 m at Station 1 from June 9 to September 10; temperature and salinity profiles were taken weekly from June 9 to August 30. At the 1 m depth temperatures of 20 C or above occurred briefly twice in June and from July 24 to August 25, a total of 39 days (Fig. 46). At the 3 m depth temperatures of 20 C or above occurred from June 19 to 22, July 22 to August 2 and August 18 to 20, a total of 19 days.

The temperature contour profile shows a warm surface layer occurred about June 21, disappeared, then reformed in late July with a thermocline between 4 and 5 m in depth (Fig. 47). The thermocline was shallower in early August, about 3 m but became deeper later in the month. On August 23 the 19 C isotherm was between 8 and 9 m in depth. The warm surface layer was still evident when sampling ended. Adequate temperatures for C. gigas larval development and survival existed from late July to the end of August.

The salinity contour profile shows only slight variations in surface salinities during the summer (Fig. 48). A weak halocline formed in late July but remained for only a short time. The lowest salinity measured during the summer was 20‰ on July 26.

SPAWNING AND LARVAL DEVELOPMENT

Spawning of C. gigas was observed indirectly through the presence of straight hinge larvae in weekly surface plankton tow samples. Tows were taken with a standard net only at Station 1. No visual sightings of spawning were reported during the summer.

The first spawning recorded occurred about June 19 since small numbers of straight hinge larvae were in the plankton on June 21 (Fig. 49). On July 12 large numbers of straight hinge larvae were observed indicating extensive spawning occurred about July 9. Another peak in straight hinge larval abundance on July 26 shows further spawning took place about July 24. A further modest spawning occurred about August 7 and minor spawning continued throughout the remainder of August as can be seen by the small number of straight hinge larvae found in the plankton.

Straight hinge oyster larvae first appeared in the plankton on June 21, relative abundance of 9 (Fig. 49). These larvae probably suffered heavy mortalities since none appeared in later developmental stages in the plankton. Relative abundance of straight hinge larvae reached a maximum of 45 on July 12 and a second peak of 36 was observed on July 26. Survival of these larvae was moderate and a set resulted. Early umbone larvae were first observed on July 26 and had a peak abundance of 16 on August 9 and 16. Mid umbone larvae were found on August 9, peak abundance of 12 on August 23. Late umbone larvae first appeared on August 16 and the relative abundance remained about 4. Eyed larvae appeared on August 23 and had a maximum abundance of 12 on August 30.

SPATFALL

Test strings of Pacific oyster shell cultch were immersed weekly at Station 1 beginning August 2. Samples of shell were taken after one week exposure and the remainder of the shell left until equipment was removed on October 5.

Spatfall began during the week of August 9 to 16, mean of 0.1 spat/shell (Table 7). Maximum spatfall, 18.5 spat/shell, occurred between August 23 and 30. Mean cumulative weekly spatfall was 22.6 spat/shell.

Final examination of test shell showed that shell immersed on August 2 and 9 had the same spatfall, 29.0 spat/shell. Settlement on cultch immersed on August 16 and 23 had slightly lower spatfall. Cultch immersed

on August 30 had 12.2 spat/shell, indicating settlement probably continued briefly after sampling ended.

ABUNDANCE OF OTHER BIVALVE LARVAE

Blue mussel, M. edulis, occurred in all but one weekly plankton sample (Fig. 50). Relative abundance of mussel larvae generally remained below 10, however maxima of 20 and 18 were recorded on June 9 and 21. The mussel set was light.

Native oyster, O. lurida, and clam larvae occurred in relative numbers less than 10. O. lurida larvae were present in all but two samples while clam larvae were present in all but one sample. O. lurida larvae attained a maximum relative abundance of 9 on August 23 and clam larvae had a peak of 6 on July 19. A light set of O. lurida was recorded (Table 8).

B. setacea larvae were uncommon but occurred in 6 of the 13 samples in relative numbers of 4 or less.

PREDATORS

No flatworms, P. ostreophagus, were found on cultch. One small starfish Pisaster ochraceus was found on test cultch but they were abundant on the anchor line of the float when it was removed on October 5.

LADYSMITH HARBOUR

The sampling program at Ladysmith Harbour began on June 8 when floats were anchored at Stations 2 and 6 (fig. 51). A temperature recorder was suspended from the float at Station 2 on this date.

WEATHER

No meteorological observations were made at Ladysmith Harbour in 1977. Daily rainfall observations are taken at Nanaimo Airport at Cassidy about 5 km from Station 2 (Fig. 52). Total rainfall from June 8 to August 31 was 53 mm. Generally, clear weather occurred from mid July to mid August.

HYDROGRAPHIC CONDITIONS

Continuous water temperature measurements were taken with a 7-day recording thermometer at a depth of 1 m at Station 2. Temperature and salinity profiles were taken periodically at Stations 2 and 6 with a portable salinometer.

Water temperatures at the 1 m depth at Station 2 increased rapidly in June to 20.7 C on June 18 and 19; declined to 16.9 C on July 4 and 5, (Fig. 53). A warming trend began and water temperatures increased gradually to a maximum of 25.2 C on August 14 and 15, then fell rapidly to a low of 14.6 C when sampling ended. The temperature remained at 20 C, or above, for a total of 38 days. The longest period occurred during the hot weather in late July and most of August.

The temperature profile at Station 2 shows the presence of a thermocline between 1 and 2 m in depth on June 15 (Table 9). By June 27 it had weakened considerably with cooling in the surface waters. Warming occurred between July 18 and 27 and on the latter date the 20 C isotherm was below the 6 m maximum sampling depth. Water temperatures to the 6 m depth generally remained above 20 C until August 22. On August 22 the thermocline was between the surface and 1 m and by August 29 had disappeared.

A thermocline appeared briefly at Station 6 on July 27 between a depth of 2 and 3 m but did not become re-established until August 8 (Table 10). It remained closer to the surface than at Station 2 and disappeared by August 22.

Salinity profiles show surface salinities remained high at both Stations, the highest salinity recorded was 27.6‰ at Station 6 on August 29 (Tables 9 and 10).

SPAWNING AND LARVAL DEVELOPMENT

Spawning of Pacific oysters in Ladysmith Harbour was observed indirectly by the appearance of straight hinge stage larvae in surface plankton tows taken at Stations 2 and 6. Straight hinge oyster larvae first appeared in relative numbers of 27 on July 27 at both Stations indicating spawning occurred about July 25 or 26 (Fig. 54 and 55). Additional spawning took place a week later (about August 1) since another peak in straight hinge larvae abundance occurred on August 3 at Station 2. Moderate spawning continued until about August 18; a second peak in abundance was observed on August 11 at Station 6.

Relative abundance of straight hinge larvae was 27 on July 27 at both Stations 2 and 6 and was the same at Station 2 on August 3 but declined to 9 at Station 6. Numbers of straight hinge larvae declined steadily at Station 2 for the remainder of the sampling period. A small second peak occurred on August 11 at Station 6. Straight hinge larvae had disappeared from the plankton by August 22 at both sampling Stations.

Early umbone oyster larvae first appeared on August 3 at Station 6 (relative number 1) and on August 8 at Station 2 (relative number 15). Numbers began to decline at Station 2 until early umbone larvae disappeared from the plankton on August 29. At Station 6 early umbone larvae reached a maximum of 9 on August 11 then began to decrease in numbers until they disappeared on August 29.

Mid umbone oyster larvae first appeared at Station 2 on August 3 and at Station 6 on August 8. They reached a maximum relative abundance of 9 at Station 2 on August 15. At Station 6 numbers of this stage larvae remained below 10 during the sampling period. No mid umbone larvae were found at either Station on August 29.

Late umbone larvae were found at Station 2 on August 19 and 22 and at Station 6 on August 22 and 29. Numbers were low at both Stations but a maximum relative number of 9 was reached at Station 6 on August 29.

Eyed larvae were first observed on August 19 at Station 2 and increased in relative abundance until they reached a maximum of 9 on August 29. At Station 6 eyed larvae were found in only one sample on August 22.

SPATFALL

Strings of Pacific oyster shell cultch were immersed at approximately weekly intervals at Stations 2 and 6. Then shells were removed for examination when the next string was immersed, the remainder were left and all cultch removed from the water on September 16.

Light settlement began between August 15 and 22 at both Stations, mean less than 1 spat/shell (Table 11). Final examination of test cultch showed heaviest settlement occurred at Station 6 on cultch exposed on August 15. Spatfall on this string was 1.2/shell, well below a commercial spatfall.

OTHER BIVALVE LARVAE

M. edulis larvae were the most abundant bivalve larvae in plankton samples. Maximum numbers occurred in early July and early August at both Stations (Fig. 56 and 57). A maximum relative abundance of 25 was found at Station 6 on July 13. During the remainder of the summer the relative number was generally less than 10.

Clam larvae were present in all plankton samples; maximum relative number was 15 at Station 6 on July 13. At both Stations two maxima occurred, in mid July and mid August.

B. setacea larvae occurred in small numbers during most of the summer. A maximum relative abundance of 20 occurred at Station 2 on July 27 and a peak of 10 on the same day at Station 6.

O. lurida larvae occurred sporadically at both Stations during the summer. The highest relative abundance value was 5 on July 13 at Station 6.

NEWSLETTER

The newsletter "British Columbia Oyster Breeding Newsletter" was continued and twelve issues were published (Appendix 1).

SUMMARY

The extended period of warm sunny weather during the summer of 1977 produced favorable conditions for Pacific oyster breeding. Limited settlement was reported from some locations in the Strait of Georgia but spatfall was much below levels recorded in 1942, 1958, or 1961. Breeding was reported from three separate locations in Baynes Sound. One count of beach cultch from the Union Bay area in late August had a mean spat count of 4/shell. Moderate spatfall was reported from the southern and eastern side of Cortes Island. These spat could have resulted from spawnings in the Pendrell Sound area. Limited spatfall was also reported from the lower reaches of Jervis Inlet. These larvae could have come from Hotham Sound. Very light spatfall occurred in Departure Bay.

In Pendrell Sound ten companies exposed collectors. These included 50,500 strings of Pacific oyster shell, 80,000 strings of Philippine oyster shell, 1,400 columns of "Chinese hat" collectors, 200 columns of cement diamond chip collectors, 5,400 cemented veneer collars and 600 bundles of cemented veneer. All companies had heavy sets on their collectors.

No commercial cultch was exposed in either Hotham Sound or Ladysmith Harbour.

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REFERENCES

- Bourne, N., and G. D. Heritage (In press). Pacific oyster breeding in Pendrell Sound, 1974. Tech. Rep.
- Heritage, G. D., P. A. Breen, and N. F. Bourne. 1976. Pacific Oyster Breeding in Pendrell Sound, 1975. Fish. Res. Board Can. MS Rep. 1406: 91 p.
- Heritage, G. D., N. Bourne, and D. W. Smith. 1977. Pacific Oyster Breeding in British Columbia, 1976. Fish. Res. Board Can. MS Rep. 1419: 49 p.
- Quayle, D. B. 1969. Pacific Oyster Culture in British Columbia. Fish. Res. Board Can. Bull. 169: 192 p.
- Westley, R. E. 1954. A Multiple Depth Running Plankton Sampler. Wash. Dep. Fish. Fish. Res. Rep. 1(2): 1-4 p.

Table 1. Weekly temperature and salinity profiles from the surface to a depth of 20 m at Station 1, Pendrell Sound, June 8-July 12, 1977.

Depth	Temperature, °C						Salinity, ‰					
	June 8	June 14	June 21	June 28	July 5	July 12	June 8	June 14	June 21	June 28	July 5	July 12
0	16.3	20.7	21.3	18.3	17.8	19.6	25.8	25.9	23.8	17.8	18.8	19.6
1	16.3	20.2	21.7	18.9	17.7	19.6	26.1	26.0	24.2	18.6	19.0	19.6
2	16.2	20.0	21.5	19.7	18.3	20.2	26.0	25.8	24.0	24.1	19.7	20.5
3	15.7	19.4	21.2	19.0	18.3	20.2	26.1	26.2	24.6	25.8	27.0	24.3
4	15.8	14.3	19.2	18.5	16.7	20.3	26.6	27.9	26.3	25.9	27.3	25.2
5	15.7	12.9	18.3	17.9	15.8	20.0	26.7	28.5	27.0	26.3	27.9	26.3
6	15.1	12.5	17.8	17.6	15.0	19.5	27.0	28.5	27.2	26.6	28.0	26.7
7	14.2	11.9	17.6	17.4	14.3	18.5	27.4	29.2	27.4	26.6	28.4	27.1
8	13.5	11.6	17.2	17.0	14.0	17.5	28.0	28.9	27.7	26.8	28.5	27.0
9	13.0	10.9	16.8	17.0	13.5	16.9	28.1	29.4	27.7	27.1	28.7	27.5
10	12.8	10.7	16.4	16.7	13.3	16.9	28.3	29.4	28.1	27.2	28.9	27.5
15	13.4		14.5	16.7	12.9	16.5	28.1		25.2	27.0	27.5	26.3
20	14.3		14.4	16.8	13.2	16.6	27.4		24.2	27.1	27.5	26.3

Table 2. Weekly temperature and salinity profiles from the surface to a depth of 20 m at Station 2, Pendrell Sound, June 8-July 12, 1977.

Depth	Temperature, °C						Salinity, ‰					
	June 8	June 14	June 21	June 28	July 5	July 12	June 8	June 14	June 21	June 28	July 5	July 12
0	16.6	21.0	21.5	18.3	17.4	19.2	26.0	26.0	24.3	17.8	18.9	19.5
1	16.8	19.8	21.6	18.7	17.4	19.2	25.8	26.0	24.3	18.1	18.7	19.4
2	15.8	19.4	21.4	19.6	18.4	19.1	26.1	26.1	24.2	21.3	21.5	19.6
3	15.7	19.2	21.1	19.7	17.8	20.2	26.0	26.2	24.7	25.2	27.0	24.1
4	15.4	16.4	18.5	18.4	16.6	20.2	26.3	27.3	26.6	26.3	27.6	25.4
5	15.1	12.9	18.5	17.7	15.9	20.0	27.1	28.5	27.0	26.4	27.9	26.0
6	13.9	12.1	17.8	17.6	15.5	19.7	27.7	28.9	27.2	26.6	28.0	26.3
7	13.8	11.7	17.4	17.0	14.7	19.5	27.8	29.1	27.5	26.8	28.2	26.4
8	13.4	11.2	17.2	16.9	14.2	18.6	28.0	29.1	27.5	26.8	28.5	26.8
9	12.8	12.0	16.5	16.7	13.8	18.2	28.3	25.4	27.9	27.0	28.7	26.8
10	12.8	11.4	16.0	16.6	13.4	17.9	28.4	28.8	28.3	27.0	28.8	27.2
15	13.5		15.7	16.6	13.6	18.1	25.6		26.0	25.4	28.2	26.3
20	13.3		16.0	16.7	12.9	17.8	27.4		25.7	25.2	28.8	26.3

Table 3. Weekly temperature and salinity profiles from the surface to a depth of 20 m at Station 4, Pendrell Sound, June 8-July 12, 1977.

Depth	Temperature, °C						Salinity, ‰					
	June 8	June 14	June 21	June 28	July 5	July 12	June 8	June 14	June 21	June 28	July 5	July 12
0	17.3	20.1	21.4	18.5	17.4	18.7	26.0	25.0	24.1	17.8	18.6	19.2
1	17.0	19.9	21.2	18.5	17.4	18.8	26.0	25.7	24.2	18.0	18.8	19.1
2	17.0	20.1	19.6	19.5	19.6	19.2	26.0	25.7	25.8	20.0	23.2	19.7
3	17.1	19.8	18.1	20.3	17.7	19.2	26.1	25.8	26.4	24.2	26.9	22.1
4	16.3	15.9	16.9	18.5	16.5	18.6	26.0	27.2	26.4	26.0	27.6	24.2
5	15.2	13.0	16.6	17.4	15.8	18.5	26.3	28.4	26.9	26.3	27.8	25.6
6	14.9	12.5	16.4	17.1	15.4	18.0	27.3	28.6	27.0	26.5	28.0	26.0
7	14.0	11.6	16.3	16.8	14.8	17.9	27.5	29.1	27.3	26.8	28.2	26.0
8	13.7	11.2	16.3	16.7	14.6	17.7	27.8	28.9	27.4	26.8	28.3	26.2
9	13.6	10.8	16.3	16.7	14.0	17.0	27.7	29.3	27.4	27.0	28.6	26.6
10	13.2	10.9	16.0	16.4	13.7	17.1	28.0	29.2	27.6	27.1	28.9	27.1
15	11.8	9.6	13.2	16.2	11.9	14.6	28.9	29.8	28.7	27.2	29.6	28.3
20	10.7	9.3	11.6	14.6	10.6	12.6	29.4	29.8	29.2	27.8	29.7	28.8

Table 4. Dates and locations of spawning sighted in Pendrell Sound, 1977.

Date	Spawning sighted
July 23	Station 2 and from Station 6-10
July 24	From Station 2-3
July 25	Along west side of head of Sound
July 26	Outside Station 6 on west side of Sound
July 31	Station 10
August 2	From Station 1-2, both shores
August 3	From Station 1-2, both shores
August 4	From Station 1-2, both shores
August 5	From Station 1-2, both shores

Table 5. Mean spat counts on test cultch immersed at weekly intervals at sampling stations in Pendrell Sound, 1977. Samples taken 1 wk after immersion and on October 4.

	Date in	Sample Date	Mean spat count	Date out	Mean spat count
Station 1	July 25	Aug. 1	0	Oct. 4	+3000
	Aug. 1	Aug. 8	1.9	Oct. 4	+2900
	Aug. 8	Aug. 15	432.2	Oct. 4	+2500
	Aug. 15	Aug. 22	4627.4	Oct. 4	+2500
	Aug. 22	Aug. 30	3318.0	Oct. 4	+1800
	Aug. 30			Oct. 4	13.3
Station 2	July 25	Aug. 1	0	Oct. 4	+2850
	Aug. 1	Aug. 8	28.0	Oct. 4	+3950
	Aug. 8	Aug. 15	648.7	Oct. 4	+3650
	Aug. 15	Aug. 22	8444.2	Oct. 4	+4300
	Aug. 22	Aug. 30	4278.0	Oct. 4	+2650
	Aug. 30			Oct. 4	16.5
Station 4	July 25	Aug. 1	0	Oct. 4	+3230
	Aug. 1	Aug. 8	0.1	Oct. 4	+3330
	Aug. 8	Aug. 15	169.4	Oct. 4	+4250
	Aug. 15	Aug. 22	7175.6	Oct. 4	+3650
	Aug. 22	Aug. 30	4804.0	Oct. 4	+2800
	Aug. 30			Oct. 4	44.1
Station 5	Aug. 1	Aug. 8	3.7	Oct. 4	+2800
	Aug. 8	Aug. 15	170.7	Oct. 4	+2550
	Aug. 15	Aug. 22	3503.2	Oct. 4	+3700
	Aug. 22	Aug. 30	7208.0	Oct. 4	+2950
	Aug. 30			Oct. 4	55.1
Station 6	Aug. 1	Aug. 8	0	Oct. 4	+3550
	Aug. 8	Aug. 15	66.9	Oct. 4	+3850
	Aug. 15	Aug. 22	2875.6	Oct. 4	+3500
	Aug. 22	Aug. 30	9496.0	Oct. 4	+2530
	Aug. 30			Oct. 4	105.8
Station 6E	Aug. 15	Aug. 23	4736.0	Oct. 4	+1510
	Aug. 23	Aug. 30	3872.0	Oct. 4	+ 810
	Aug. 30			Oct. 4	48.2
Station 10	Aug. 8			Oct. 4	+2780
	Aug. 15	Aug. 22	4287.4	Oct. 4	+3160
	Aug. 22	Aug. 30	3294.0	Oct. 4	+ 630
	Aug. 30			Oct. 4	33.0

+Means more than number listed.

Table 6. Range and mean length of largest Pacific Oyster spat, pendrell Sound, 1977.

Date In		Station						
		1	2	4	5	6	6E	10
25/7/77	Range	13-21	12-17	11-18	-	-	-	-
	Mean	15.6	13.8	13.7	-	-	-	-
	N	40	40	40	-	-	-	-
1/8/77	Range	12-21	13-18	10-14	13.17	8-17	-	-
	Mean	15.7	14.7	11.2	14.0	11.4	-	-
	N	40	40	40	40	40	-	-
8/8/77	Range	10-20	10-19	8-15	13-20	7-11	-	8-12
	Mean	14.4	14.2	10.9	14.6	8.4	-	9.4
	N	40	40	40	40	37	-	40
15/8/77	Range	8-13	7-12	7-10	7-14	9-14	7-11	7-11
	Mean	9.7	9.0	8.1	9.2	11.3	8.6	8.1
	N	40	40	35	40	40	40	36
22/8/77	Range	5-12	6-8	6-8	5-7	4-6	(23/8'77) 4-9	5-8
	Mean	7.8	6.7	6.8	5.9	4.6	6.0	6.3
	N	40	40	36	40	25	40	40
30/8/77	Range	4-6	3-6	4-7	3-6	4-5	4-6	4-5
	Mean	4.8	4.3	5.0	4.5	4.1	4.5	4.3
	N	20	40	40	40	40	40	31

Table 7. Mean spat counts on test cultch immersed at weekly intervals at Station 1, Hotham Sound, 1977. Samples taken 1 wk after immersion and on October 5.

Date in	Sample date	Mean spat count	Date out	Mean spat count
Aug. 2	Aug. 9	0	Oct. 5	29.0
Aug. 9	Aug. 16	0.1	Oct. 5	29.1
Aug. 16	Aug. 23	4.0	Oct. 5	26.8
Aug. 23	Aug. 30	18.5	Oct. 5	21.6
Aug. 30			Oct. 5	12.2

Table 8. Mean spat counts of O. lurida on test cultch Station 1, Hotham Sound, 1977.

Date In	Sample Date	Mean Spat Count	Final Date	Mean Cumulative Spat Count
2/8/77	9/8/77	0	5/10/77	1.4
9/8/77	16/8/77	0	5/10/77	0.2
16/8/77	23/8/77	0	5/10/77	0.5
23/8/77	30/8/77	0	5/10/77	0.2
30/8/77			5/10/77	0

Table 9. Temperature and salinity profiles taken at Station 2, Ladysmith Harbour June 1-August 29, 1977.

Depth	June						July			August						
	1	3	7	8	15	27	5	18	27	3	8	11	15	19	22	29
	<u>Water Temperatures, °C</u>															
0	13.8	13.2	18.1	16.9	21.1	19.1	17.4	18.4	21.8	22.3	23.3	24.6	25.3	21.8	21.1	17.4
1	12.9	13.1	17.5	16.3	20.6	19.2	16.9	18.3	21.7	22.1	23.2	24.4	25.2	21.6	18.7	17.0
2	12.7	12.8	17.4	15.0	17.5	17.2	16.6	17.9	21.1	21.6	22.0	23.8	24.5	21.0	17.8	16.3
3	12.2	12.5	15.9	14.5		16.0	16.3	17.9	21.2	21.0	20.9	22.5	24.1	20.0	18.0	13.0
4	13.4	12.4		14.5		16.6	16.4	17.9	21.0	22.0	20.5	24.3	24.7	17.2	18.0	14.9
5	13.8	12.5				17.0	16.3	18.0	22.0	22.1	21.5	24.4	24.7	20.7	17.6	15.0
6	13.1	12.6				16.5	16.4	17.7	22.0	21.3	20.7	23.7	24.0	19.6	17.0	15.1
	<u>Salinities, ‰</u>															
0						27.3	27.1	26.5	26.5	26.9	25.8	26.1	26.0	26.0	25.9	25.8
1						27.2	27.0	26.5	26.5	26.9	25.8	26.0	25.9	25.9	26.3	25.0
2						27.2	27.0	27.0	26.6	26.7	26.9	25.9	26.1	26.0	26.1	24.4
3						27.4	27.1	22.5	26.3	26.8	26.0	23.7	22.8	25.9	25.4	23.3
4						26.6	27.0	22.9	21.6	23.0	25.1	23.8	23.4	25.8	25.1	25.0
5						26.6	20.2	23.3	25.7	25.6	24.8	23.6	23.2	23.2	23.9	23.3
6						26.7	22.4	23.5	25.5	21.0	20.8	23.9	23.7	24.6	25.5	23.0

Table 10. Temperature and salinity profiles taken at Station 6, Ladysmith Harbour, June 3-August 29, 1977.

Depth	June				July			August					
	3	7	15	27	5	18	27	3	8	11	15	22	29
	<u>Water temperature, °C</u>												
0	10.2	10.5	16.5	16.7	17.5	18.4	20.1	18.4	21.7	21.2	22.2	19.6	15.4
1	10.2	10.9	15.5	16.7	16.3	18.3	20.0	18.4	21.5	20.4	18.9	18.9	14.1
2	11.2	10.7	15.3	16.5	15.5	17.9	20.0	18.5	21.2	20.1	17.9	17.0	13.9
3	11.6	14.5	14.7	12.9	14.9	17.9	17.7	18.3	19.2	19.6	17.4	15.8	13.8
4	11.9	16.4	15.5	13.0	14.7	17.9	17.4	18.3	17.4		18.4	14.9	13.7
5	12.2	16.8	15.7	14.0	15.0	18.0	16.9	18.8	18.4		18.7	14.6	14.2
6	12.3	16.9	15.6	14.1	14.9	17.7	15.8	19.4	17.8		19.3	14.8	14.2
	<u>Salinities, ‰</u>												
0				27.2	26.8	26.5	26.0	25.5	25.0	25.1	25.6	26.1	27.6
1				27.2	27.2	26.5	26.1	25.6	25.0	25.2	25.5	26.5	27.8
2				26.9	26.9	27.0	26.1	25.7	25.0	25.1	25.6	26.6	27.9
3				27.4	27.5	22.5	26.2	25.6	25.2	25.3	25.6	26.8	27.9
4				27.2	27.8	22.9	26.3	25.6	25.5		23.0	27.1	27.8
5				26.5	27.3	23.3	26.5	25.3	24.9		25.0	21.7	27.7
6				26.4	27.0	23.5	26.3	24.1	25.1		24.7	26.7	27.4

Table 11. Mean spat counts on test cultch immersed at Stations 2 and 6, Ladysmith Harbour, 1977.

	Date In	Sample Date	Mean Spat Count	Date Out	Mean Cumulative Spat Count
Station 2	Aug. 3	Aug. 8	0	Sept. 16	0
	Aug. 8	Aug. 15	0	Sept. 16	0
	Aug. 15	Aug. 22	0.1	Sept. 16	0.2
	Aug. 22	Aug. 29	0.3	Sept. 16	0
	Aug. 29			Sept. 16	0
Station 6	Aug. 3	Aug. 8	0	Sept. 16	0
	Aug. 8	Aug. 15	0	Sept. 16	0
	Aug. 15	Aug. 22	0.8	Sept. 16	1.2
	Aug. 22	Aug. 29	0.3	Sept. 16	0.2
	Aug. 29			Sept. 16	0.4

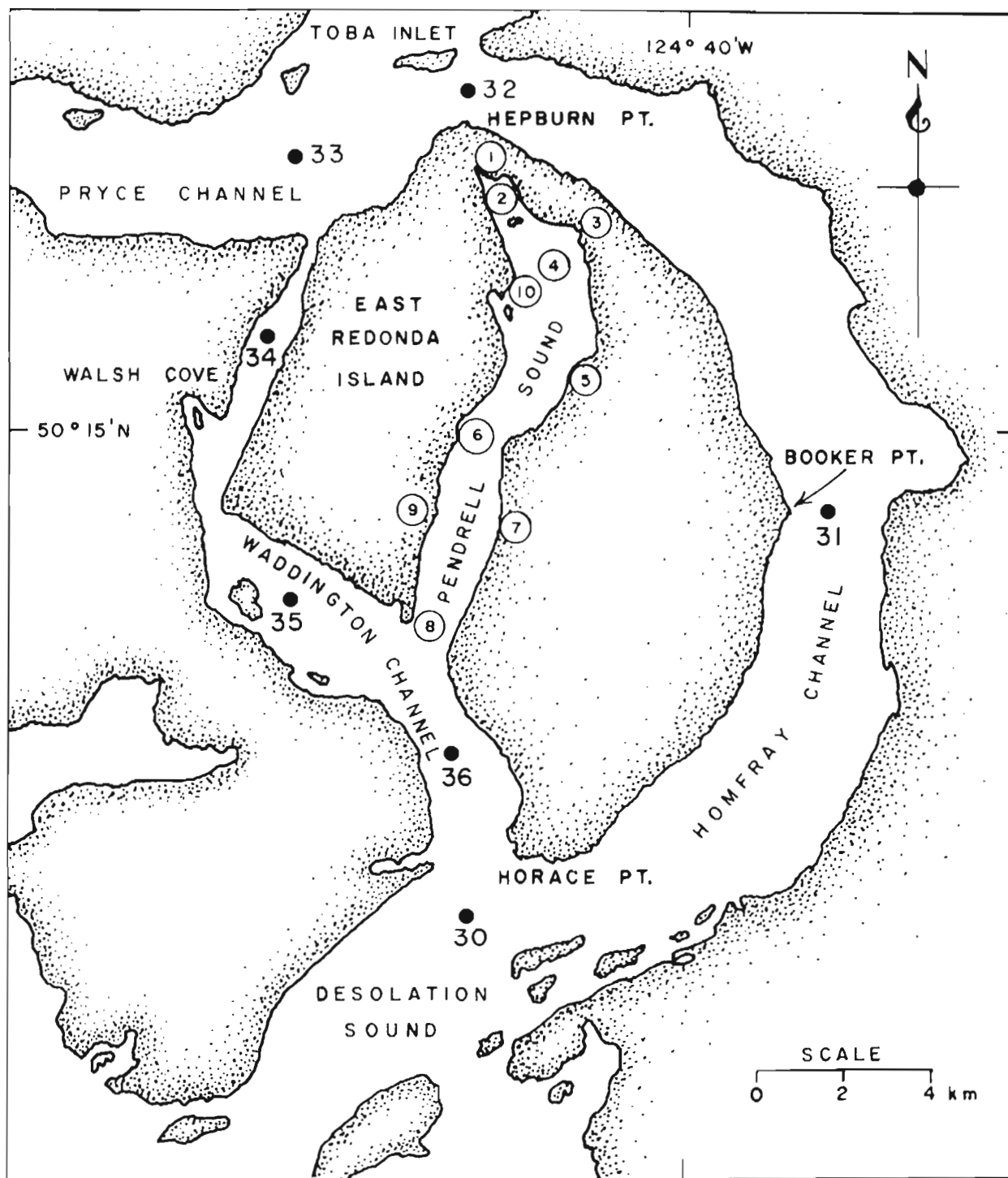
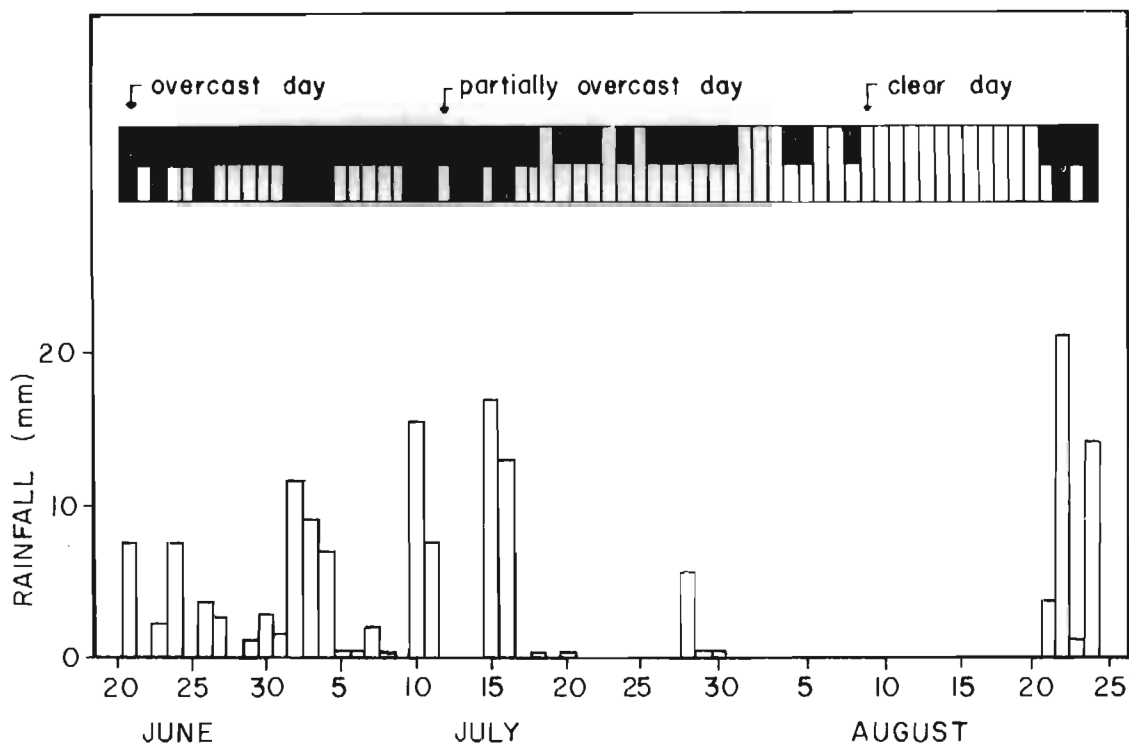
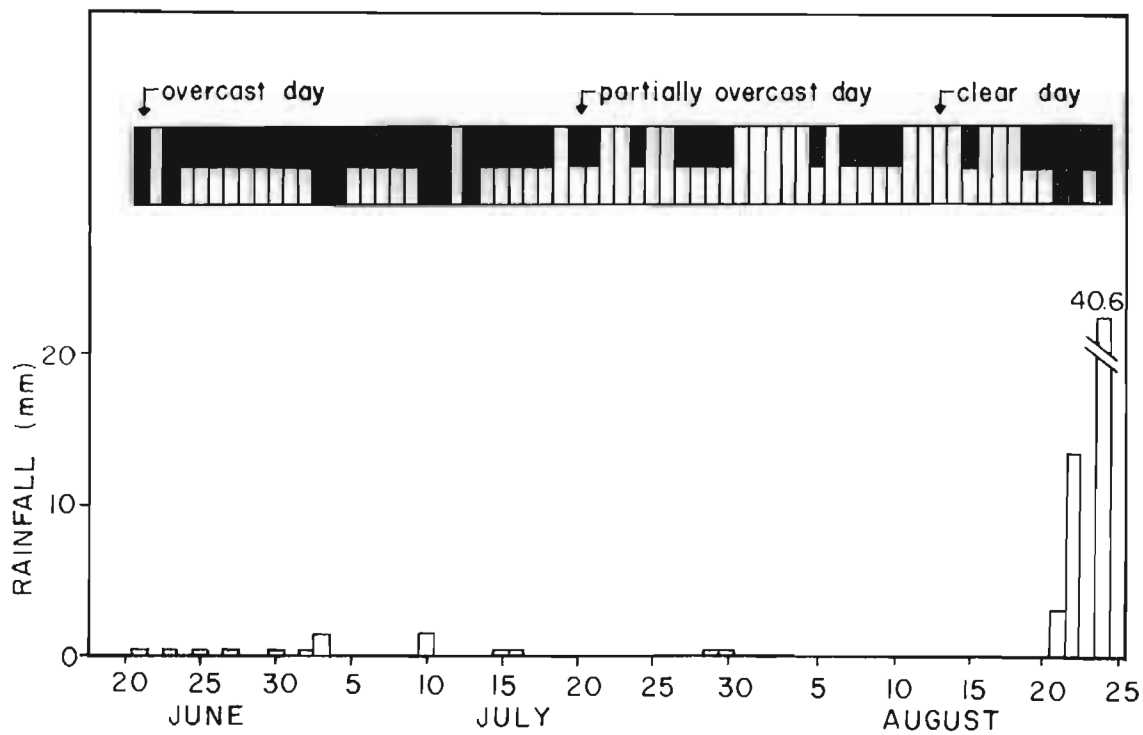


Fig. 1. Map of Pendrell Sound and surrounding waters showing permanent sampling stations.



- 2A -



- 2B -

Fig. 2A & B. Daily cloud cover and rainfall (A) at Whaletown, Cortes Island and (B) at Station 2, Pendrell Sound; June 19 - August 25, 1977.

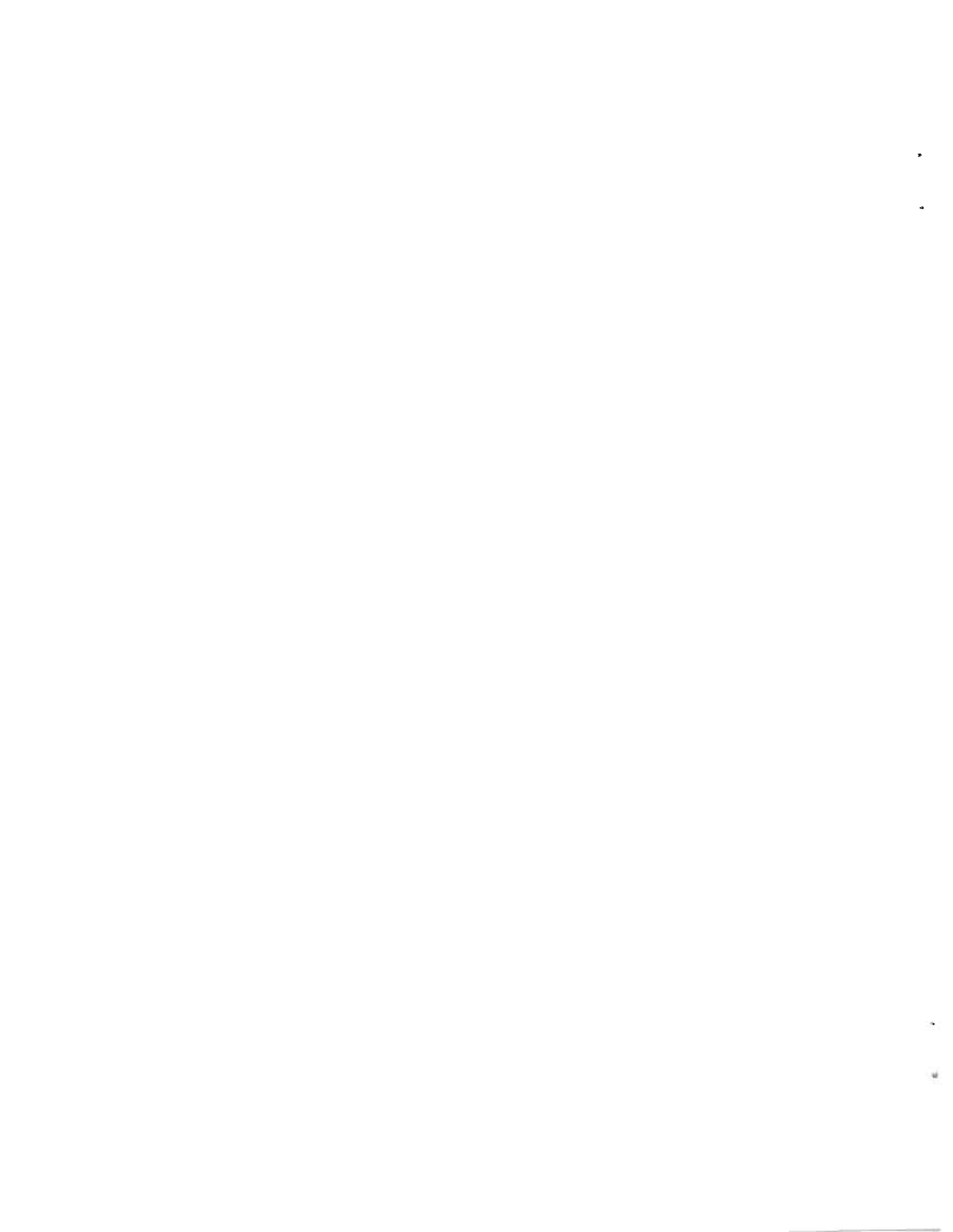


Fig. 3. Mean daily water temperatures at depths of 1 and 3 m, Station 1, Pendrell Sound, June 8 - September 7, 1977.

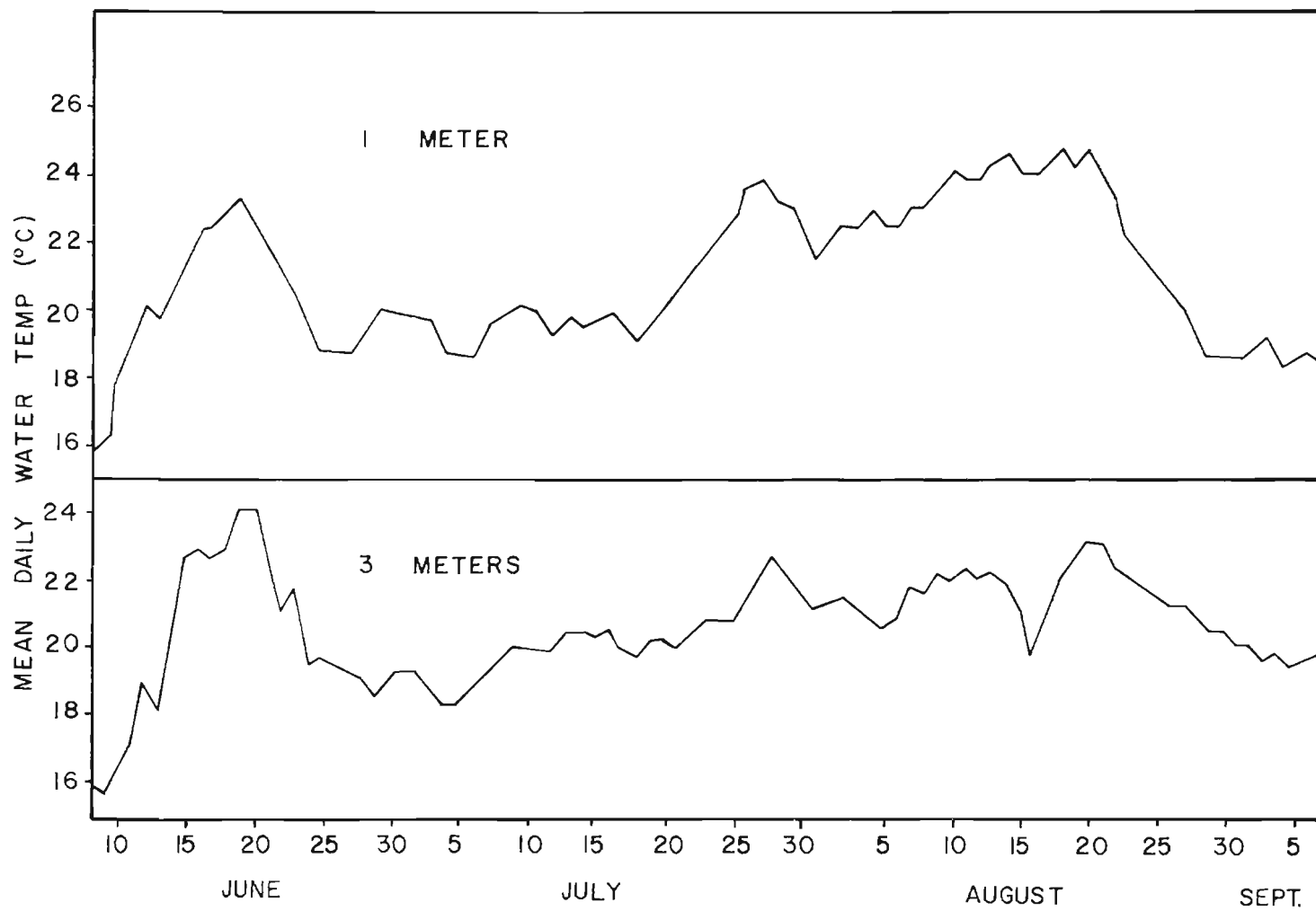
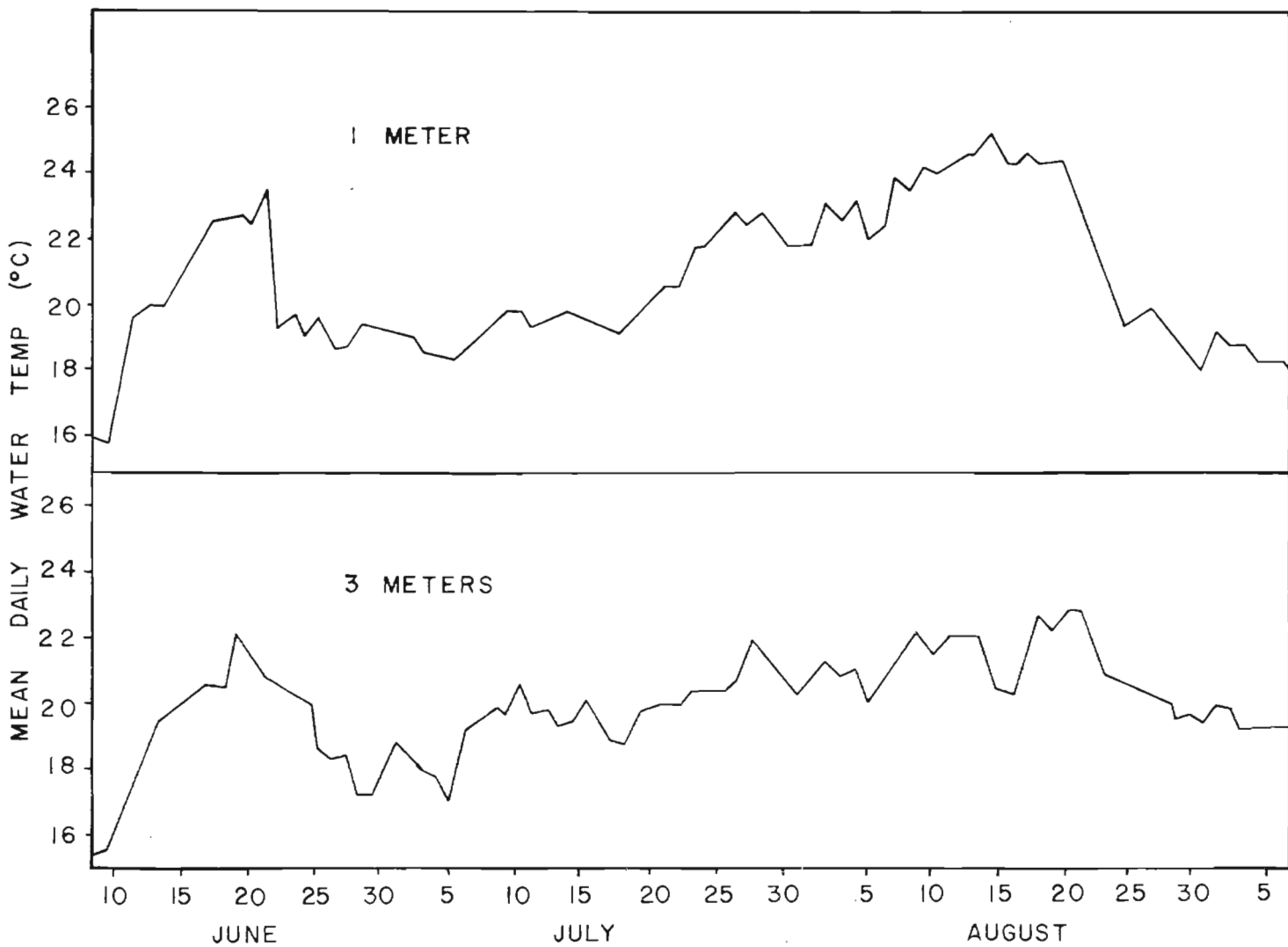




Fig. 4. Mean daily water temperatures at depths of 1 and 3 m, Station 2, Pendrell Sound, June 8 - September 7, 1977.





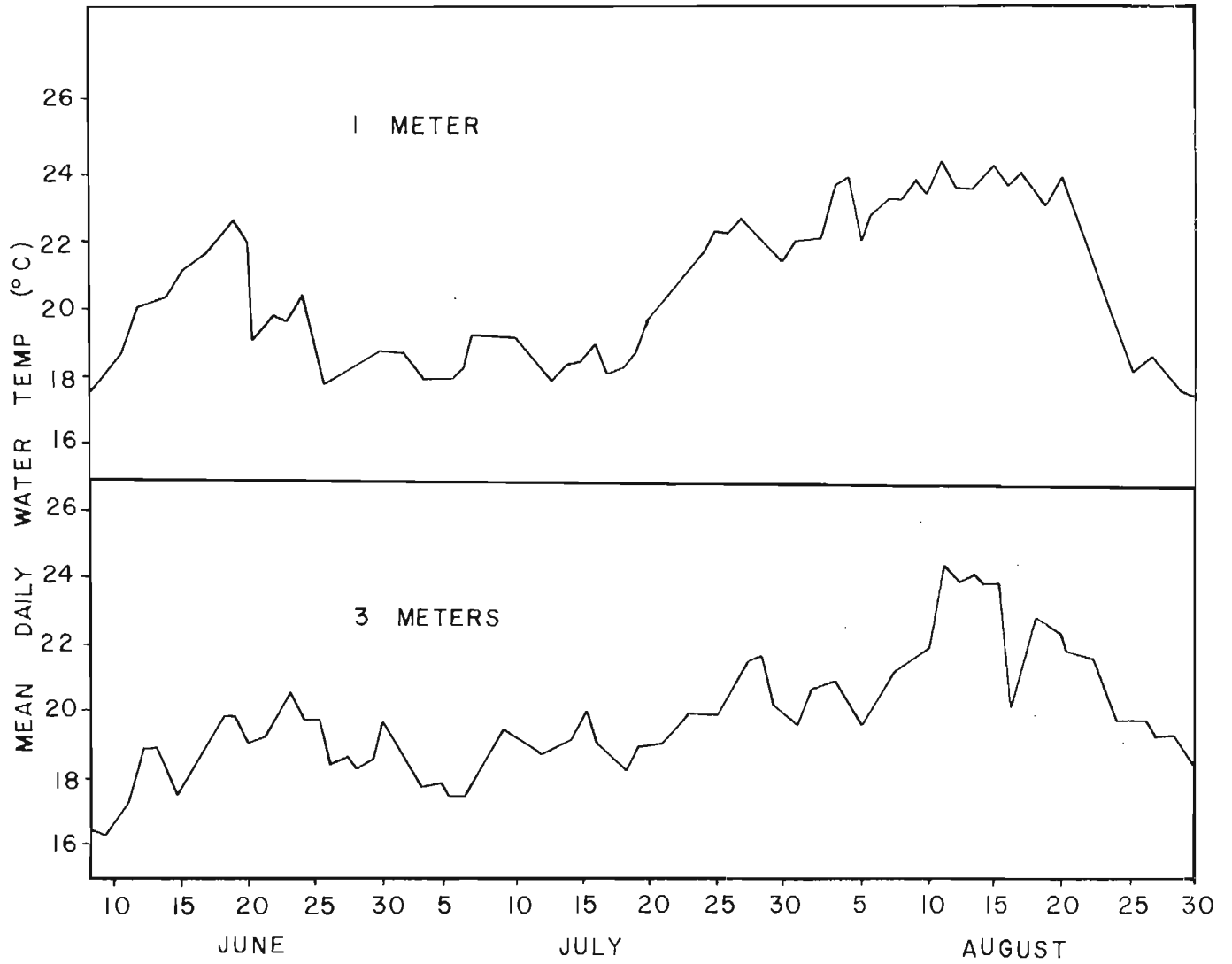


Fig. 5. Mean daily water temperatures at depths of 1 and 3 m, Station 4, Pendrell Sound, June 8 - August 30, 1977.



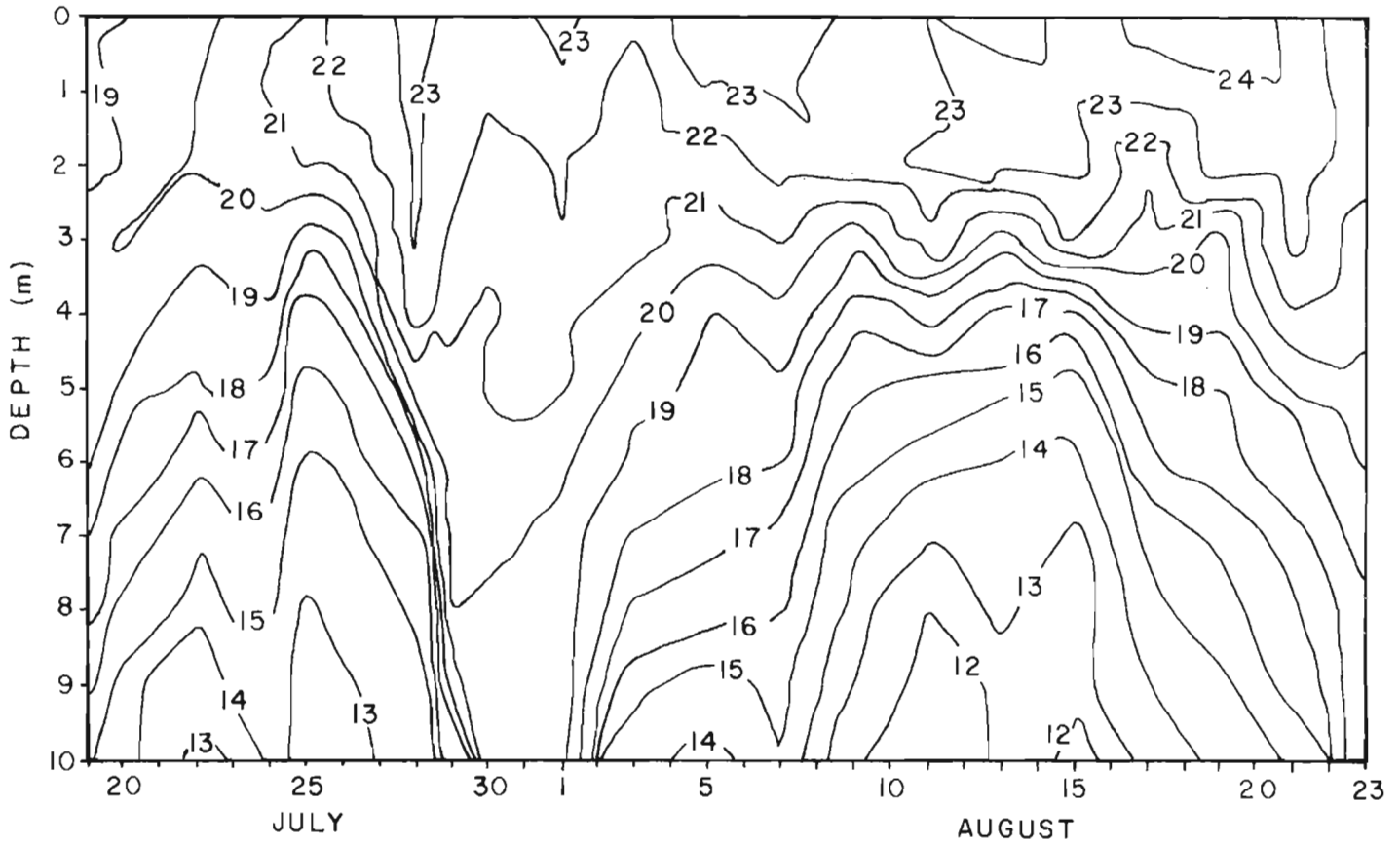


Fig. 6. Temperature contour profile from the surface to a depth of 10 m at Station 1, Pendrell Sound, July 19 - August 23, 1977.

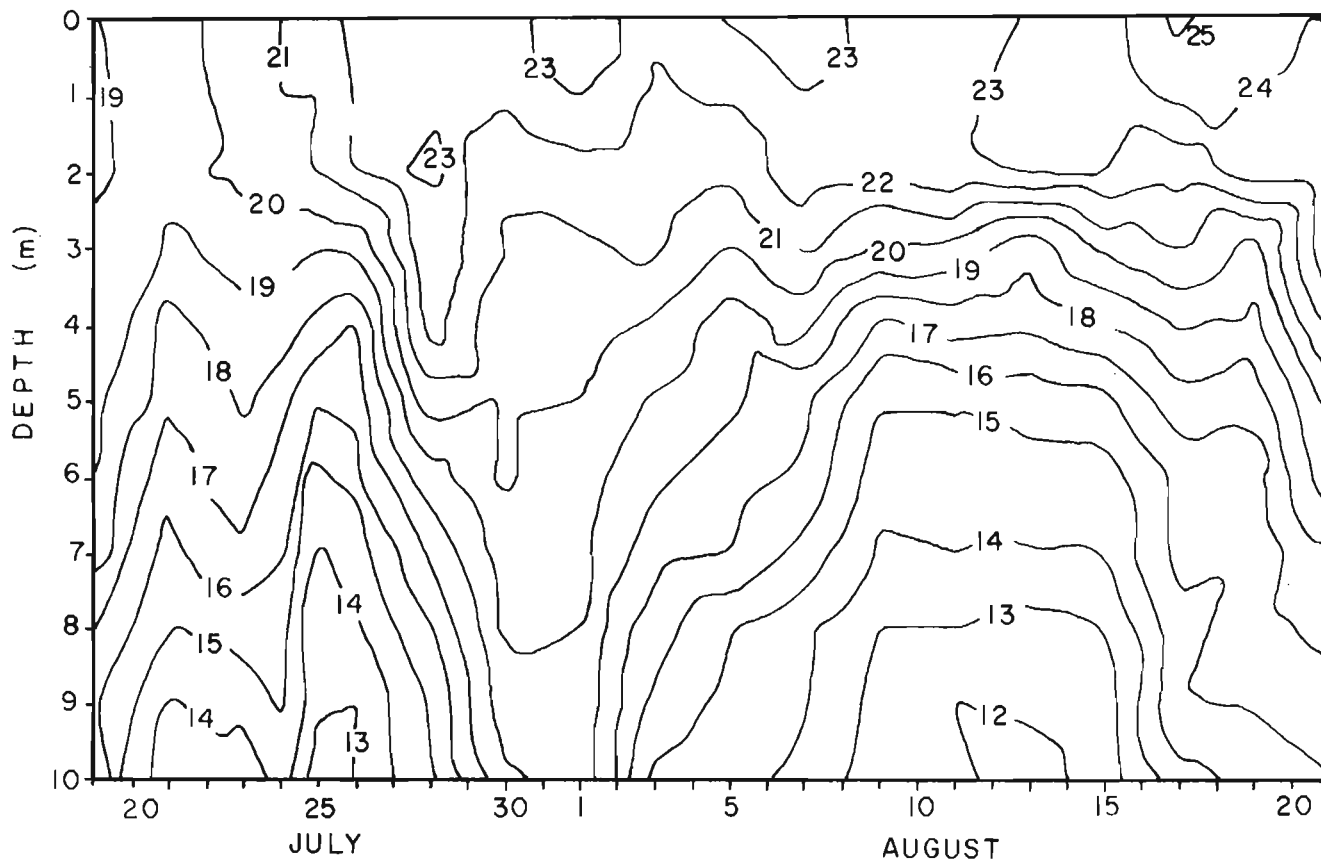


Fig. 7. Temperature contour profile from the surface to a depth of 10 m at Station 2, Pendrell Sound, July 19 - August 23, 1977.



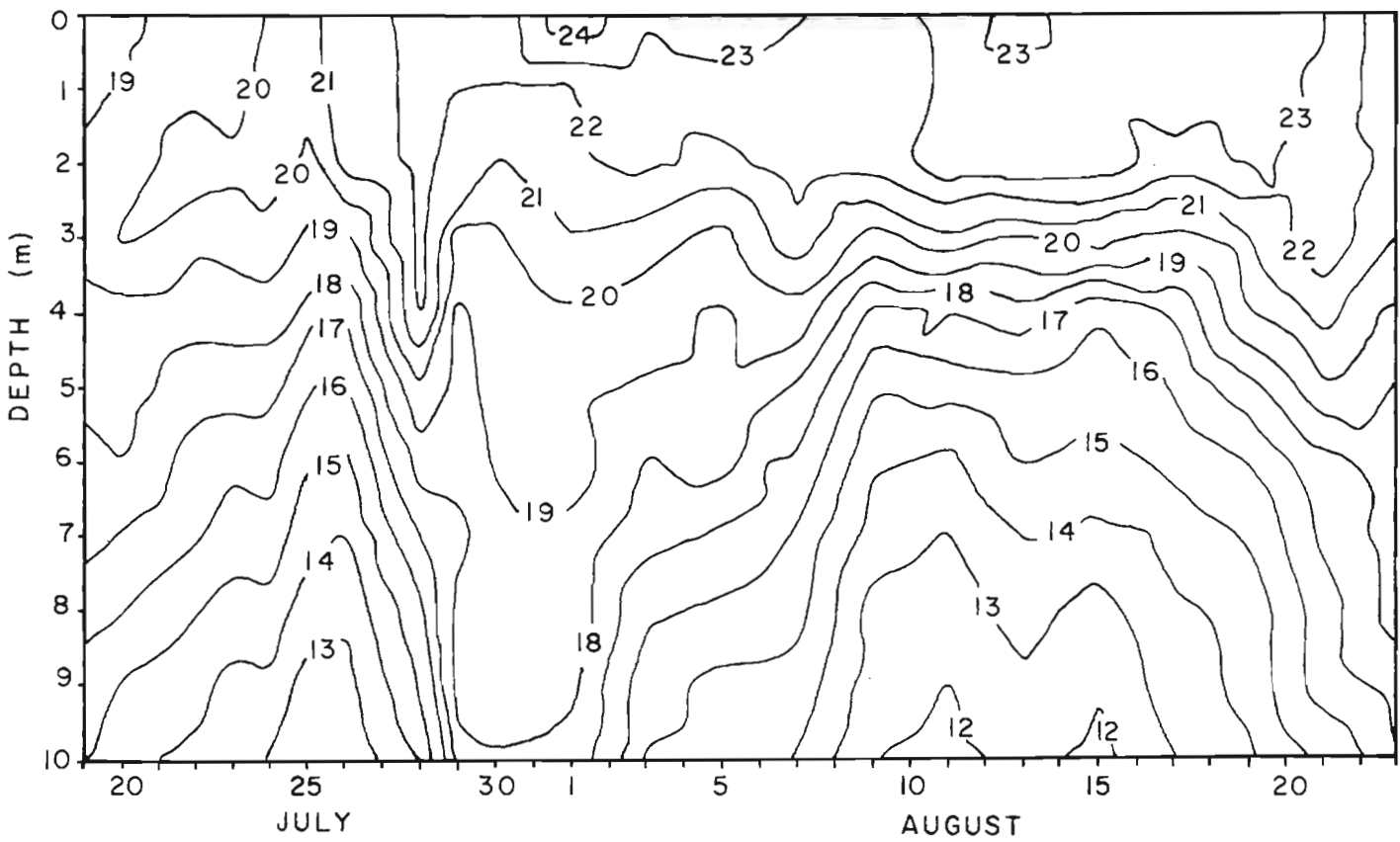


Fig. 8. Temperature contour profile from the surface to a depth of 10 m at Station 4, Pendrell Sound, July 19 - August 23, 1977.

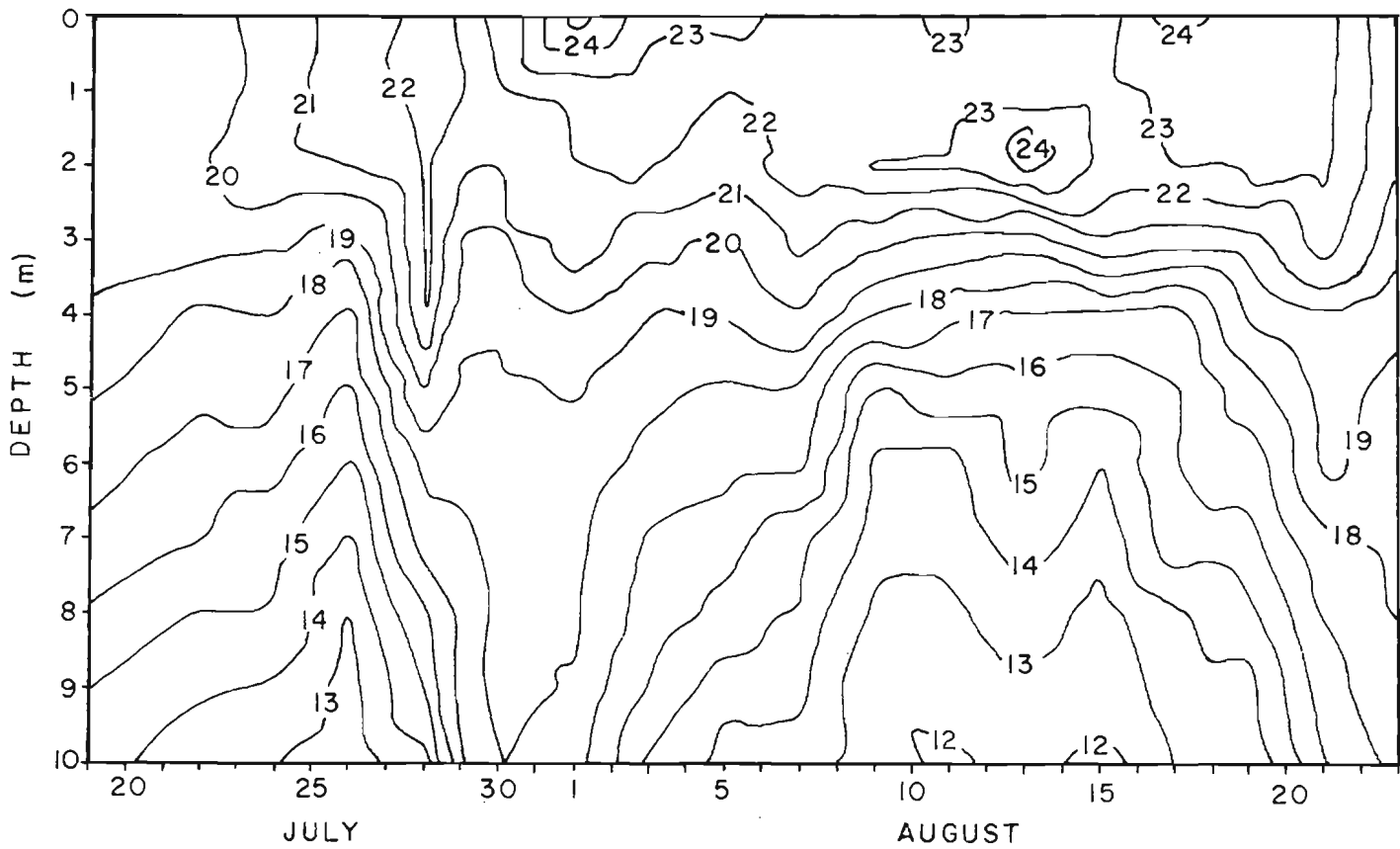


Fig. 9. Temperature contour profile from the surface to a depth of 10 m at Station 5, Pendrell Sound, July 19 - August 23, 1977.

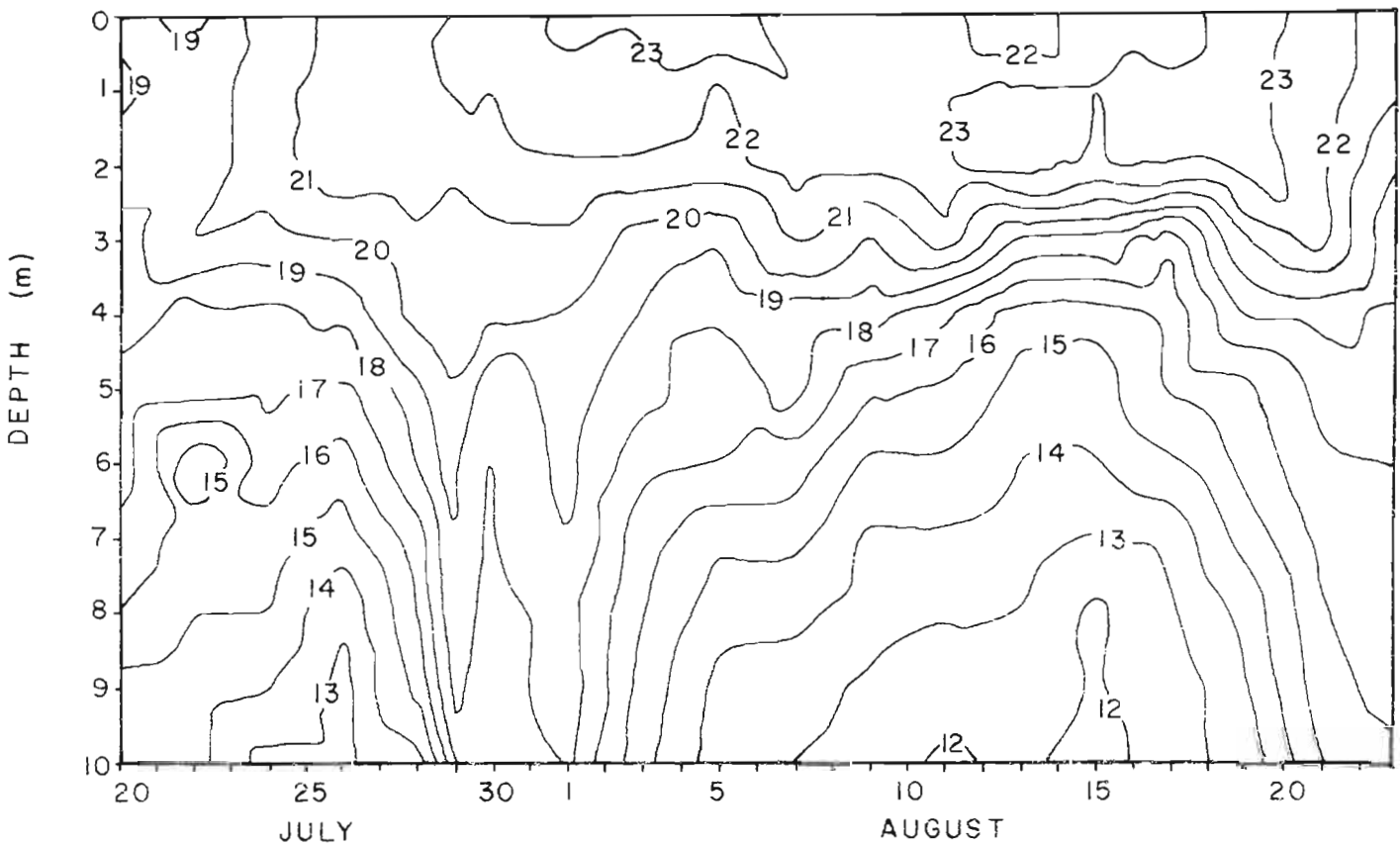


Fig. 10. Temperature contour profile from the surface to a depth of 10 m at Station 6, Pendrell Sound, July 20 - August 23, 1977.

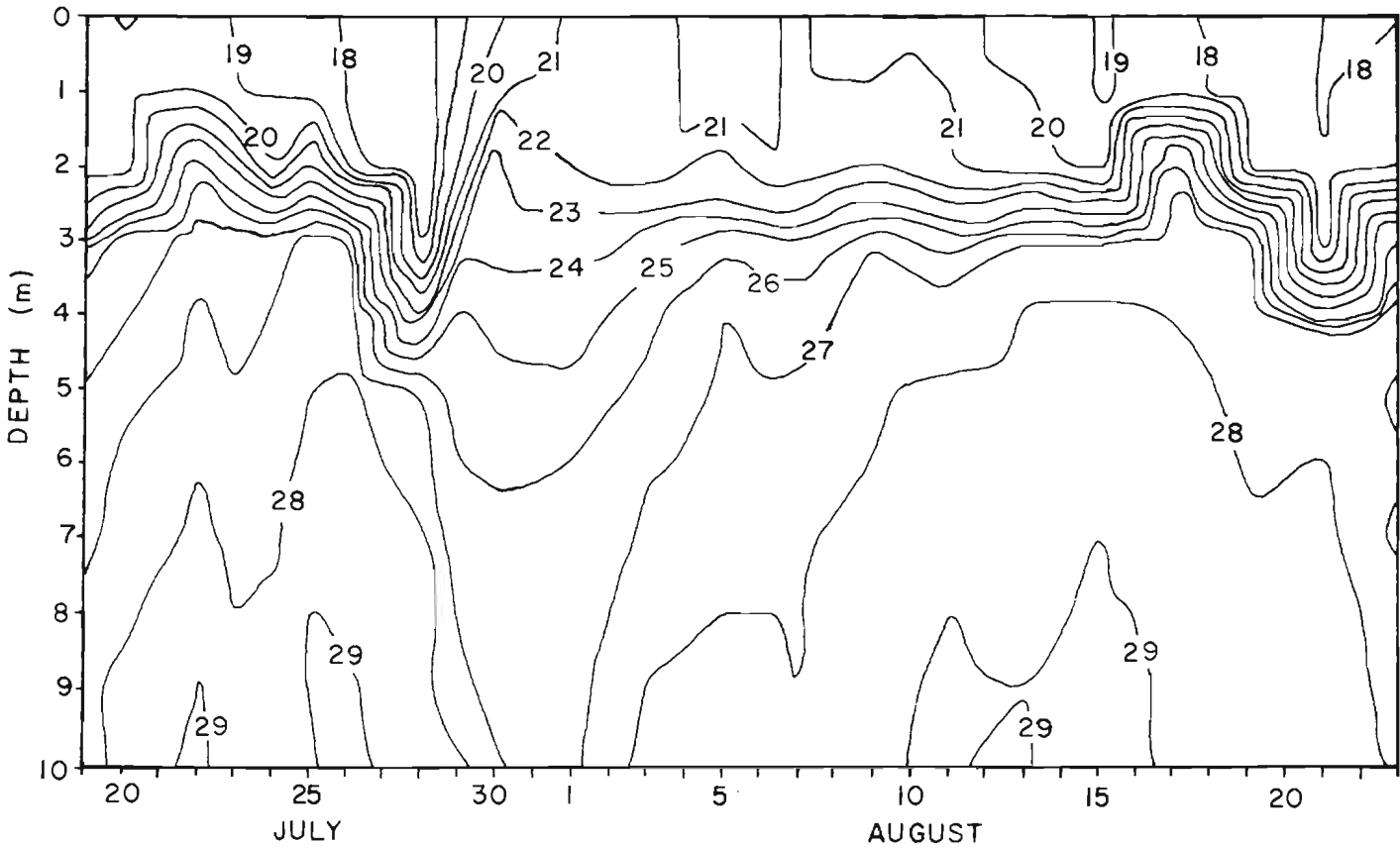


Fig. 11. Salinity contour profile from the surface to a depth of 10 m at Station 1, Pendrell Sound, July 19 - August 23, 1977.



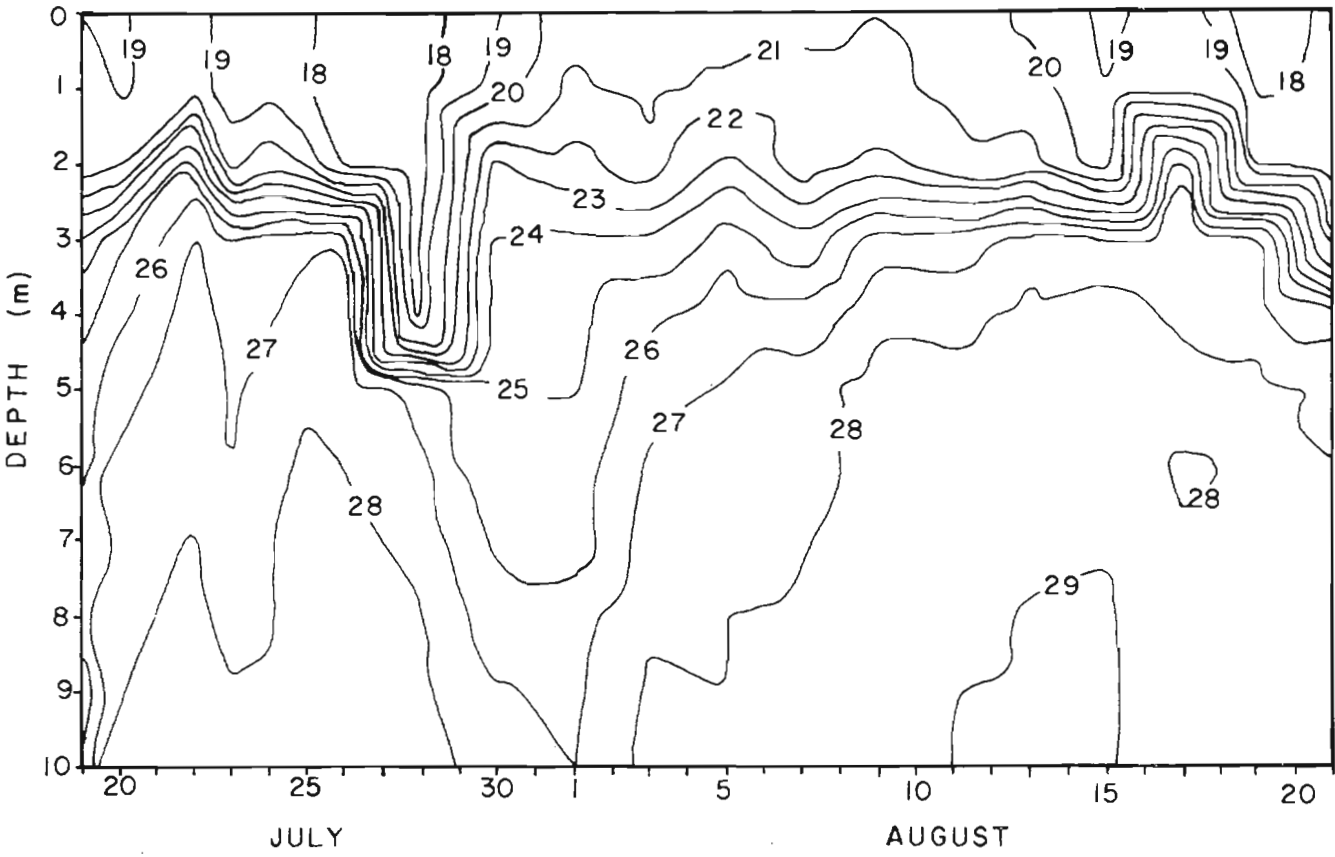


Fig. 12. Salinity contour profile from the surface to a depth of 10 m at Station 2, Pendrell Sound, July 19 - August 21, 1977.



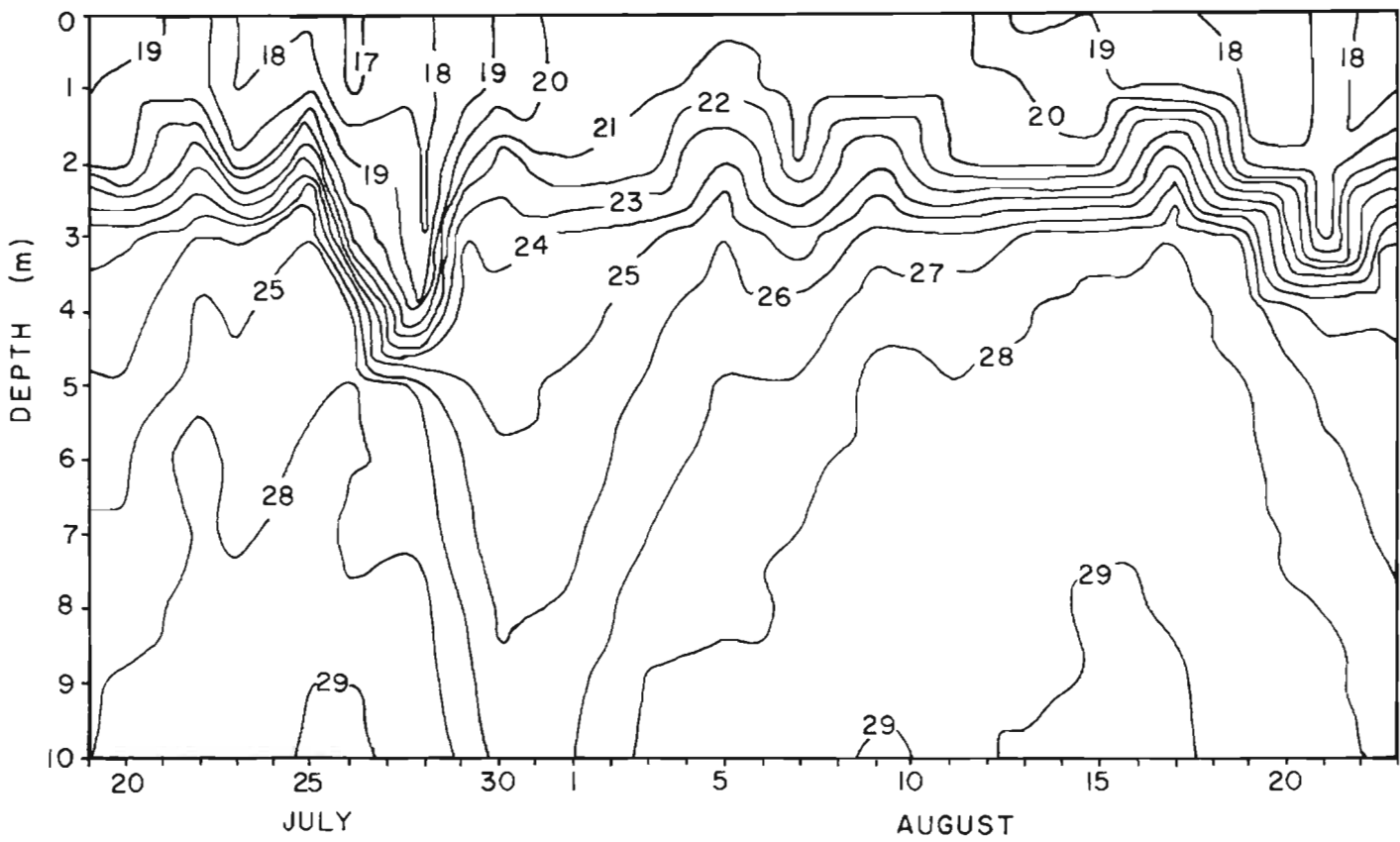


Fig. 13. Salinity contour profile from the surface to a depth of 10 m at Station 4, Pendrell Sound, July 19 - August 23, 1977.

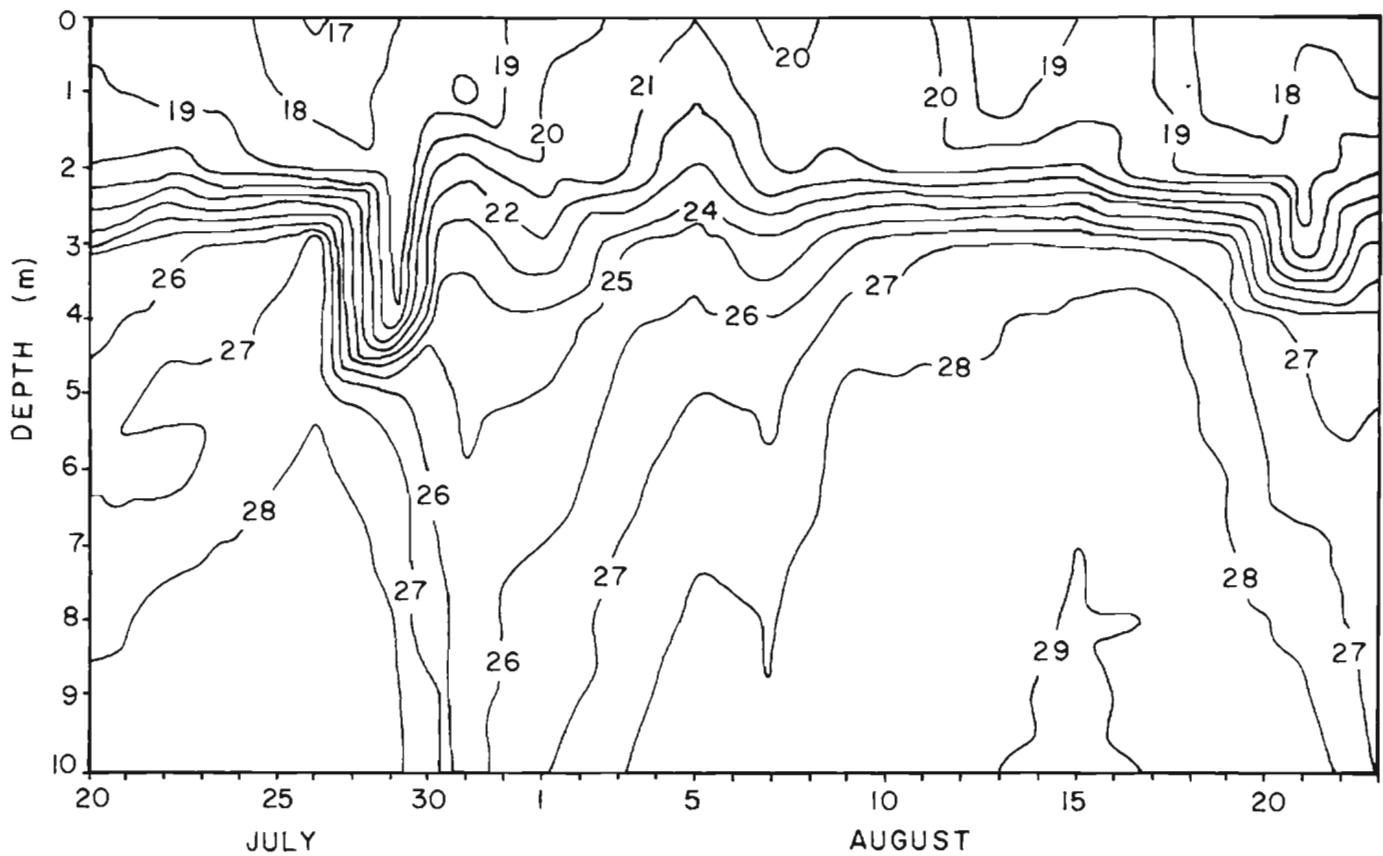


Fig. 14. Salinity contour profile from the surface to a depth of 10 m at Station 5, Pendrell Sound, July 20 - August 23, 1977.

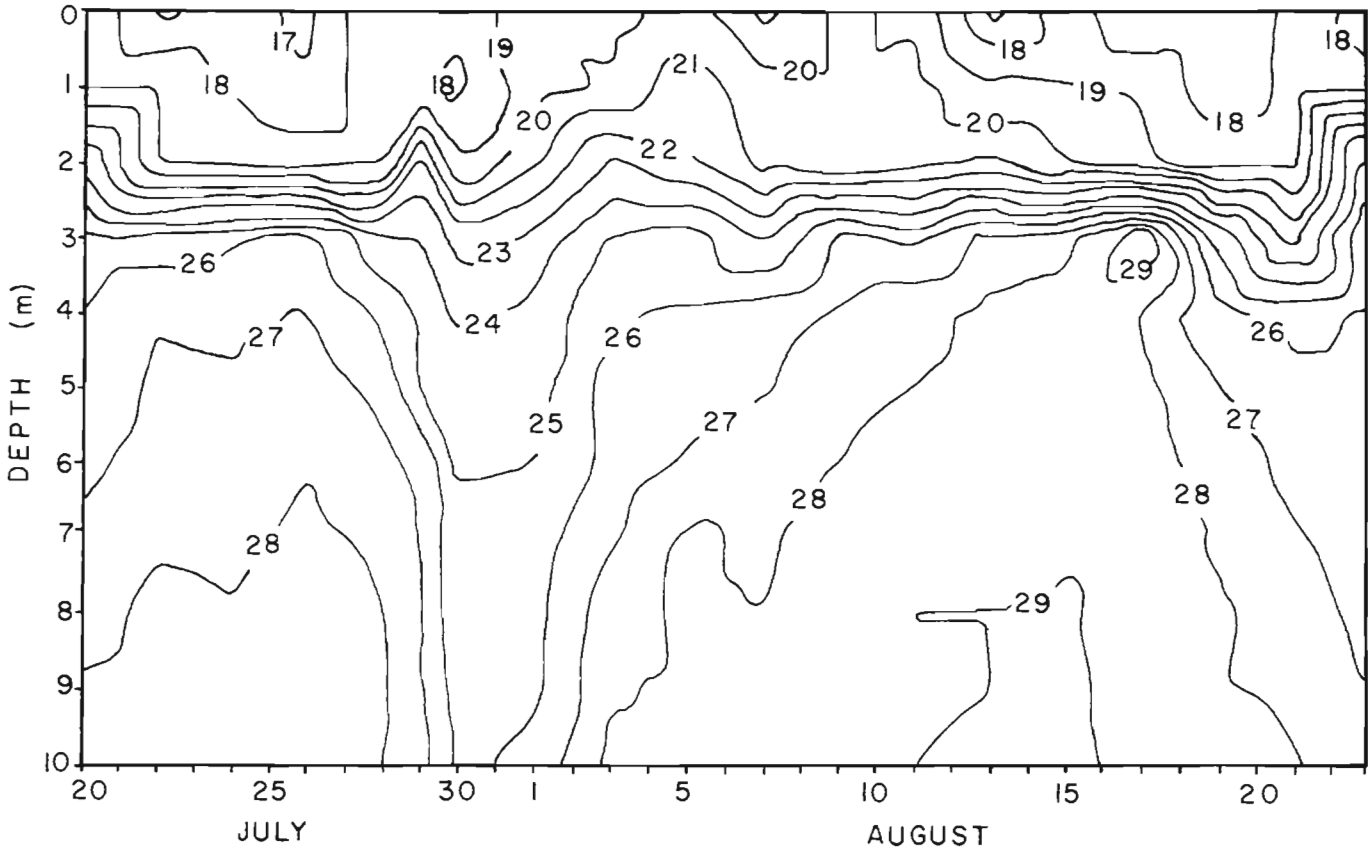


Fig. 15. Salinity contour profile from the surface to a depth of 10 m at Station 6, Pendrell Sound, July 20 - August 23, 1977.

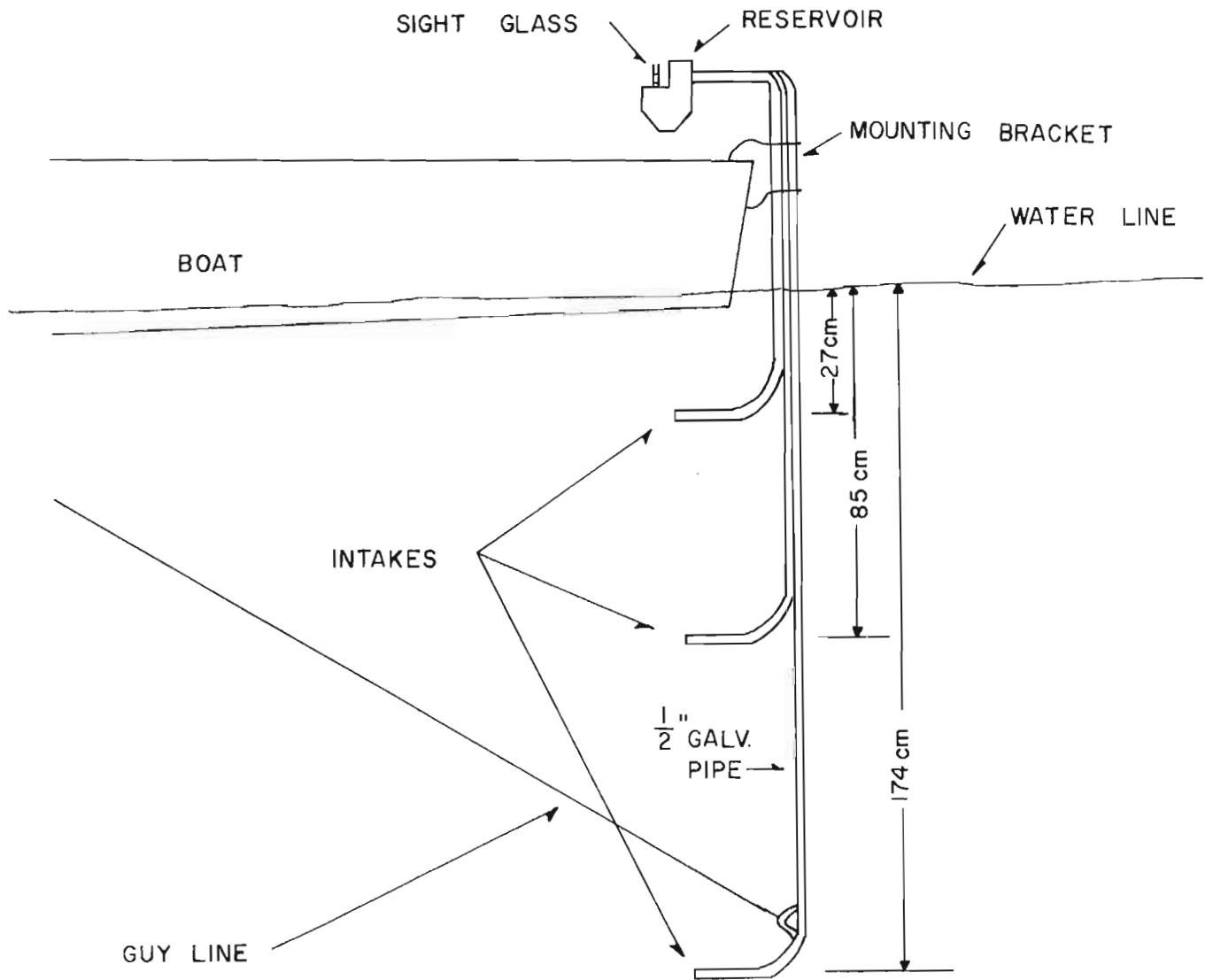


Fig. 16. Multiple depth running pipe sampler.

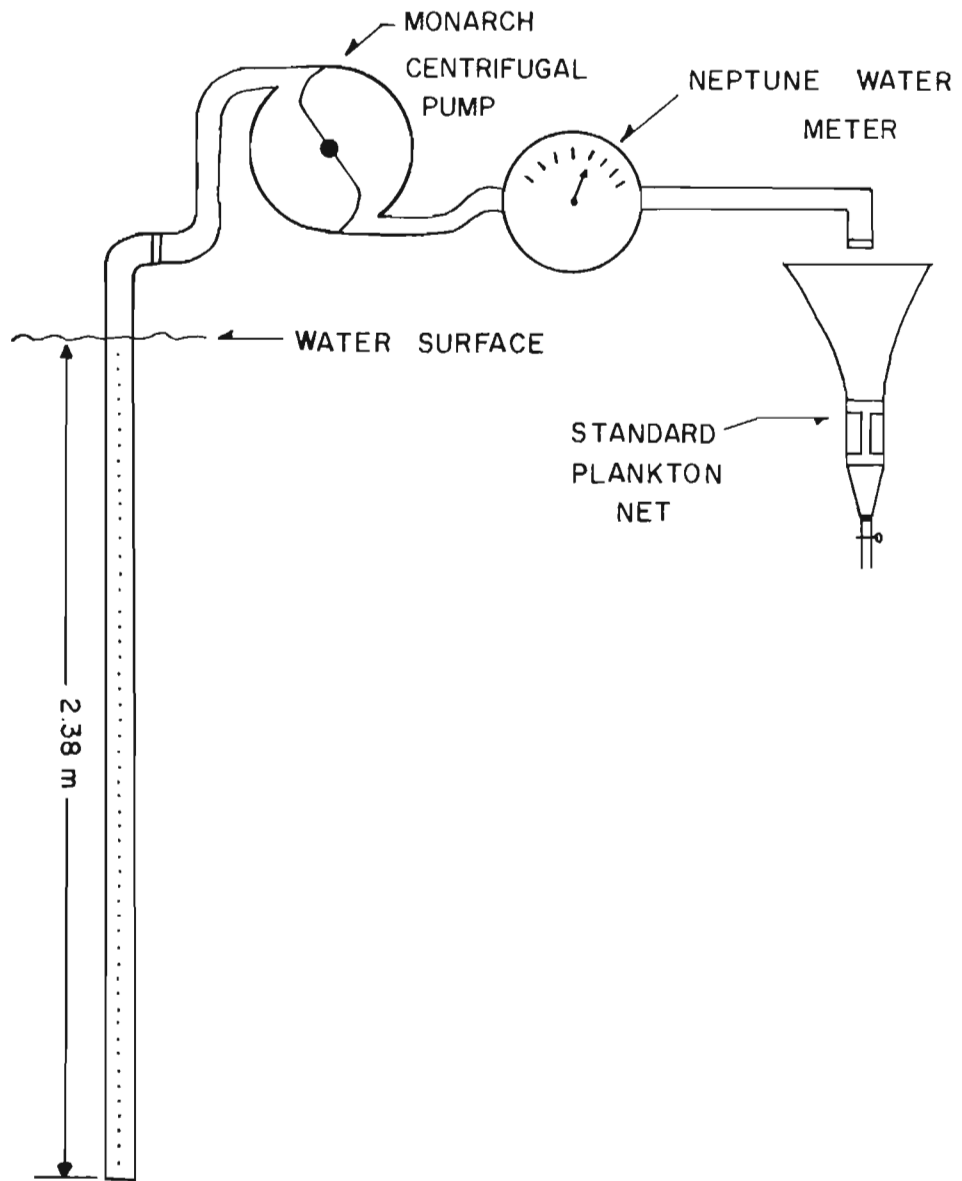


Fig. 17. Schematic drawing of standing pump sampler.

Fig. 18. Relative number of the five developmental stages of *C. gigas* from surface plankton tows at Station 1, Pendrell Sound, June 8 - August 30, 1977.

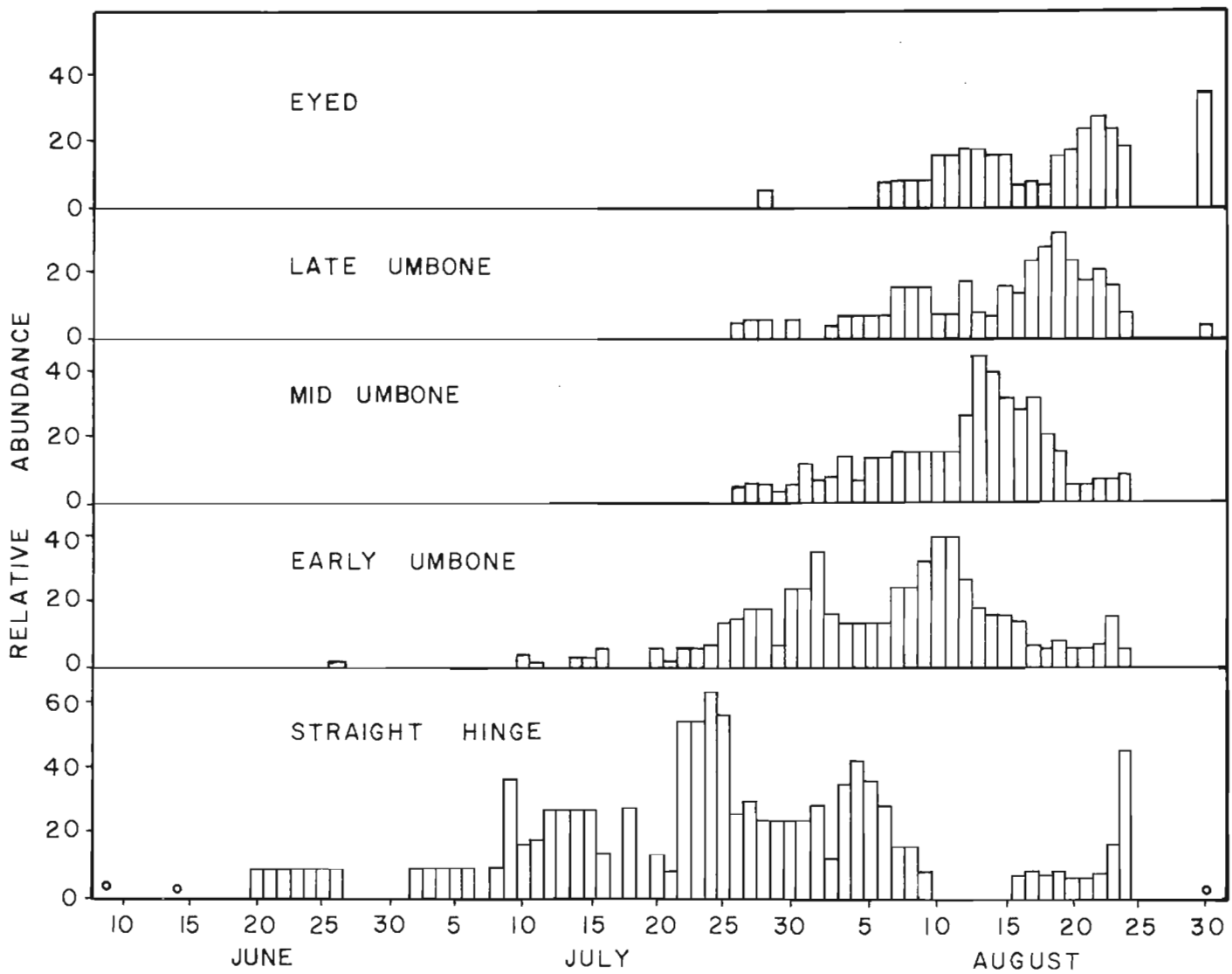


Fig. 19. Relative number of the five developmental stages of *C. gigas* from surface plankton tows at Station 4, Pendrell Sound, June 8 - August 30, 1977.

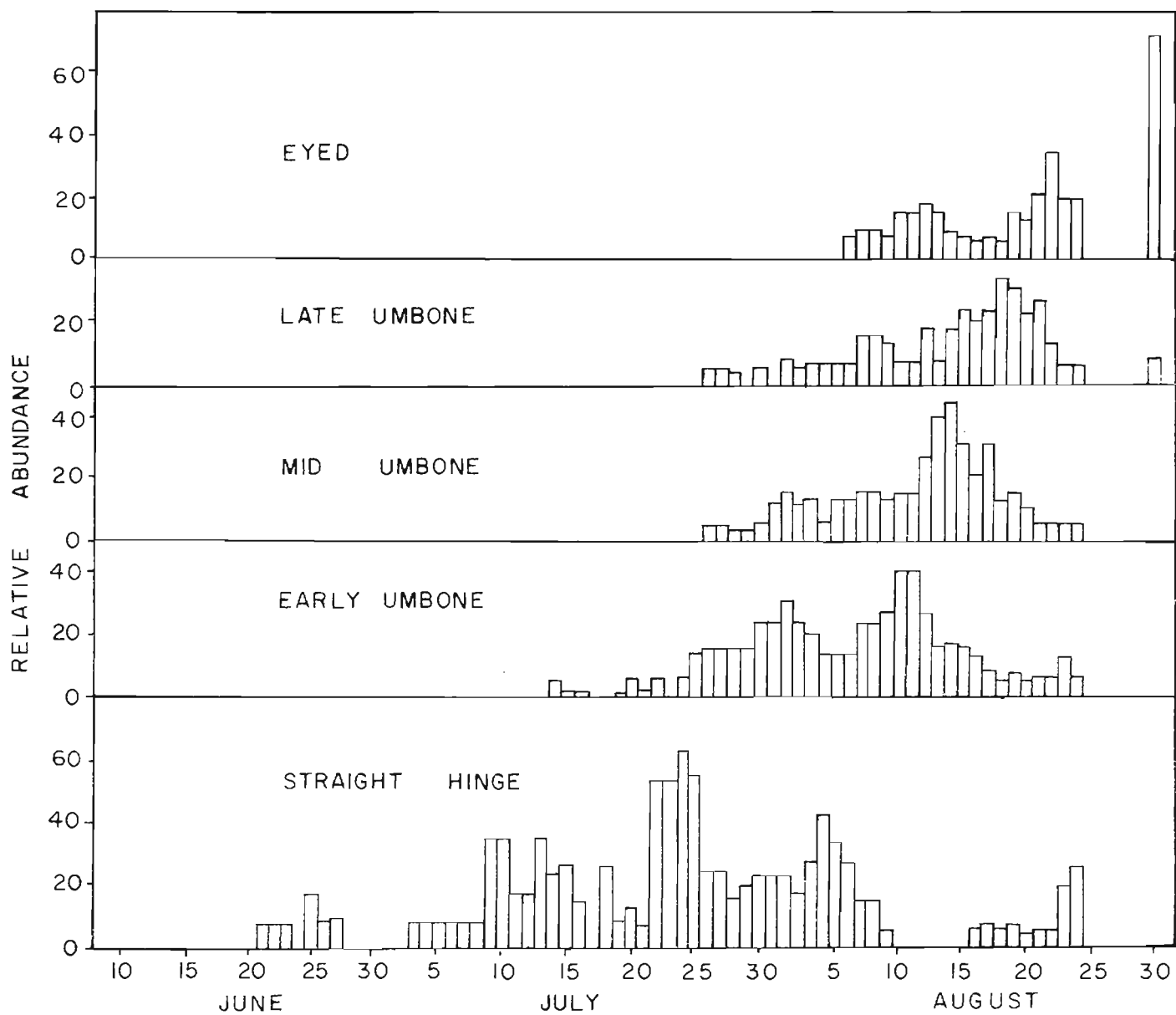
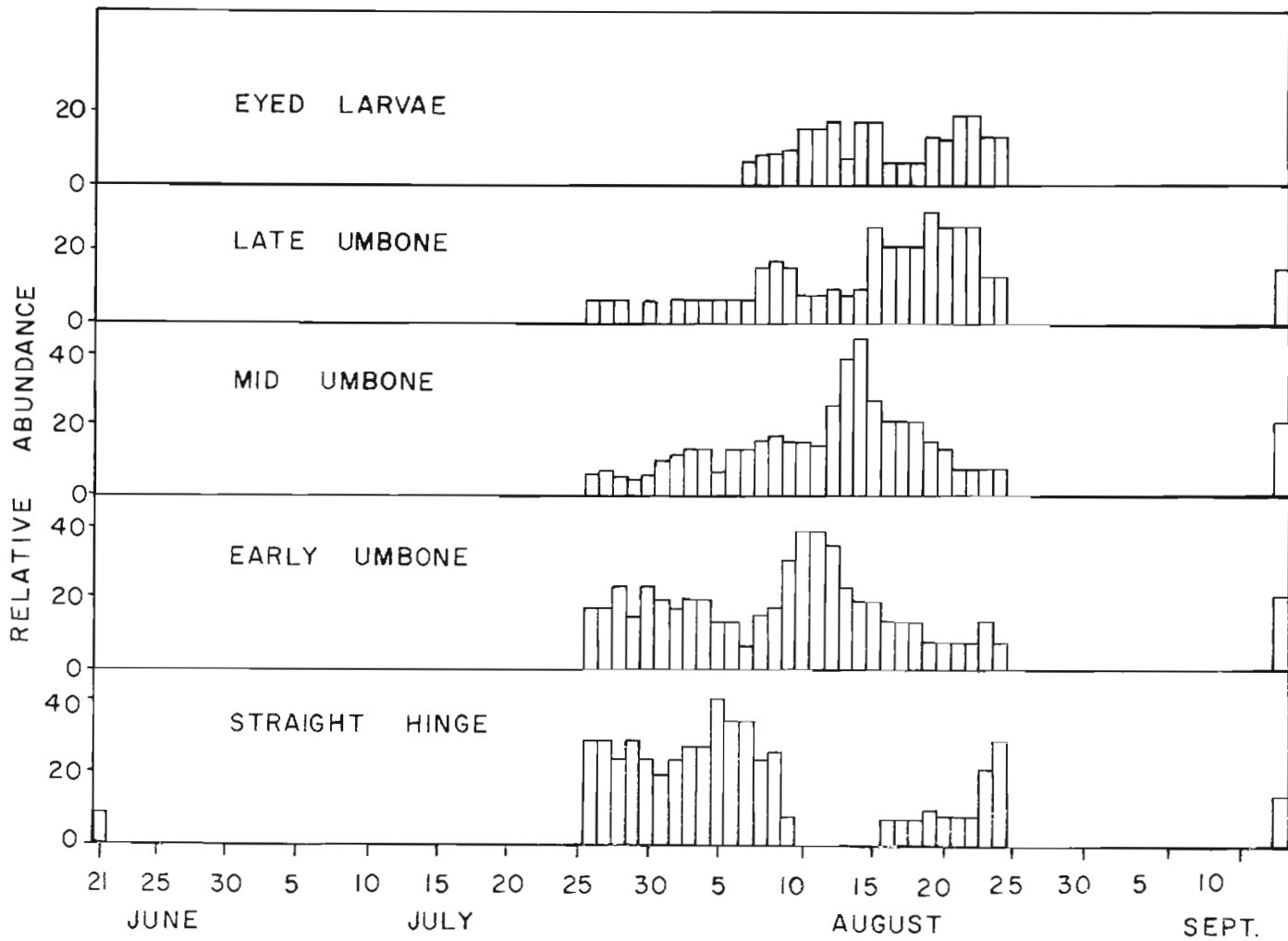


Fig. 20. Relative number of the five developmental stages of C. rigas from surface plankton tows at Station 5, Pendrell Sound, June 21 - September 15, 1977.



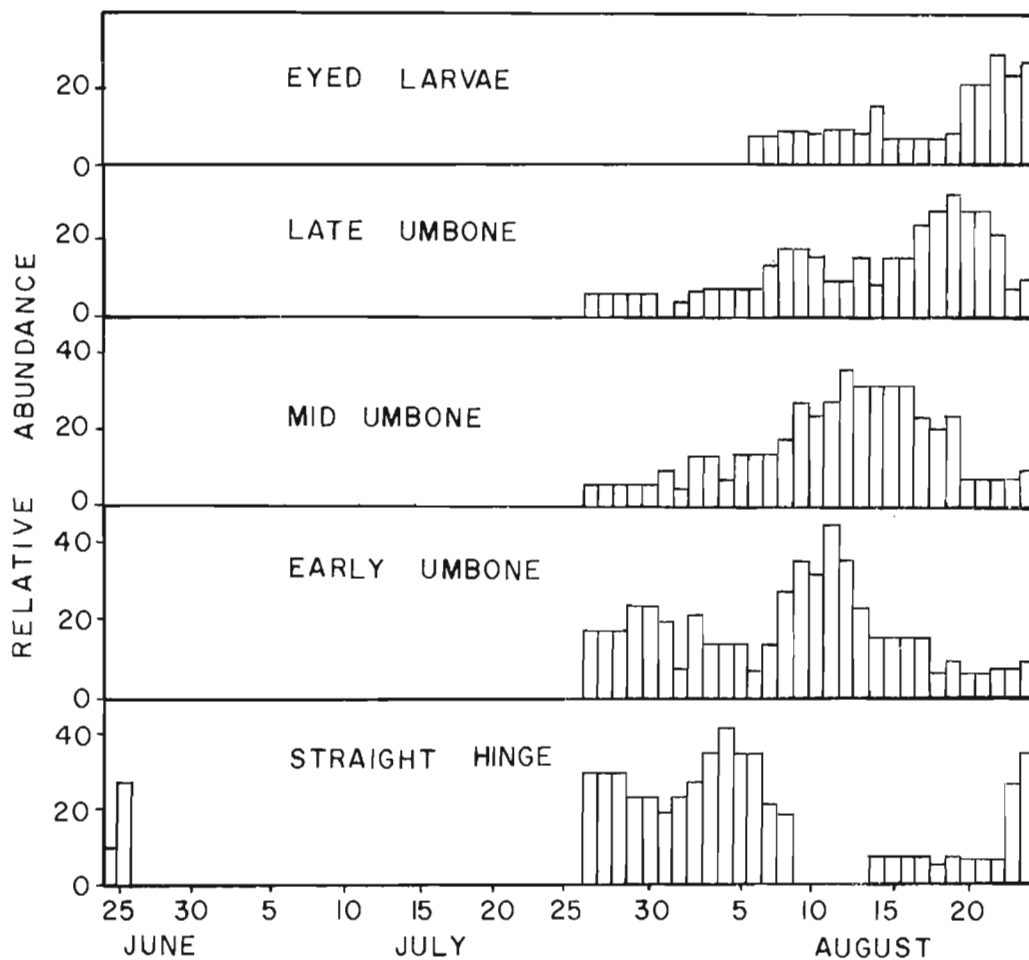


Fig. 21. Relative number of the five developmental stages of *C. gigas* from surface plankton tows at Station 6, Pendrell Sound, June 24 - August 24, 1977.

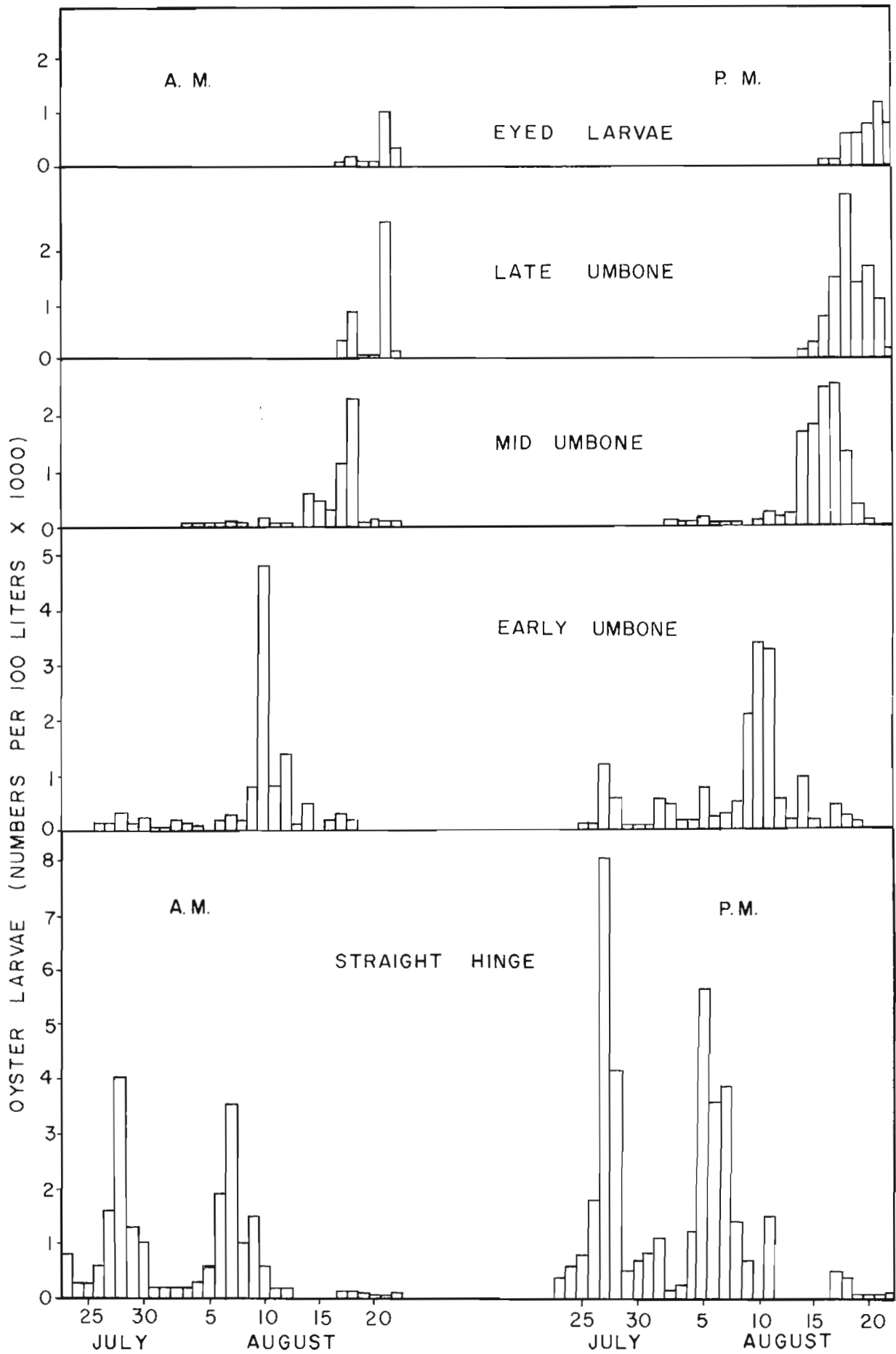


Fig. 22. Morning and evening counts of five larval stages of *C. gigas* in standing pump samples taken at Station 2, Pendrell Sound, July 23 - August 23, 1977. Samples taken at 0700 & 1900 PST.



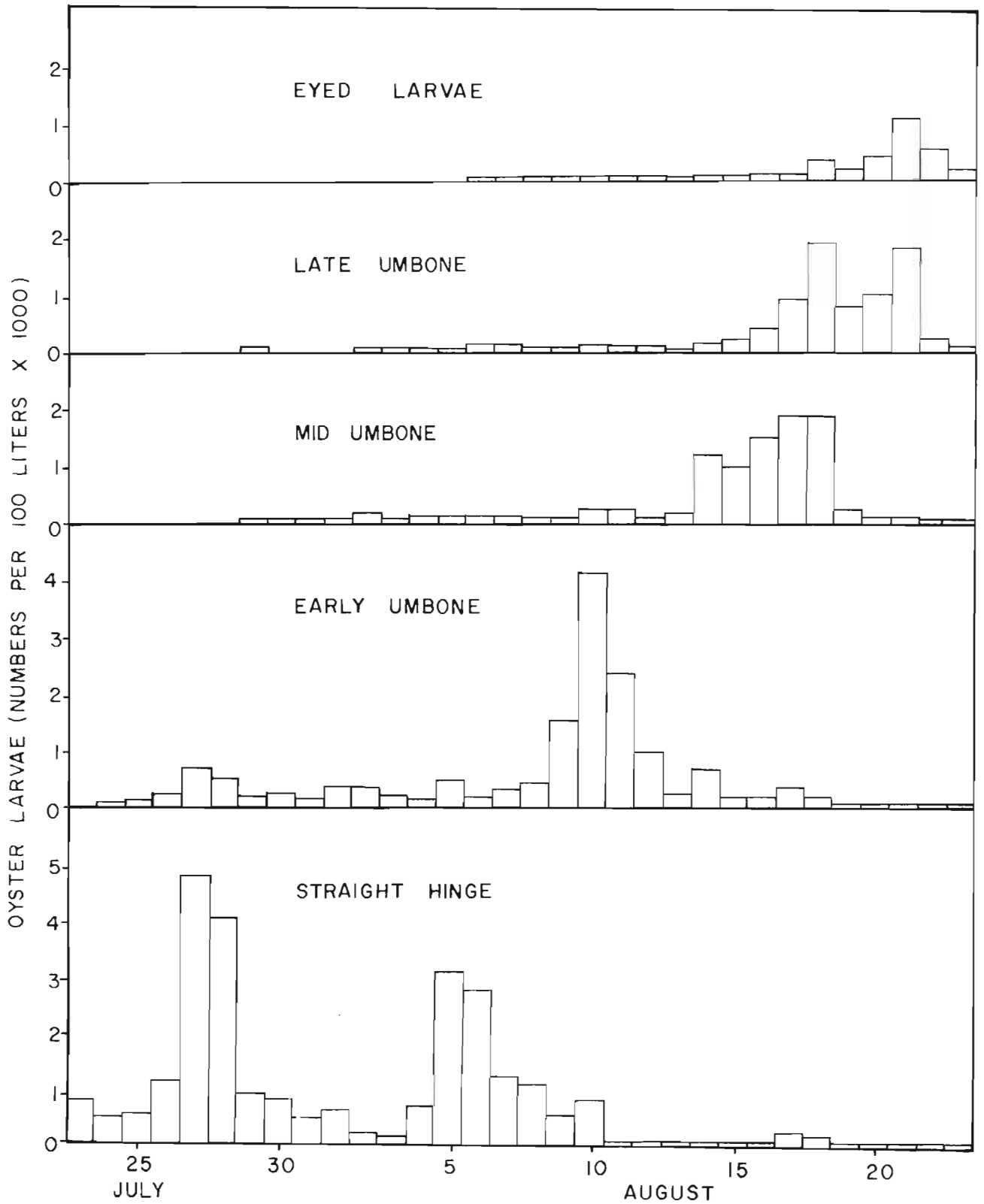


Fig. 23. Daily mean density of five larval stages of *C. gigas* in standing pump samples taken at Station 2, Pendrell Sound, July 23 - August 23, 1977.

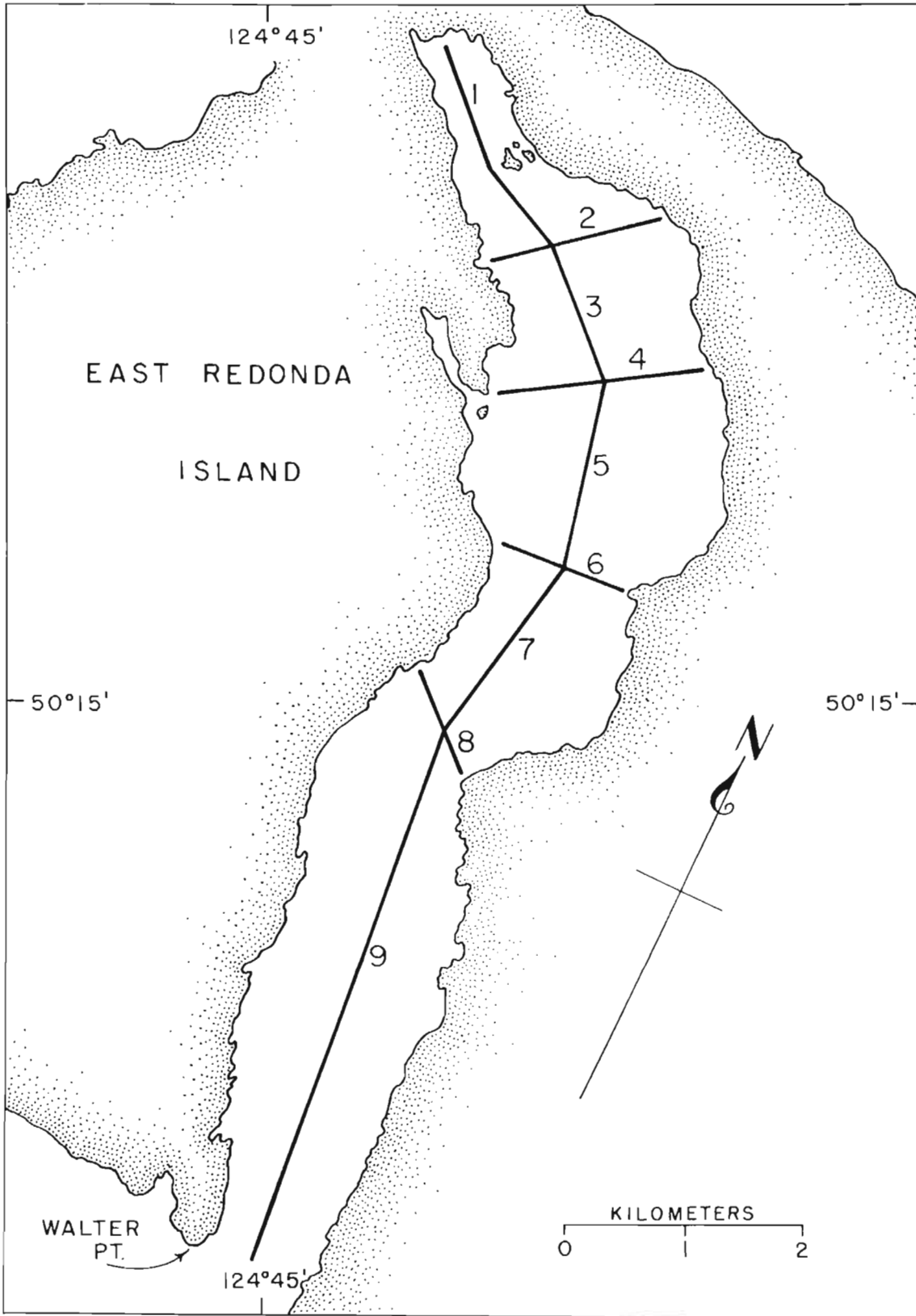


Fig. 24. Map of Pendrell Sound showing running pipe sample transects.

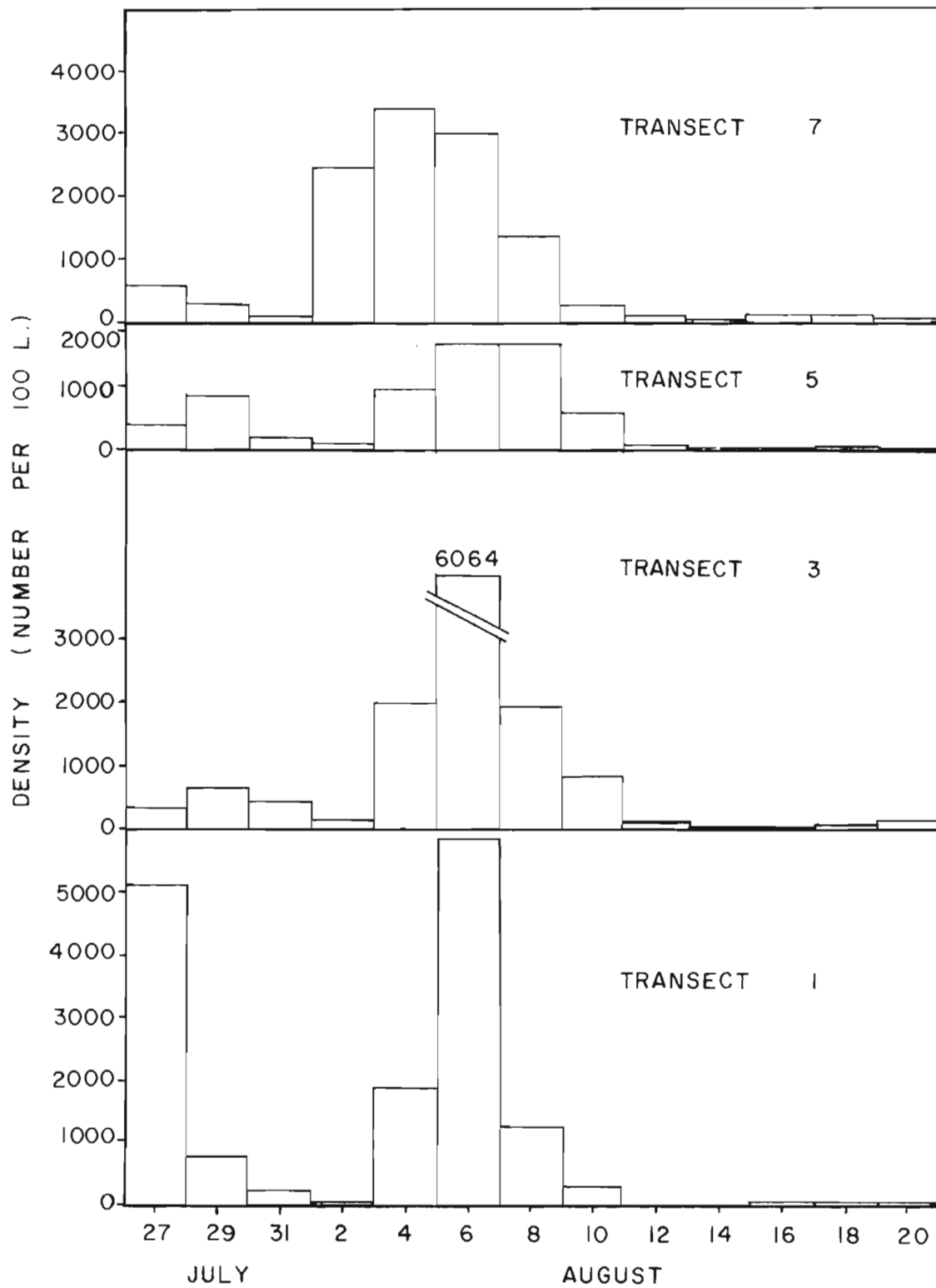


Fig. 25. Density of straight-hinge stage *C. gigas* larvae at running pipe sample Transects 1, 3, 5, and 7, Pendrell Sound, July 27 - August 20, 1977.

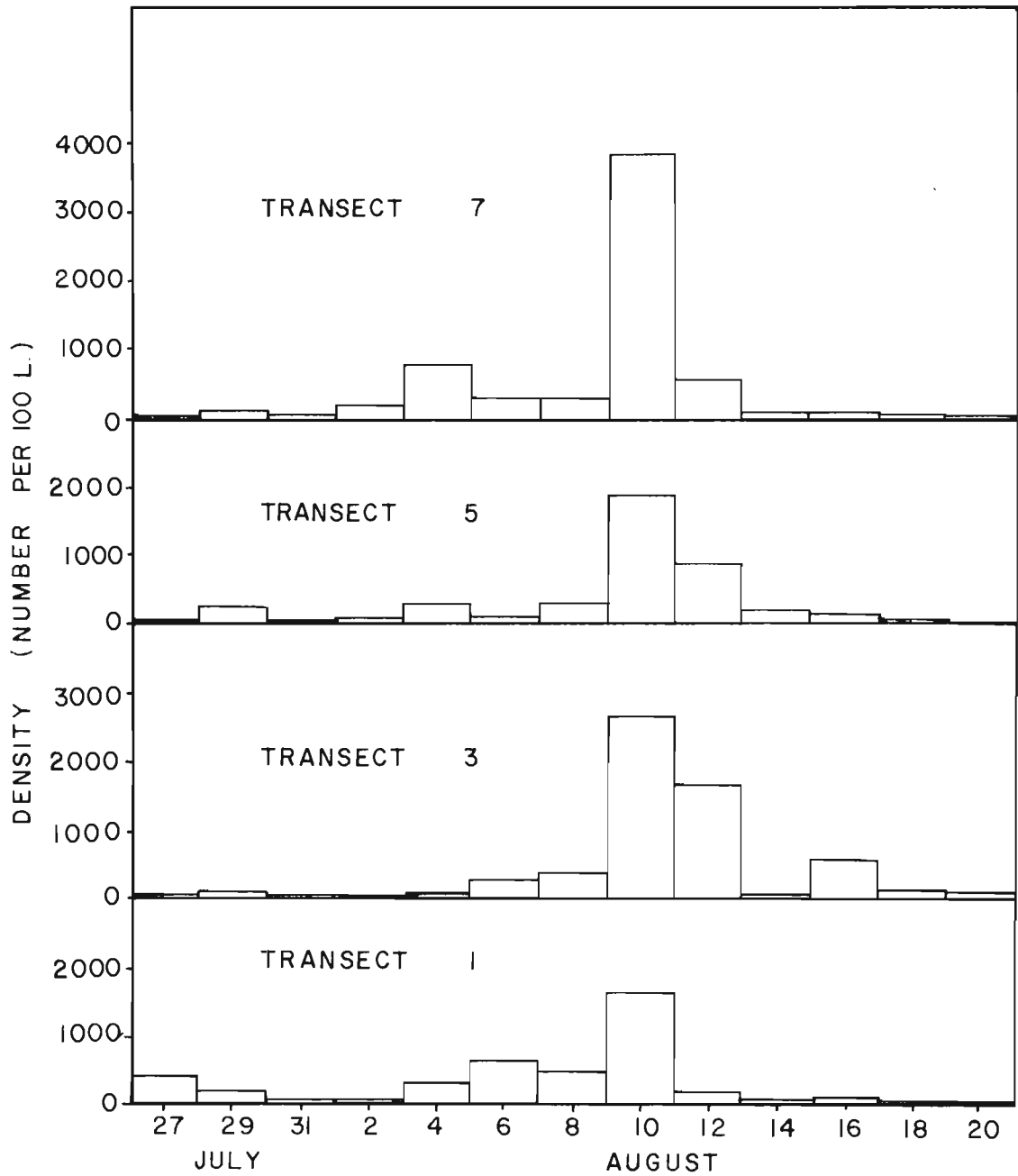


Fig. 26. Density of early umbone stage *G. gigas* larvae at running pipe sample Transects 1, 3, 5, and 7, Pendrell Sound, July 27 - August 20, 1977.

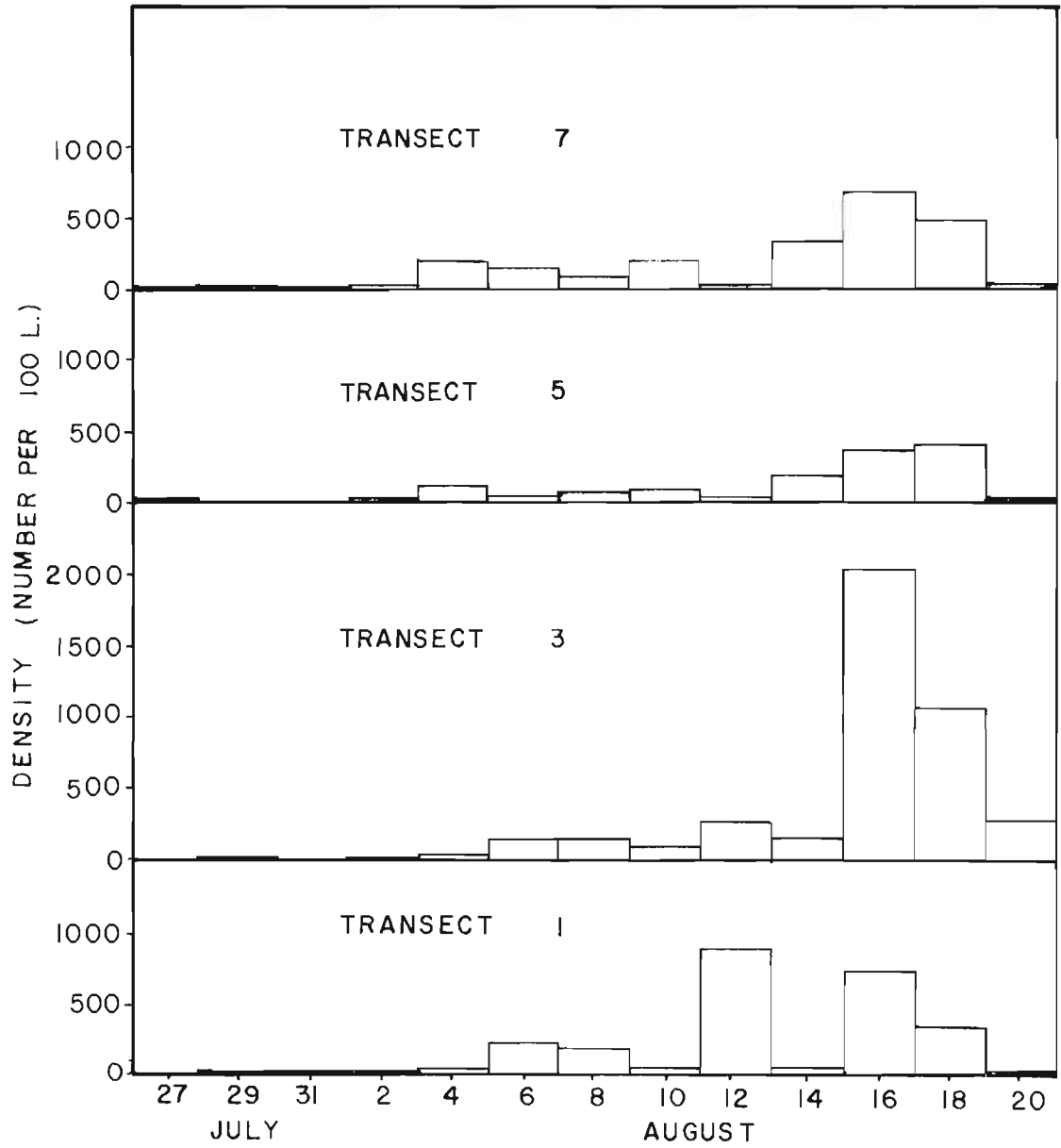


Fig. 27. Density of mid-umbone stage *C. gigas* larvae at running pipe sample Transects 1, 3, 5, and 7, Pendrell Sound, July 27 - August 20, 1977.

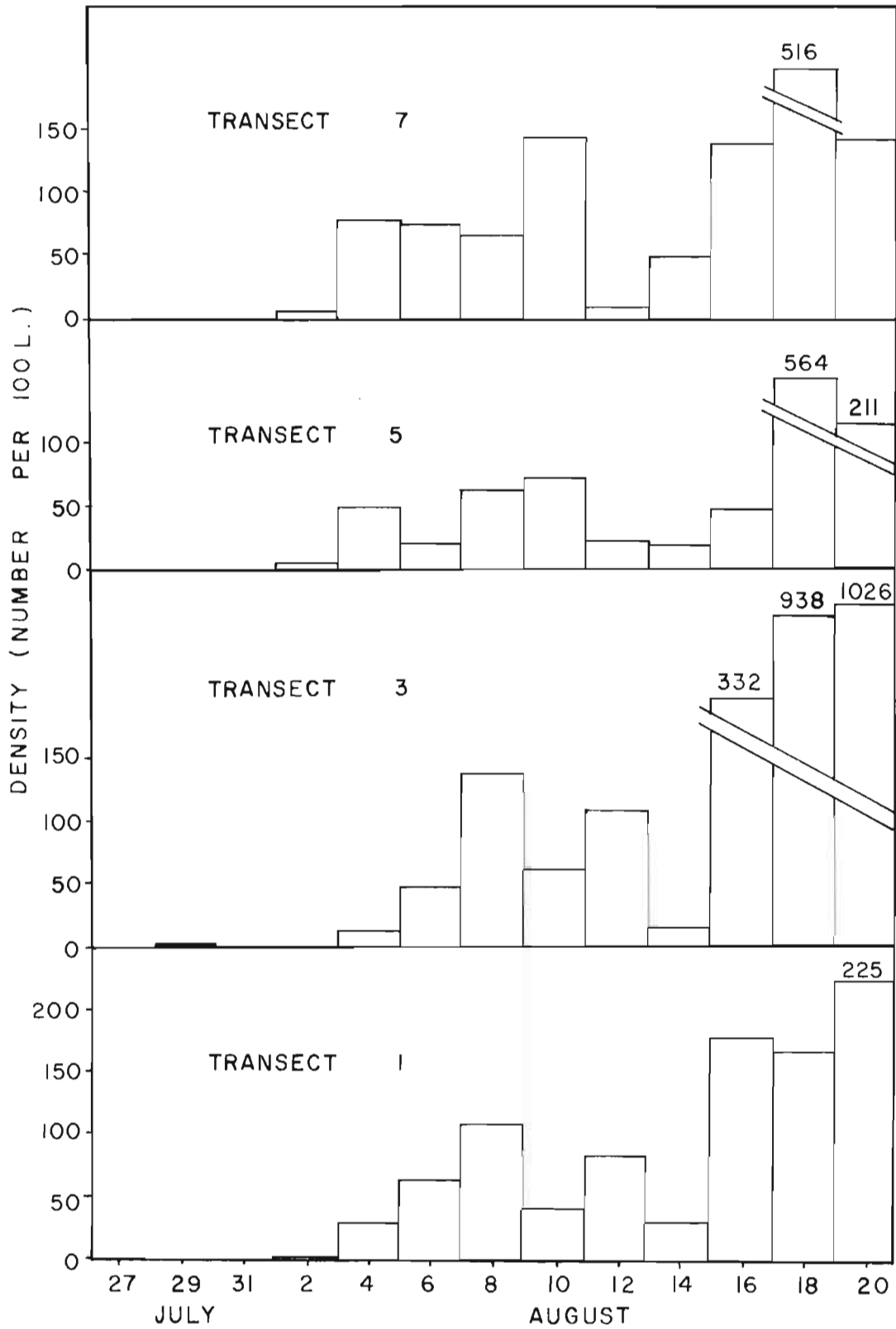


Fig. 28. Density of late umbone stage *C. gigas* larvae at running pipe sample Transects 1, 3, 5, and 7, Pendrell Sound, July 27 - August 20, 1977.

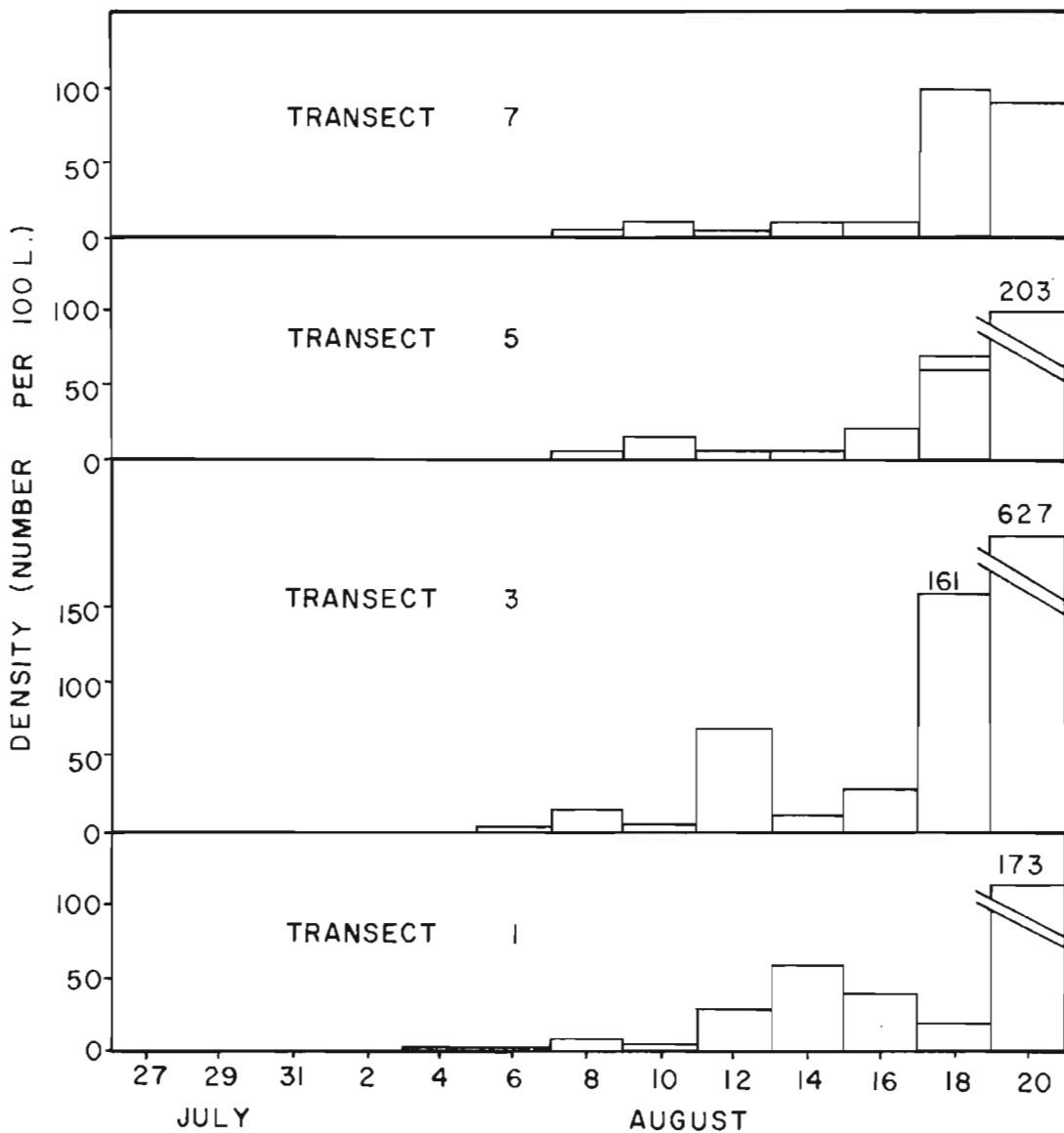


Fig. 29. Density of eyed *C. gigas* larvae at running pipe sample Transects 1, 3, 5, and 7, Pendrell Sound, July 27 - August 20, 1977.

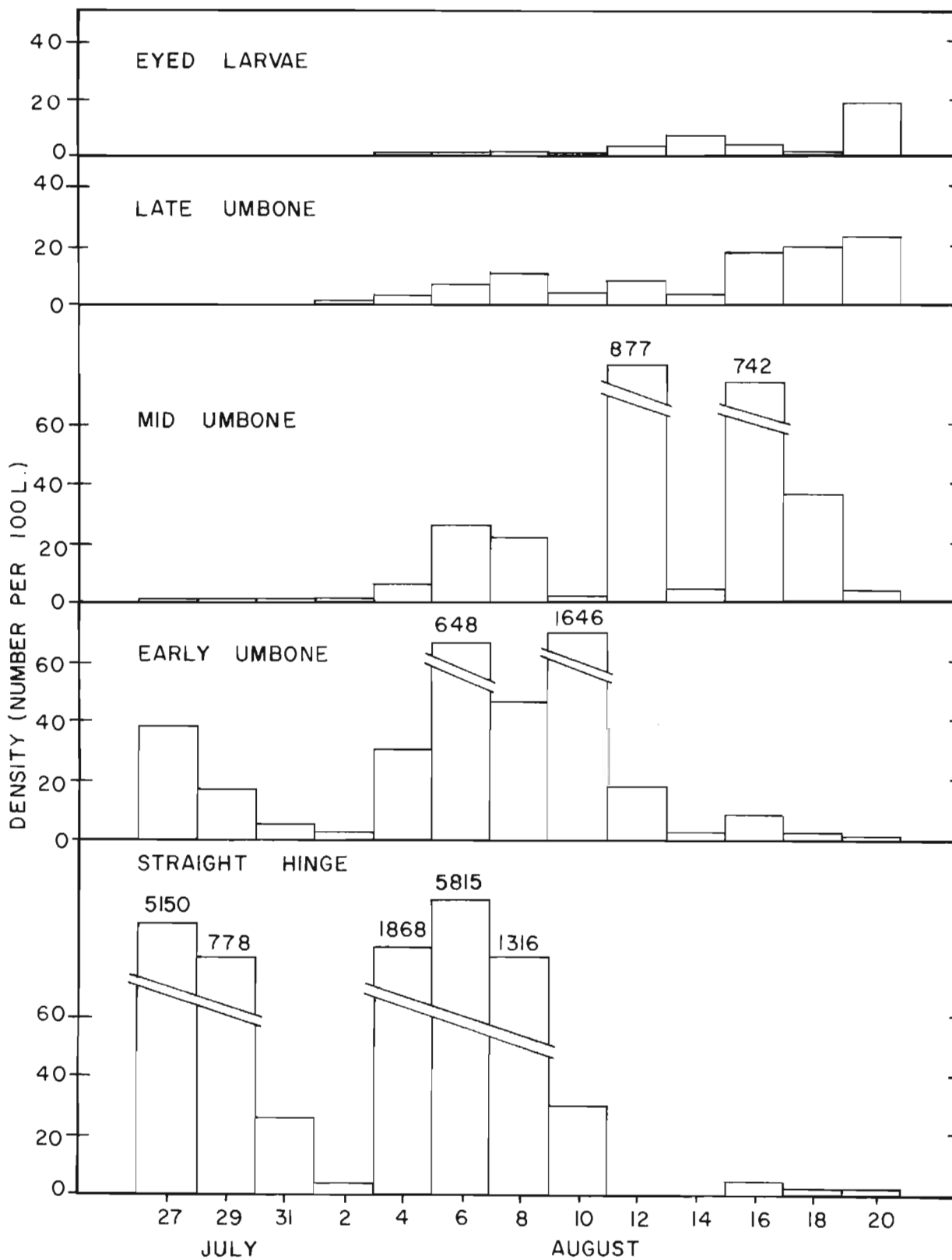


Fig. 30. Density of the five larval stages of *C. gigas* on running pipe sample Transect 1, Pendrell Sound, July 27 - August 20, 1977.

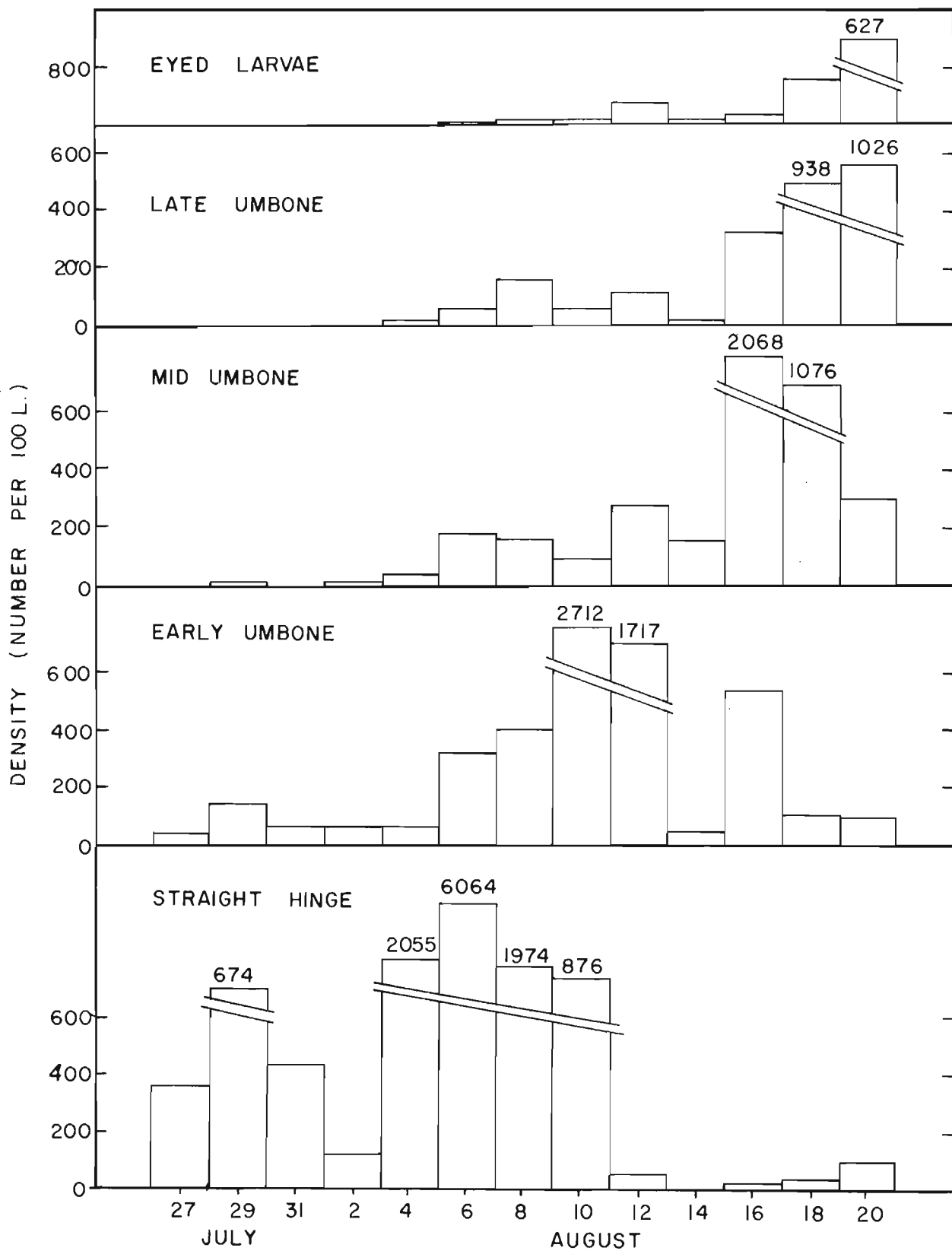


Fig. 31. Density of the five larval stages of *C. gigas* on running pipe sample Transect 3, Pendrell Sound, July 27 - August 20, 1977.

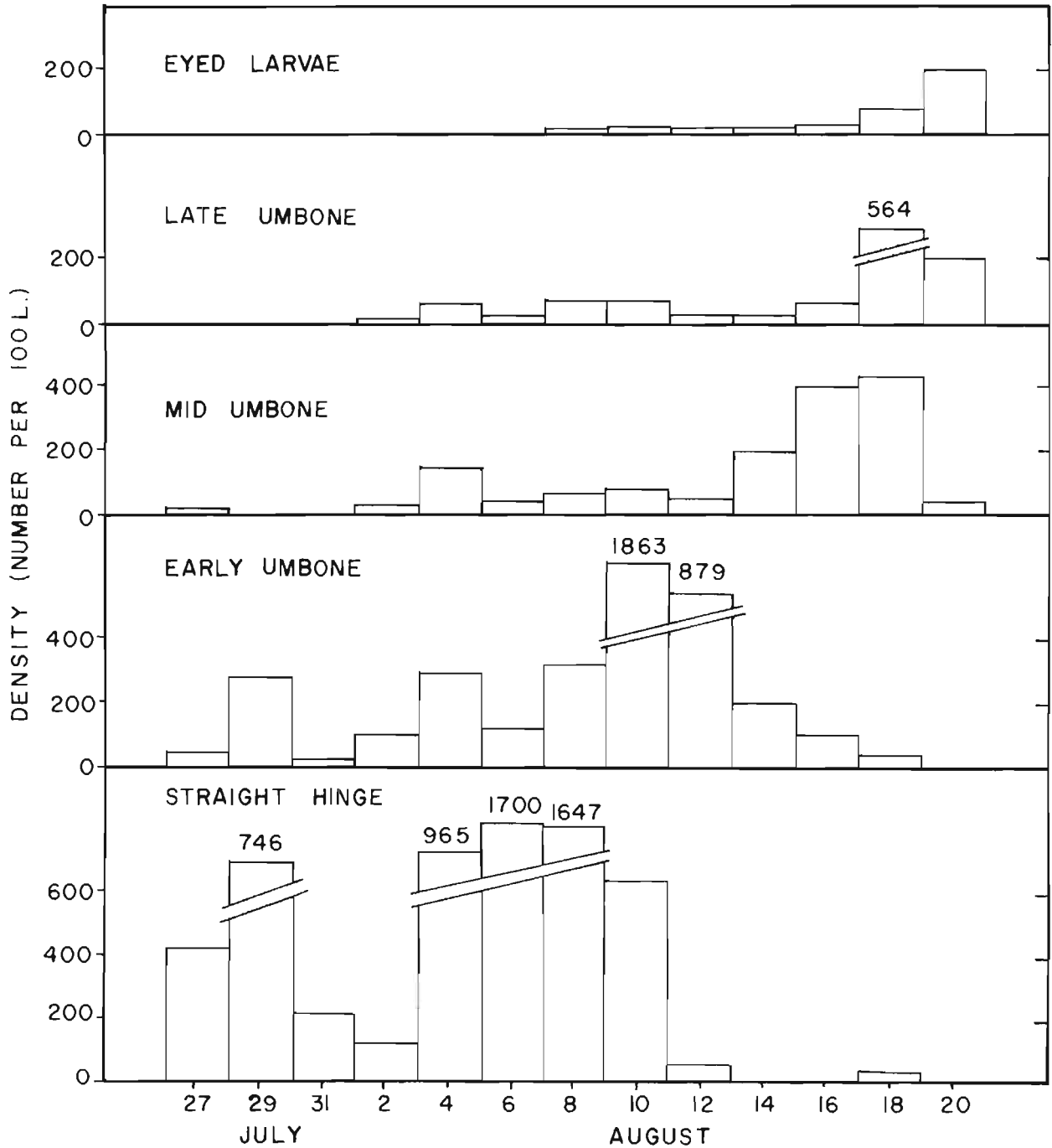


Fig. 32. Density of the five larval stages of *C. gigas* on running pipe sample Transect 5, Pendrell Sound, July 27 - August 20, 1977.

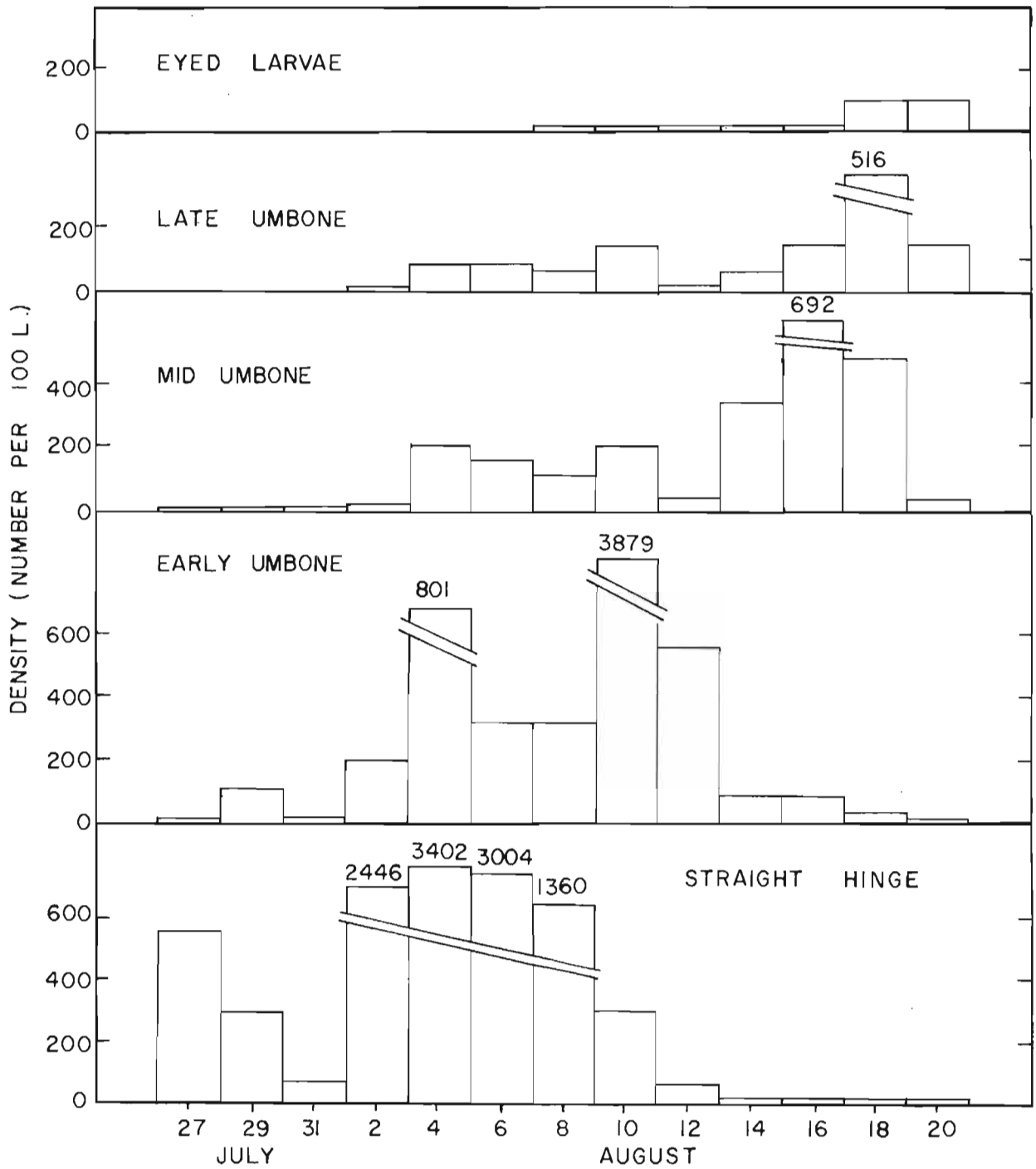
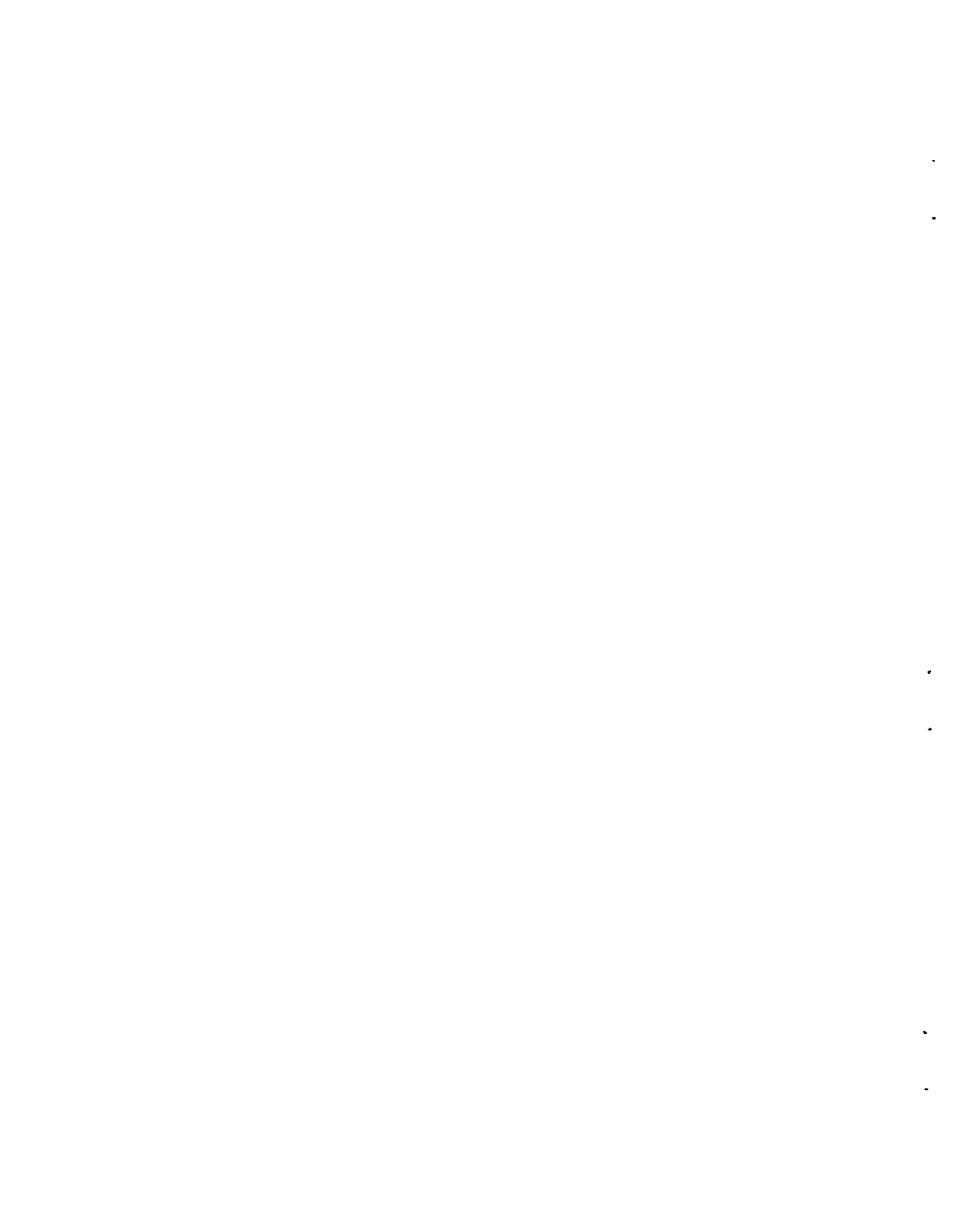


Fig. 33. Density of the five larval stages of C. gigas on running pipe sample Transect 7, Pendrell Sound, July 27 - August 20, 1977.



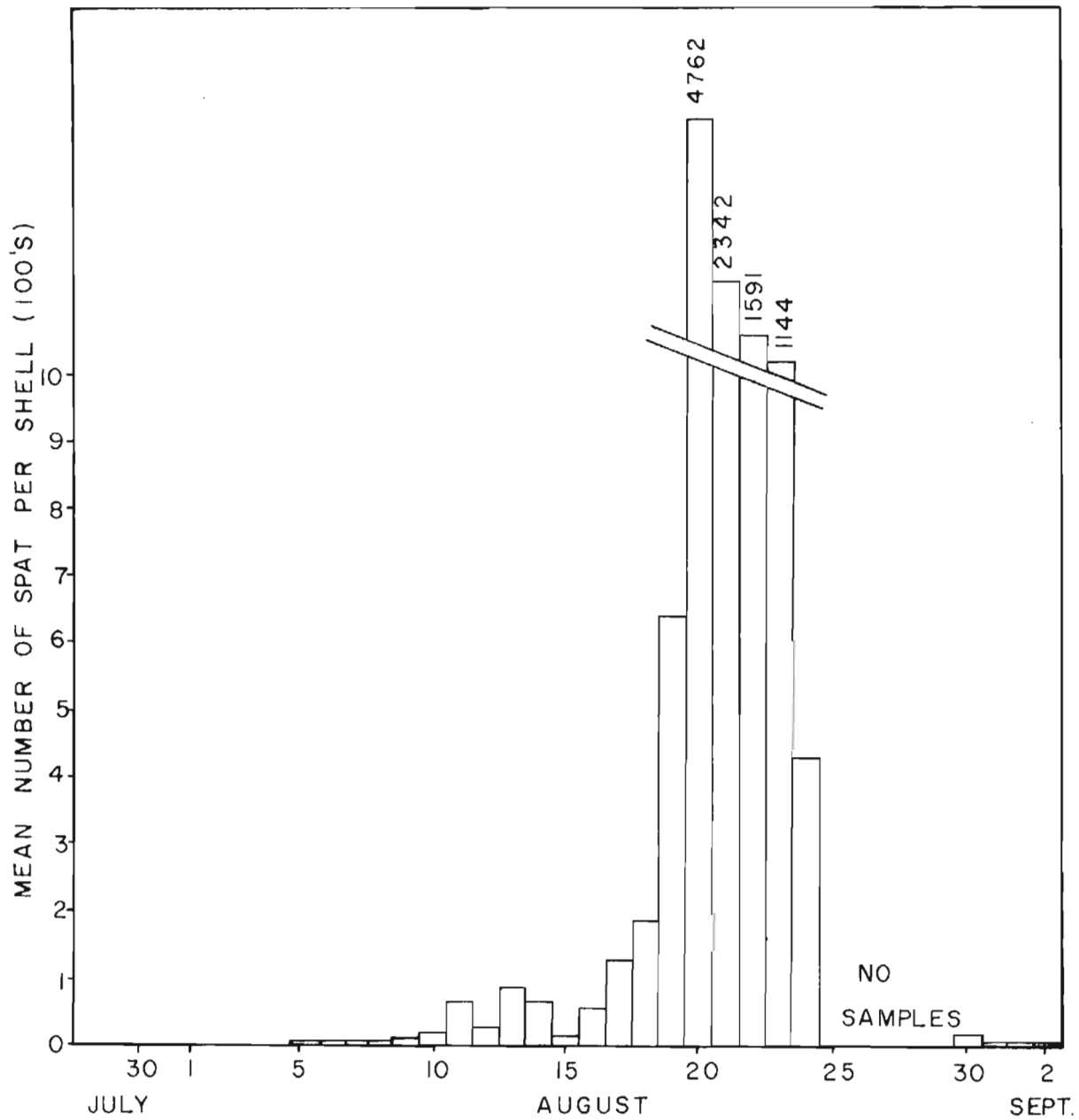


Fig. 34. Mean number of *C. gigas* spat/shell on daily cultch exposed at Station 2, Pendrell Sound, July 28 - September 2, 1977.

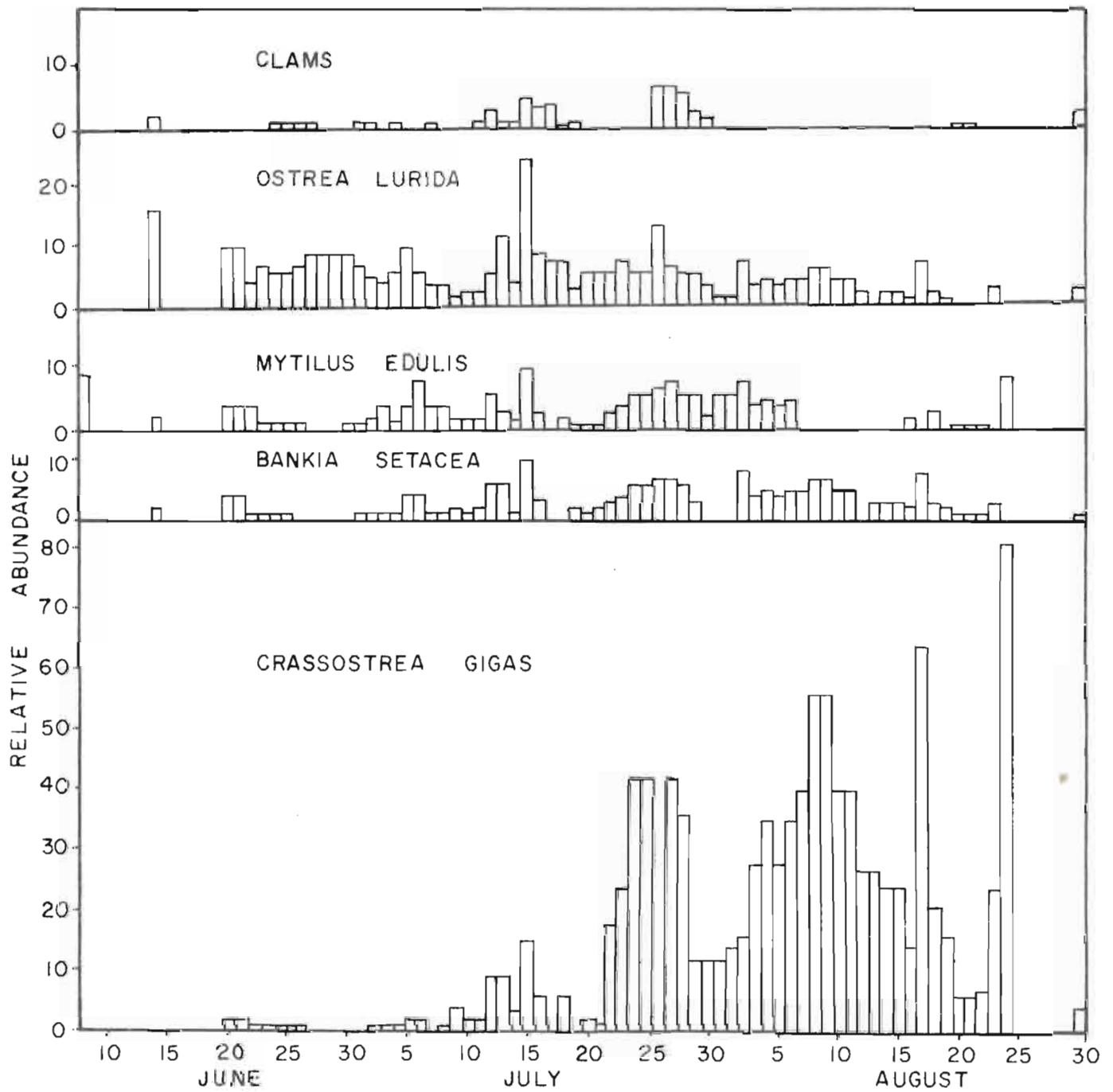


Fig. 35. Relative abundance of the different bivalve larvae in surface plankton tows taken at Station 1, Pendrell Sound, June 8 - August 30, 1977.

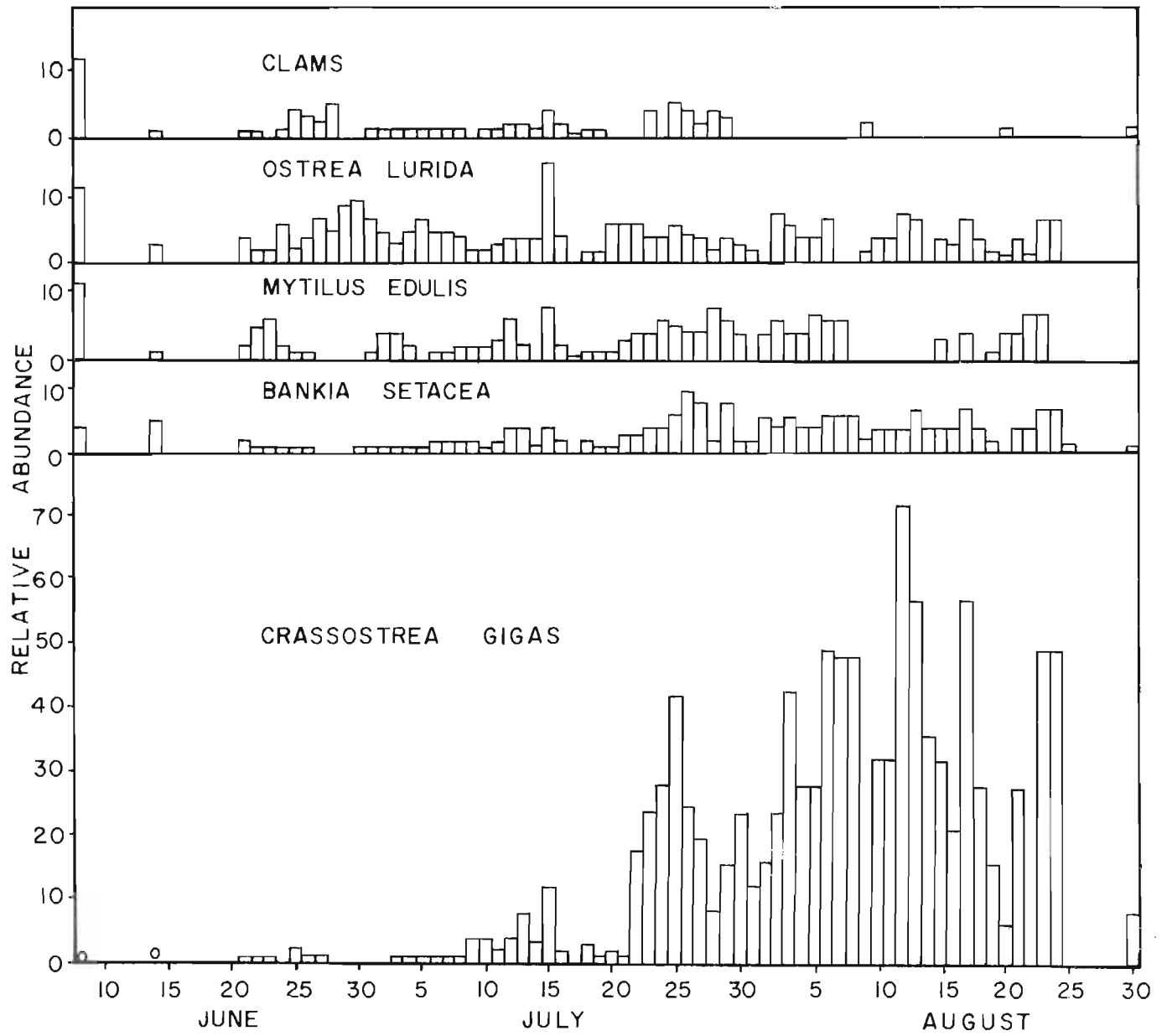


Fig. 36. Relative abundance of the different bivalve larvae in surface plankton tows taken at Station 4, Pendrell Sound, June 8 - August 30, 1977.

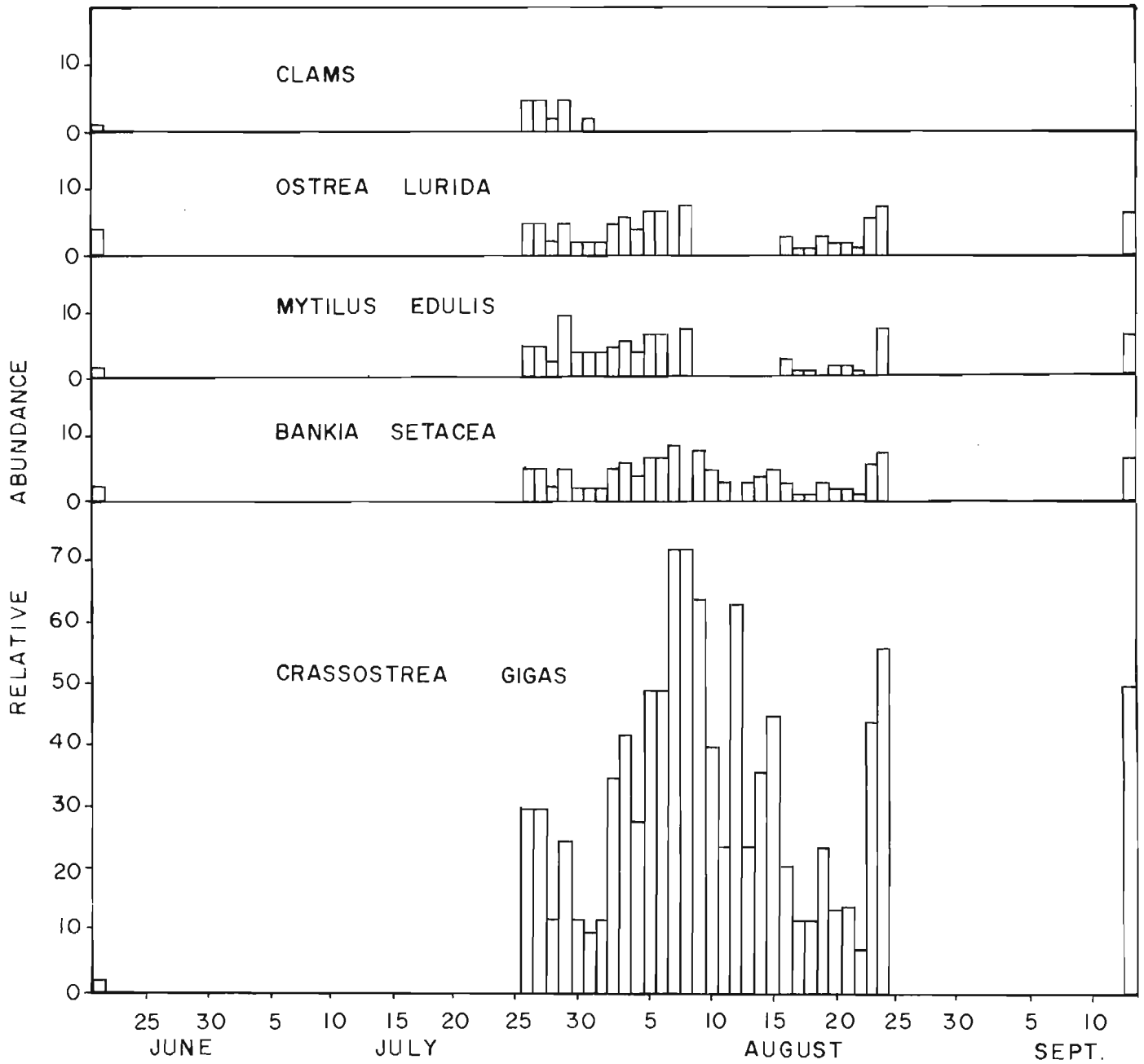


Fig. 37. Relative abundance of the different bivalve larvae in surface plankton tows taken at Station 5, Pendrell Sound, June 21 - September 13, 1977.

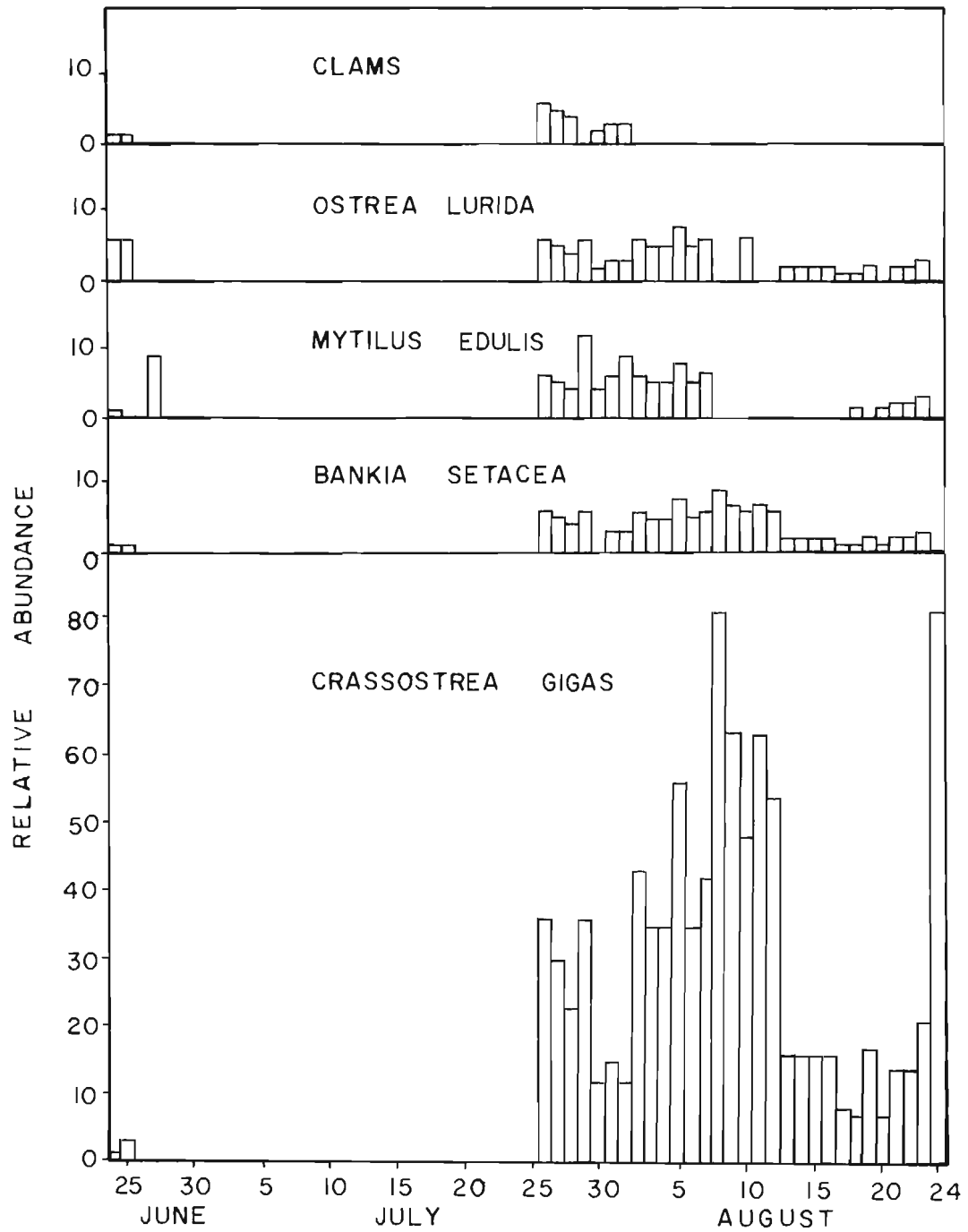
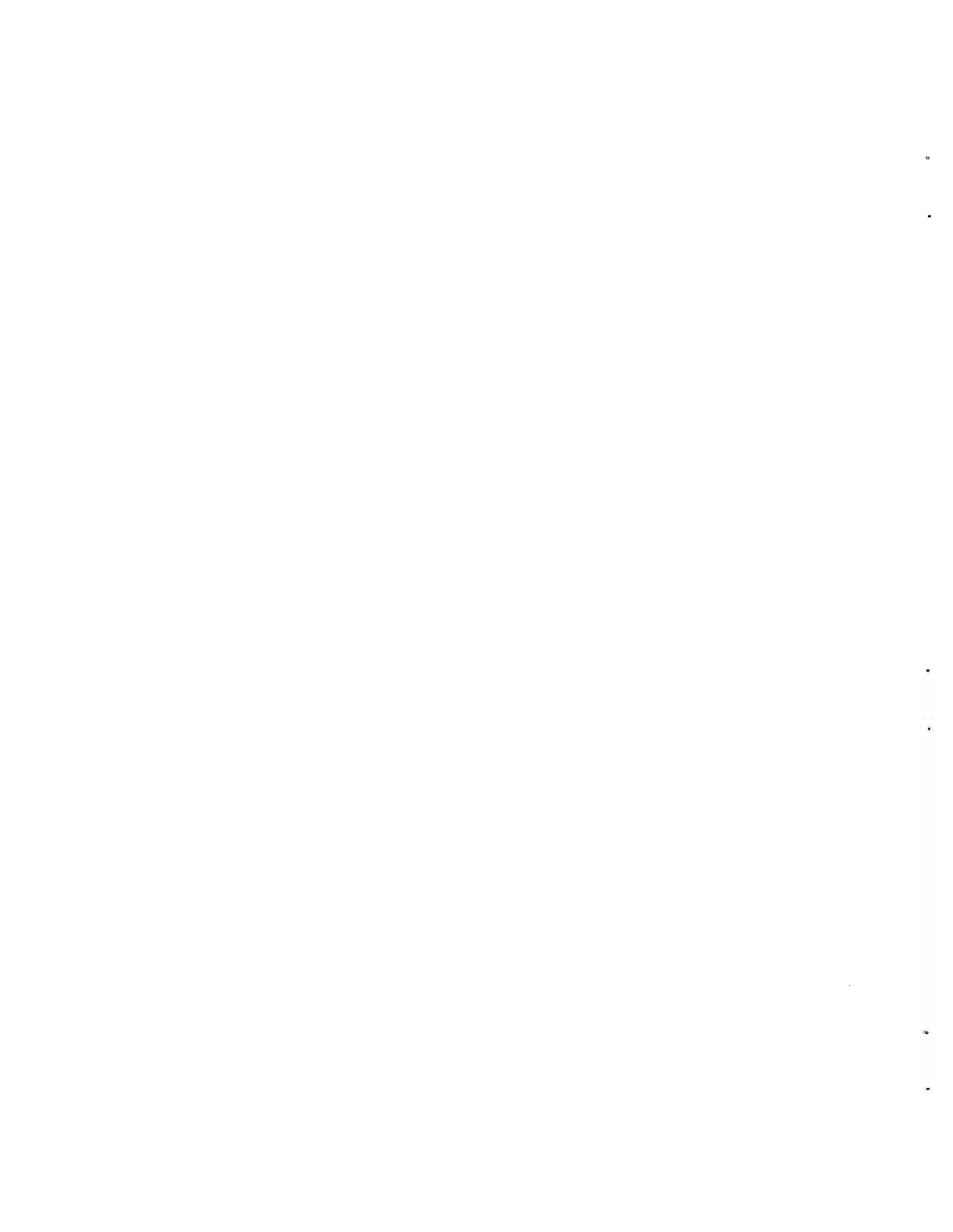


Fig. 38. Relative abundance of the different bivalve larvae in surface plankton tows taken at Station 6, Pendrell Sound, June 24 - August 24, 1977.



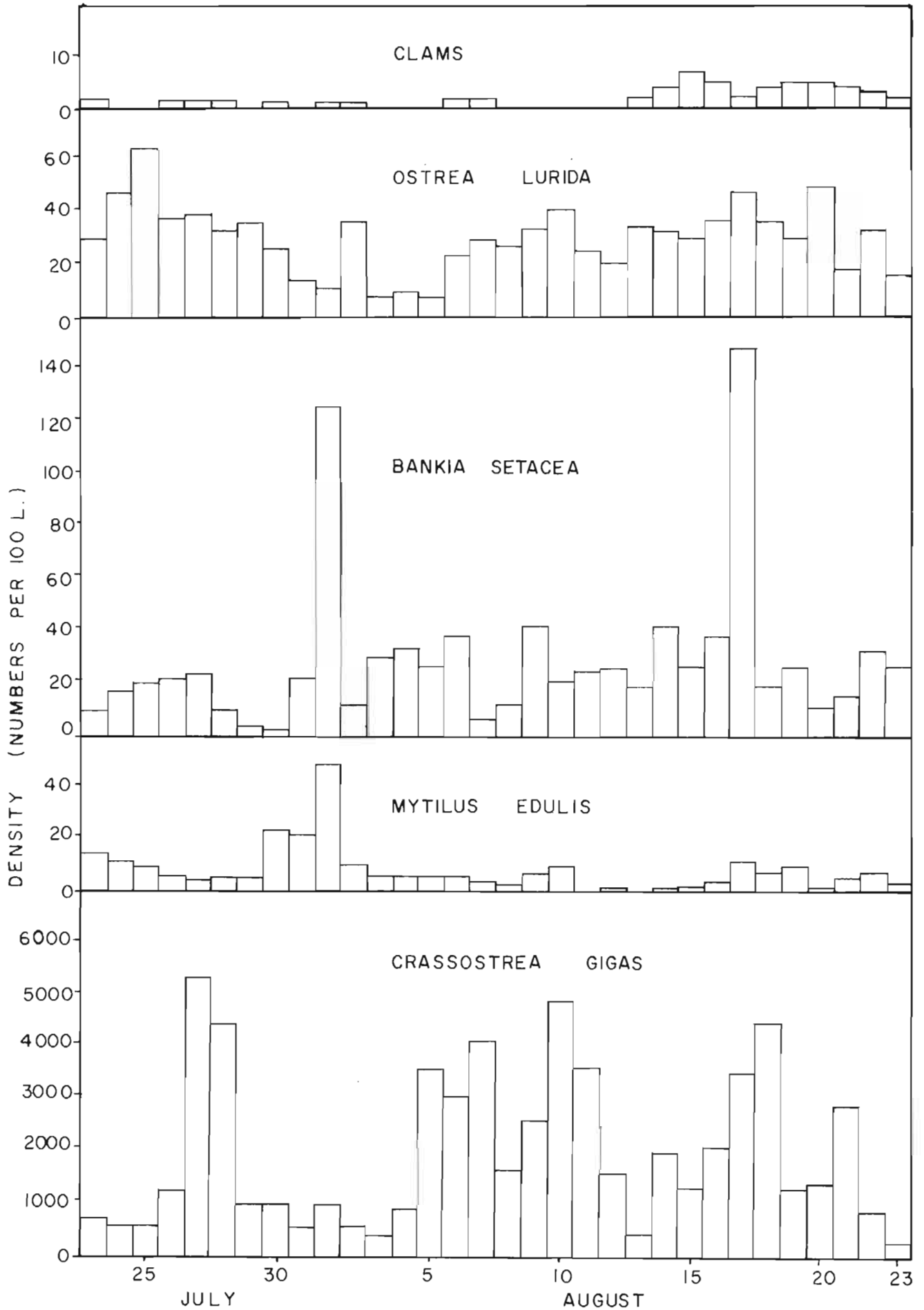


Fig. 39. Mean density of the different bivalve larvae in standing pump samples taken at Station 2, Pendrell Sound, July 23 - August 23, 1977.

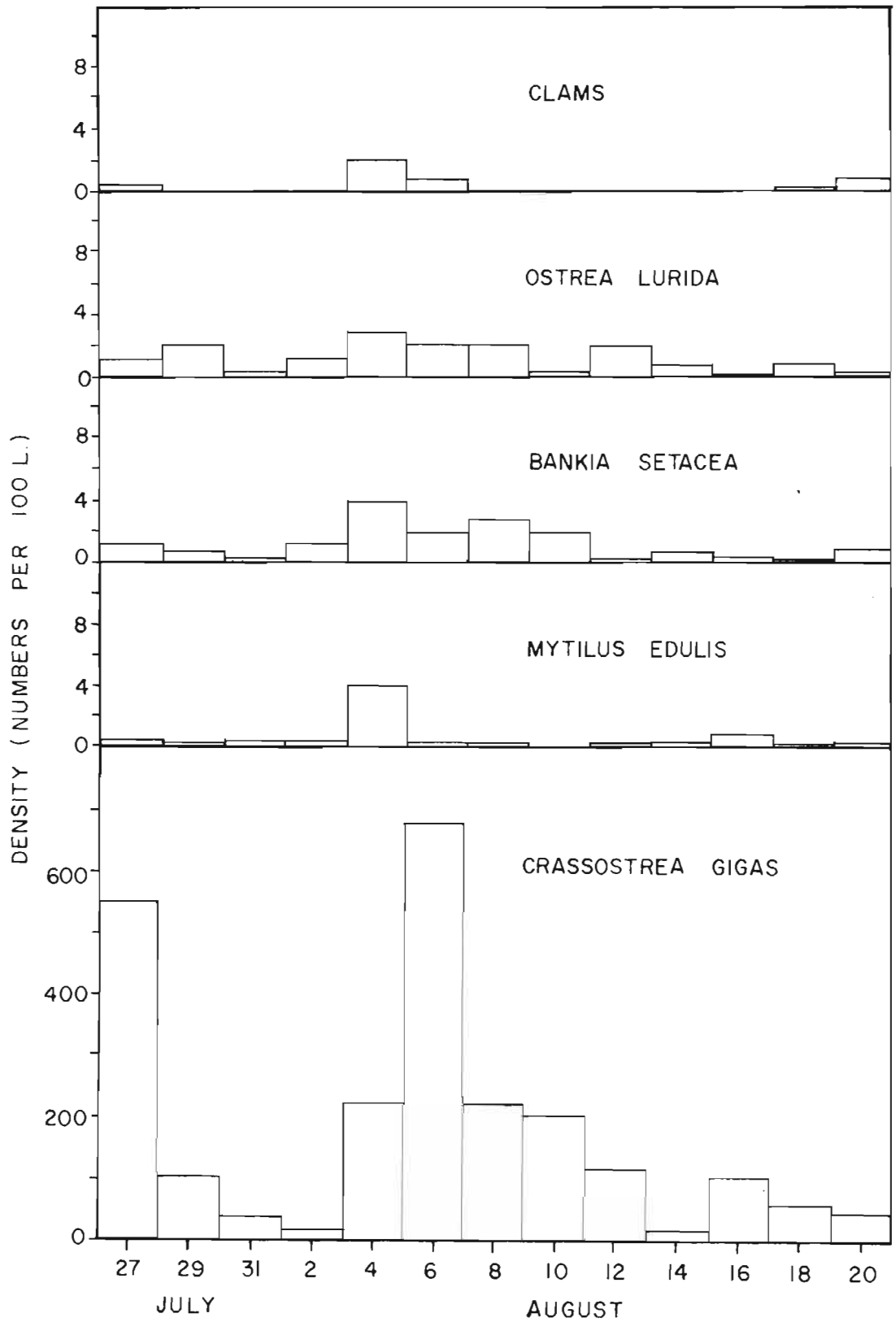
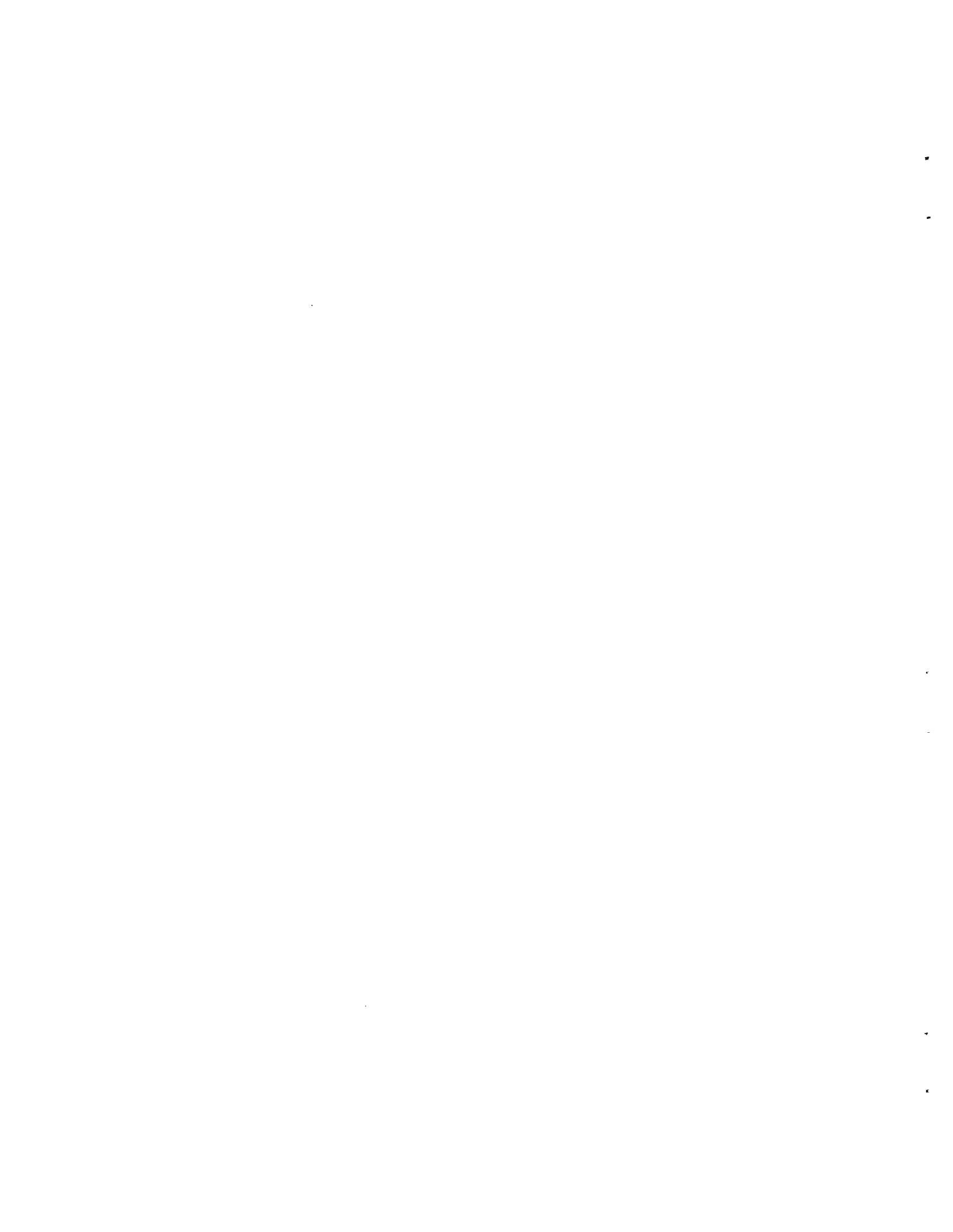


Fig. 40. Density of the different bivalve larvae in running pipe samples taken on Transect 1, Pendrell Sound, July 27 - August 20, 1977.



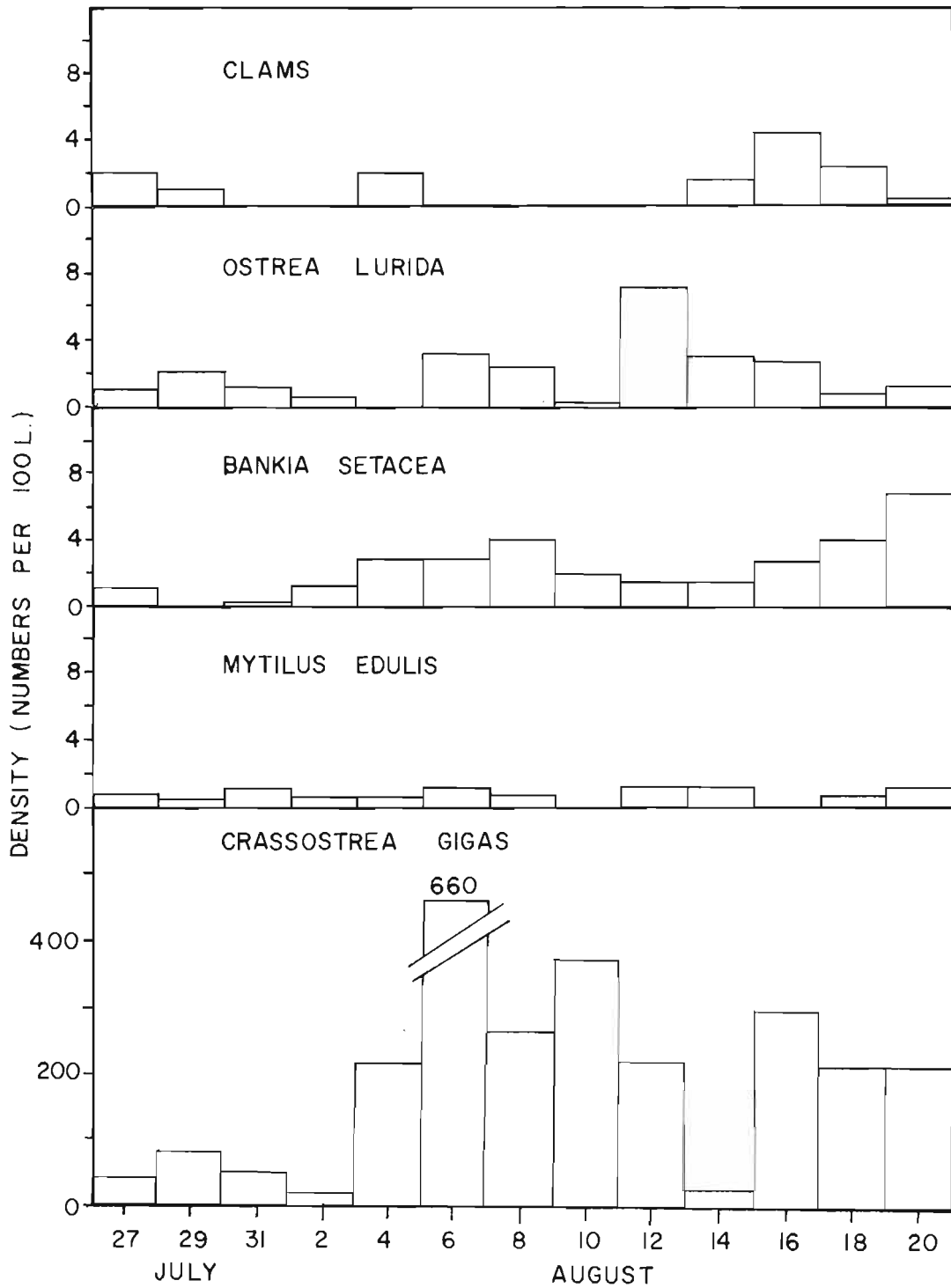
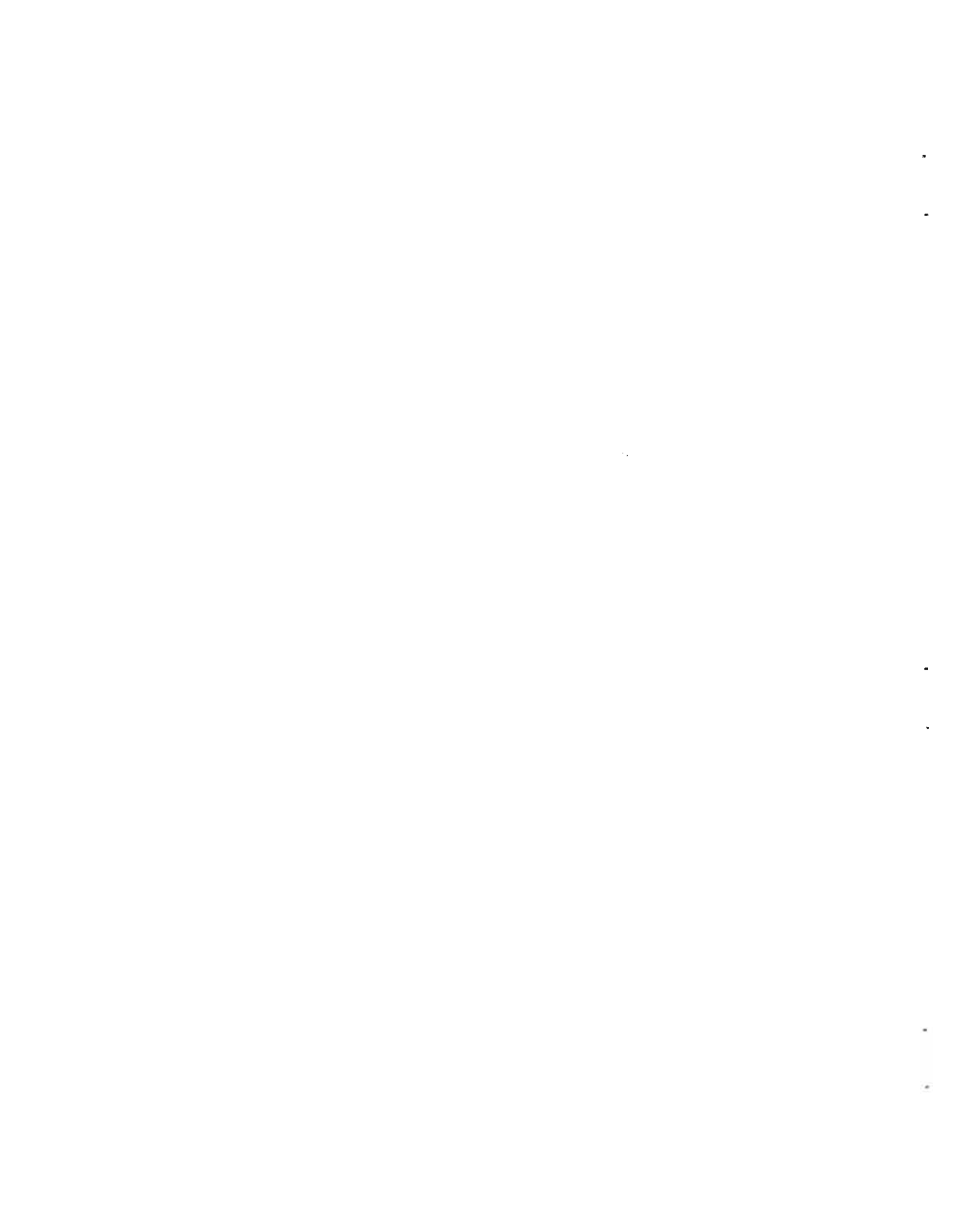


Fig. 41. Density of the different bivalve larvae in running pipe samples taken on Transect 3, Pendrell Sound, July 27 - August 20, 1977.



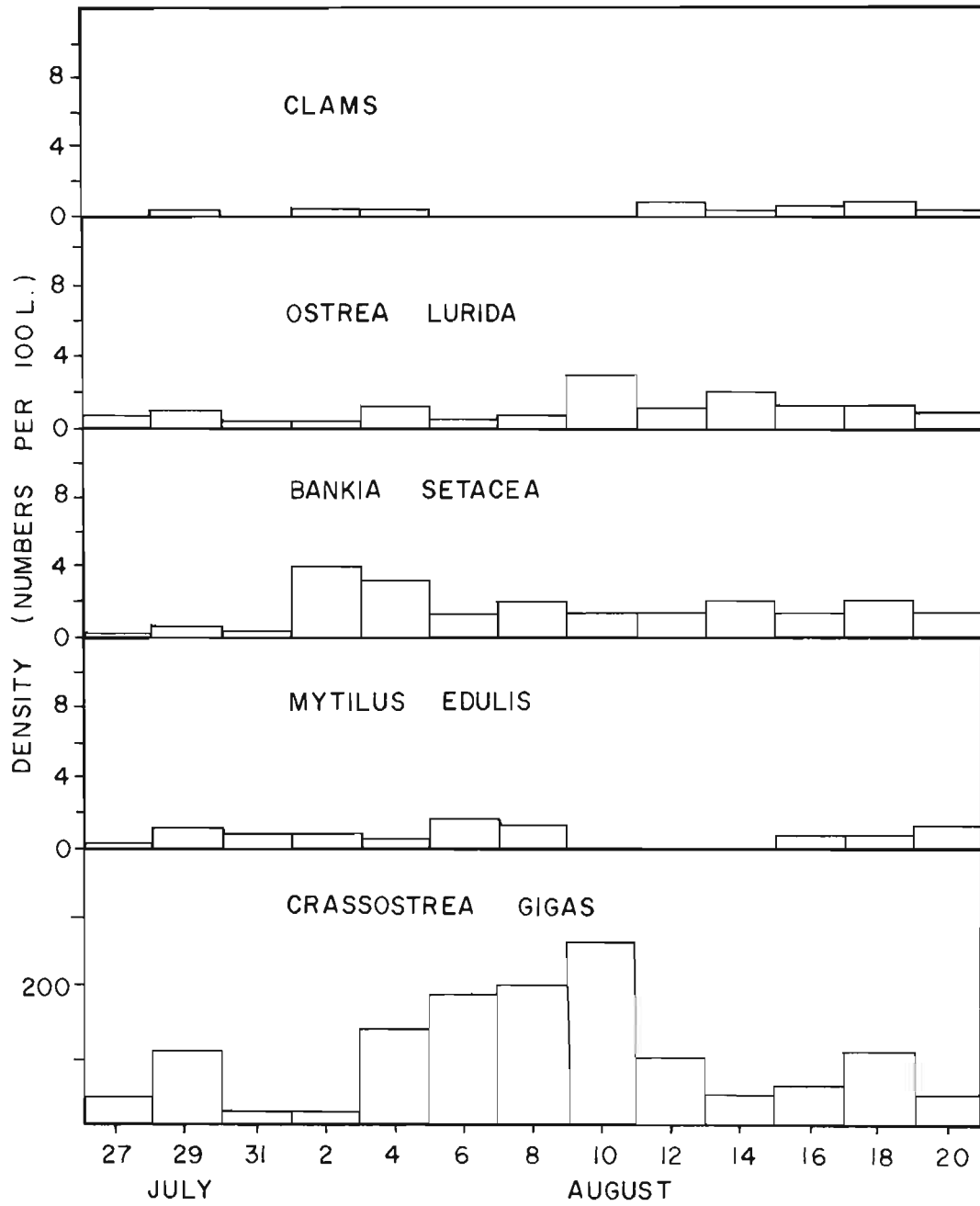


Fig. 42. Density of the different bivalve larvae in running pipe samples taken on Transect 5, Pendrell Sound, July 27 - August 20, 1977.

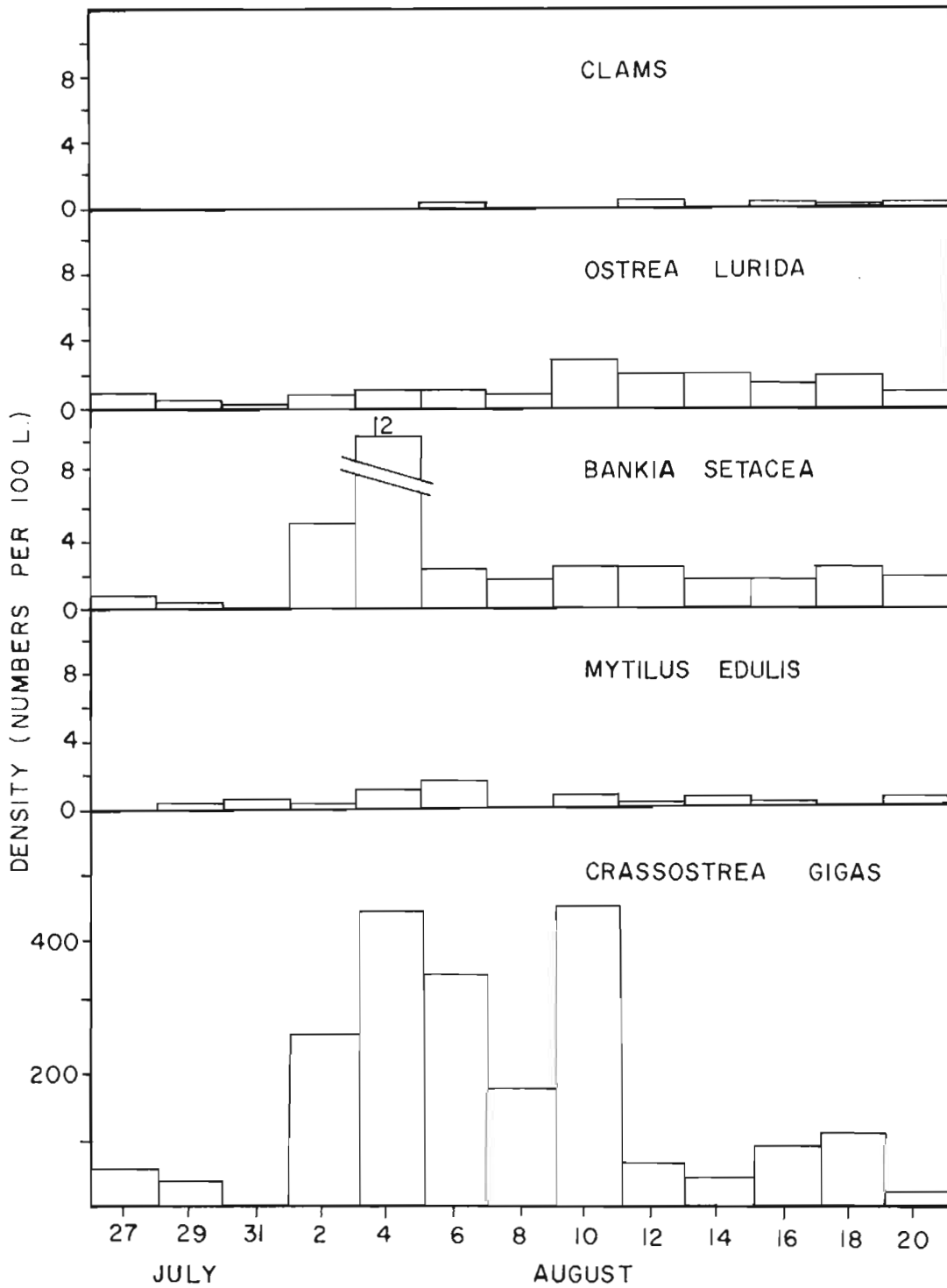


Fig. 43. Density of the different bivalve larvae in running pipe samples on Transect 7, Pendrell Sound, July 27 - August 20, 1977.

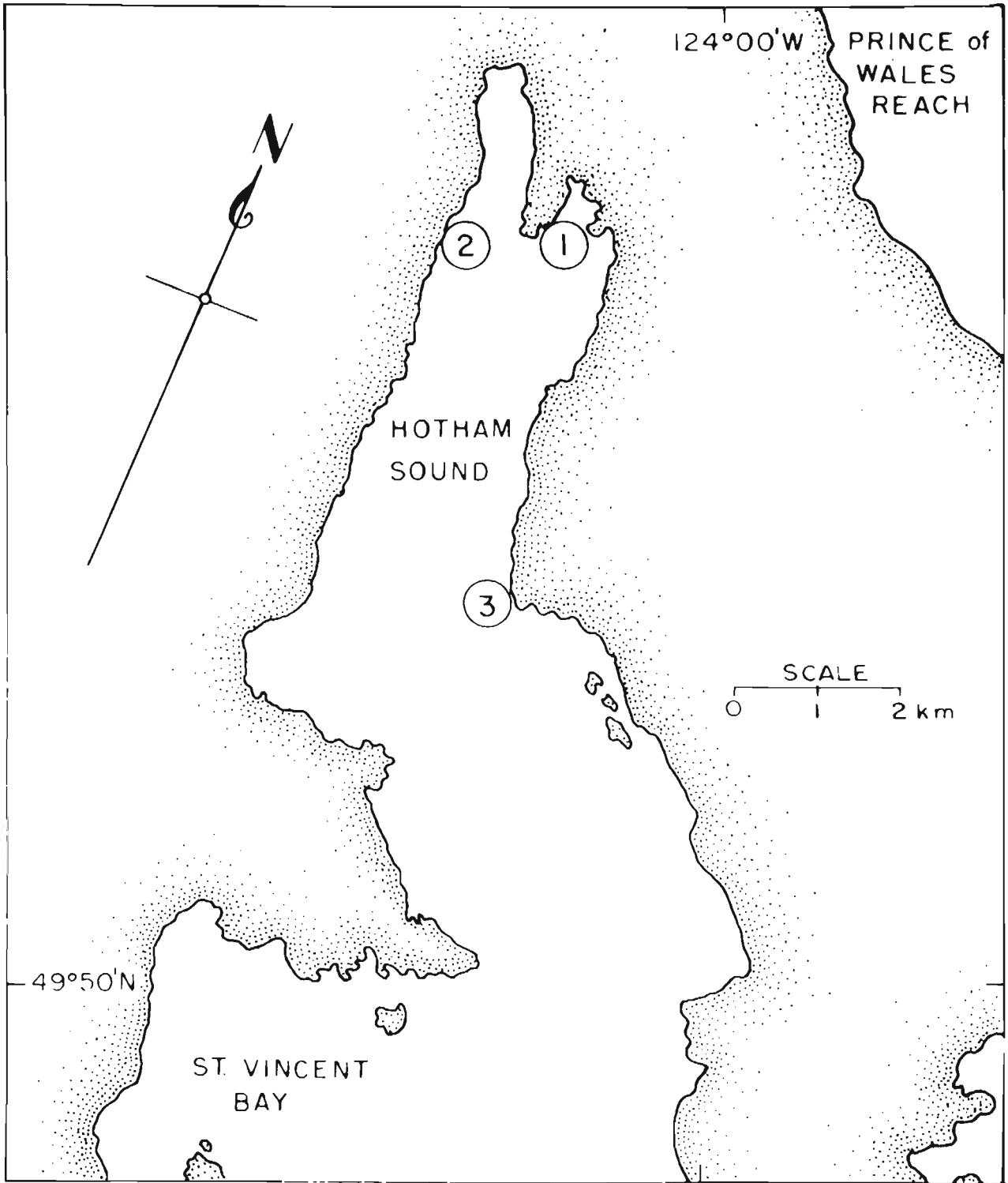


Fig. 44. Map of Hotham Sound showing permanent sampling stations.

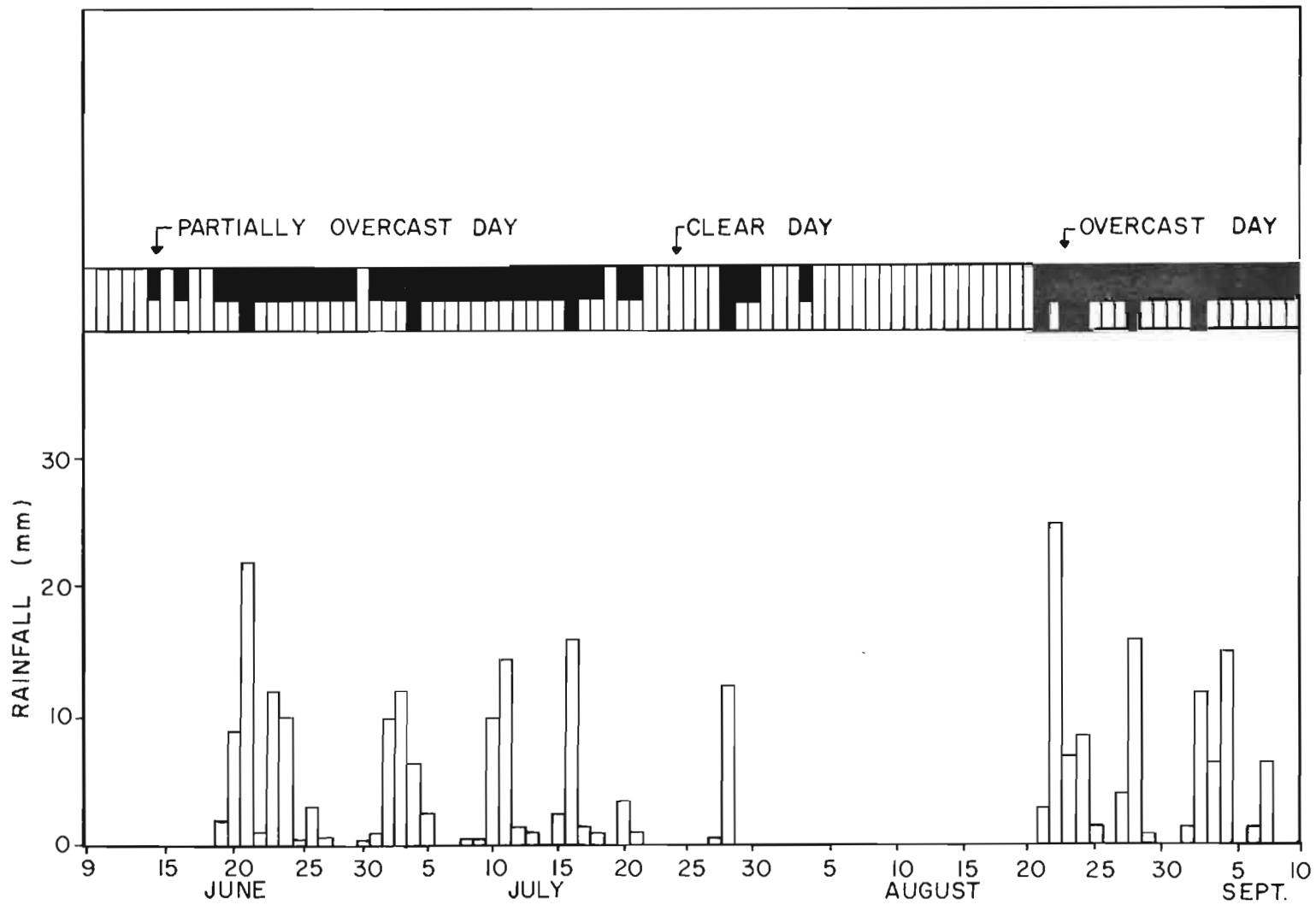


Fig. 45. Daily cloud cover and rainfall at Malibu, Jervis Inlet, June 9 - September 10, 1977.



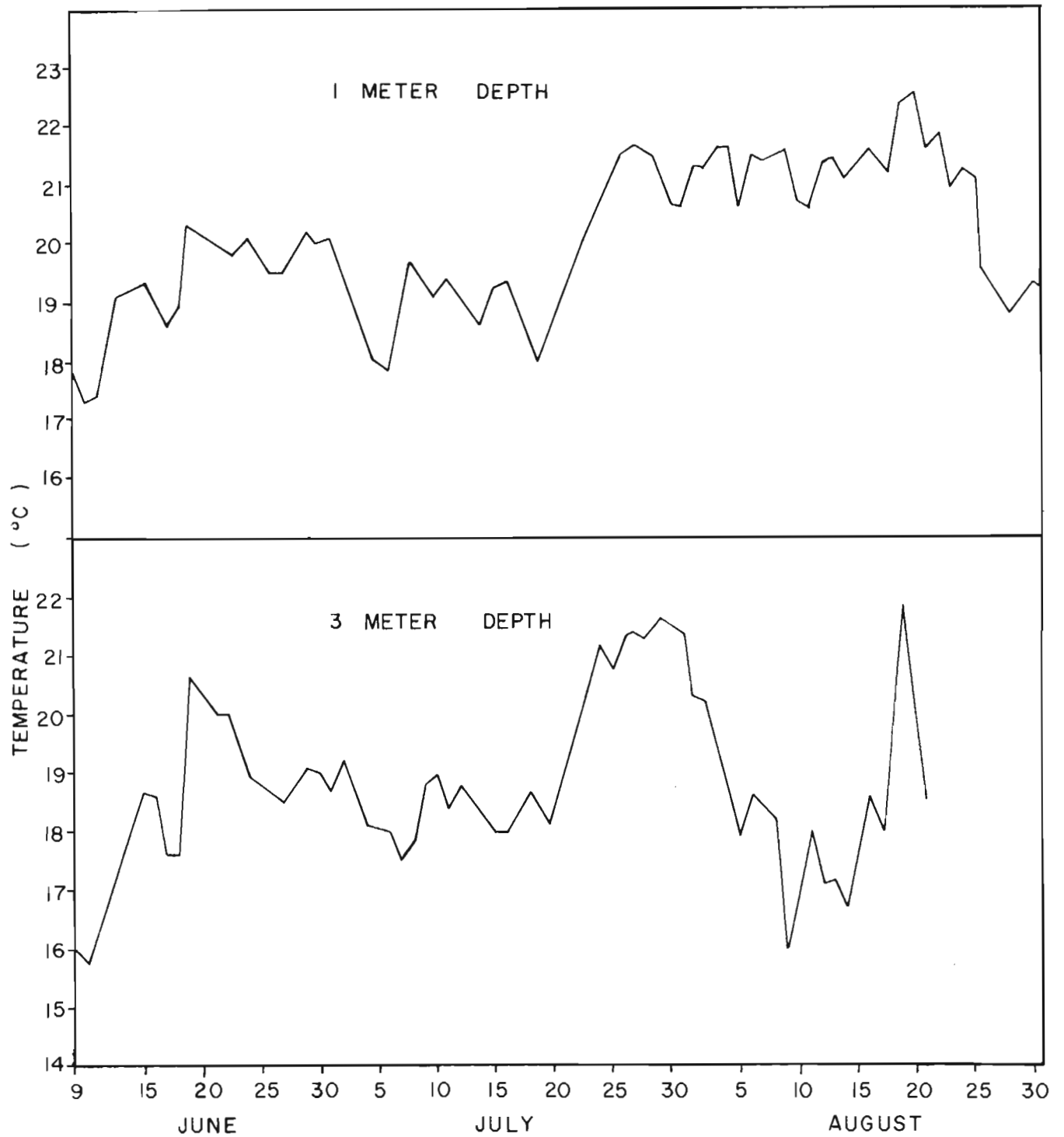


Fig. 46. Mean daily water temperatures at depths of 1 and 3 m, Station 1, Hotham Sound, June 9 - August 31, 1977.

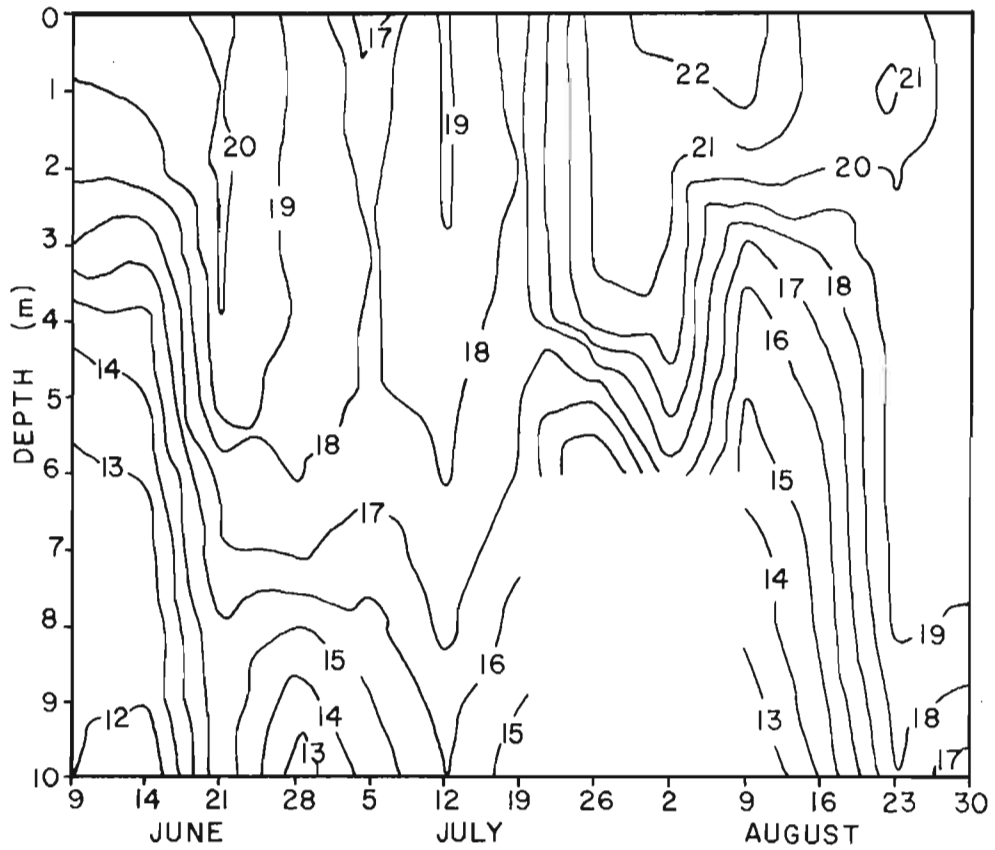


Fig. 47. Temperature contour profile from the surface to a depth of 10 m at Station 1, Hotham Sound, June 9 - August 30, 1977. No measurements were taken below 6 m from July 19 - August 9.

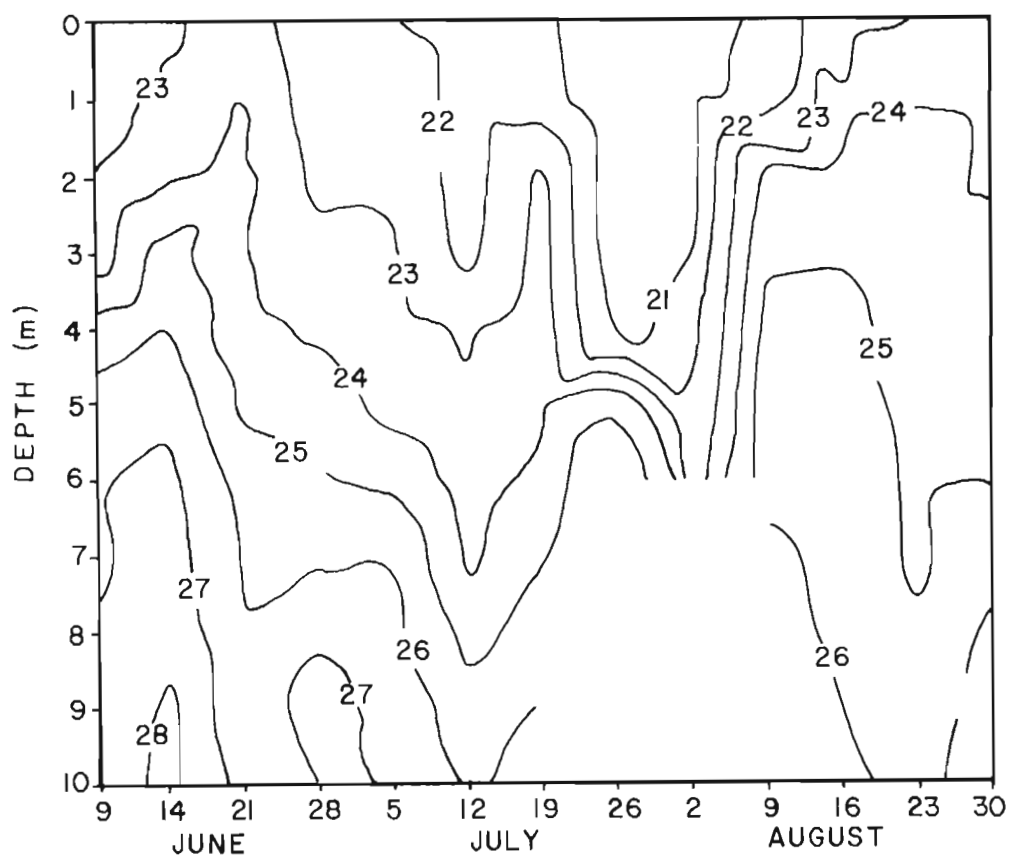


Fig. 48. Salinity contour profile from the surface to a depth of 10 m at Station 1, Hotham Sound, June 9 - August 30, 1977. No measurements were taken below 6 m from July 19 - August 9.

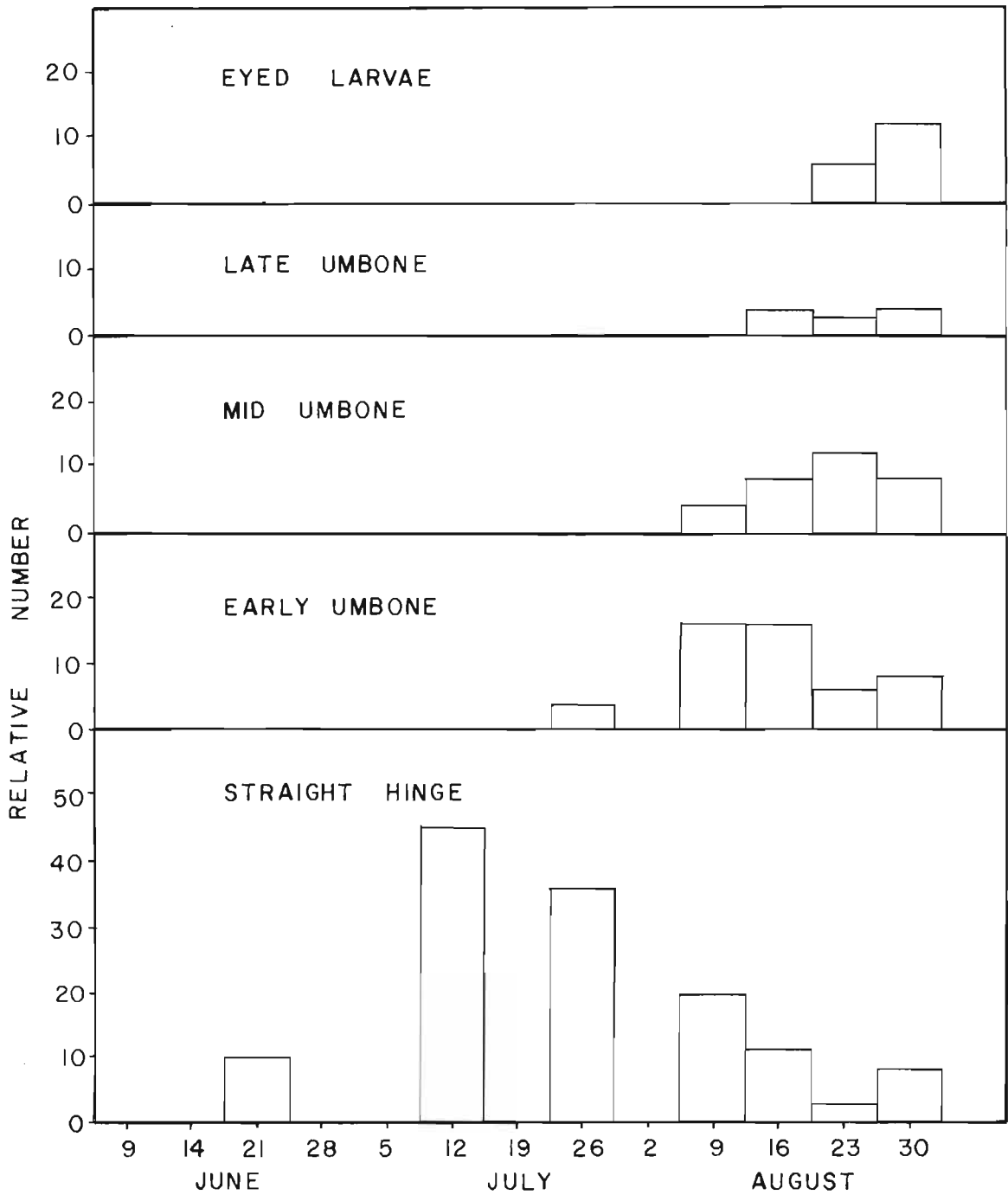
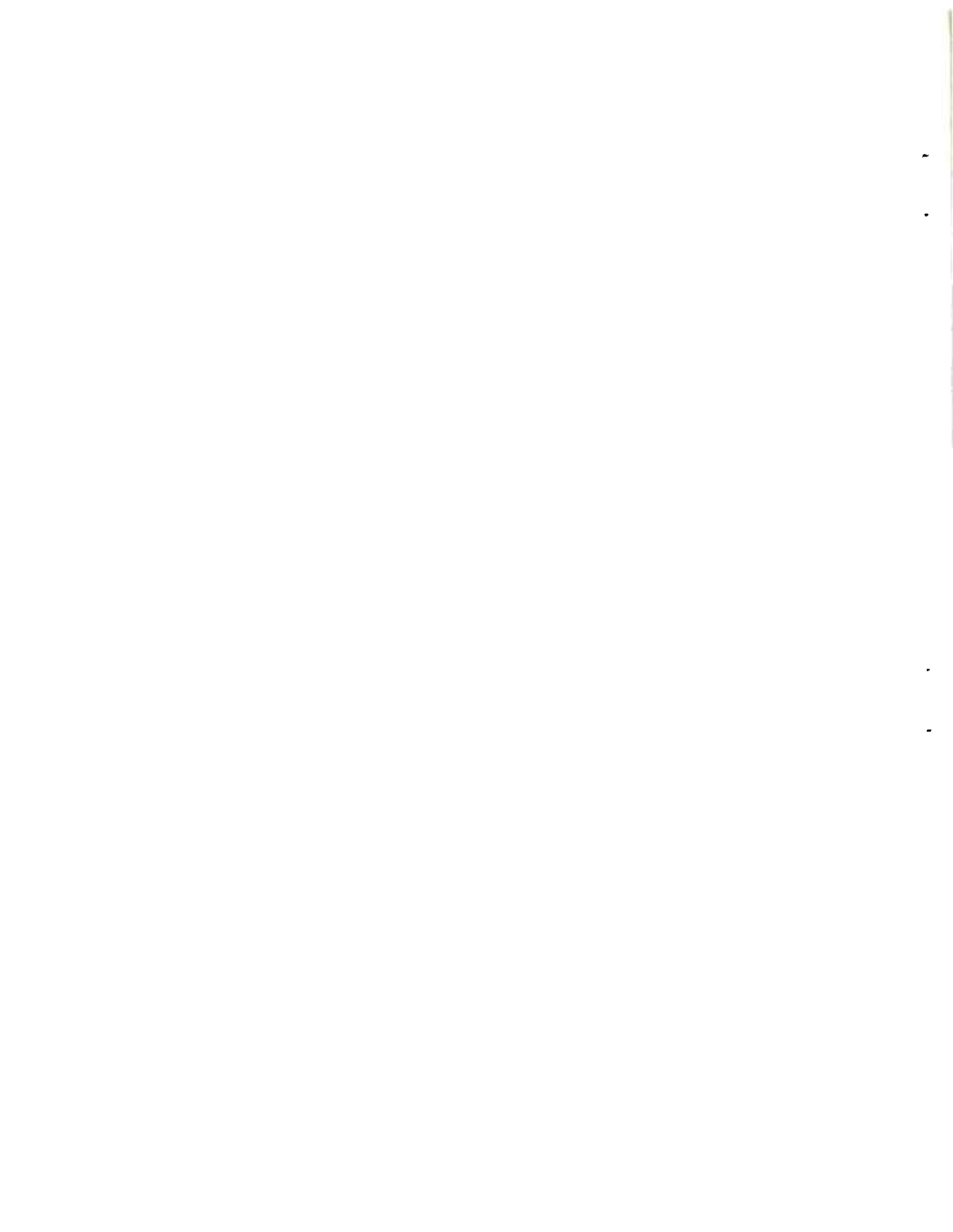


Fig. 49. Relative number of the five larval stages of *C. gigas* in weekly surface plankton tows taken at Station 1, Hotham Sound, June 9 - August 30, 1977. Samples were taken on each date shown.



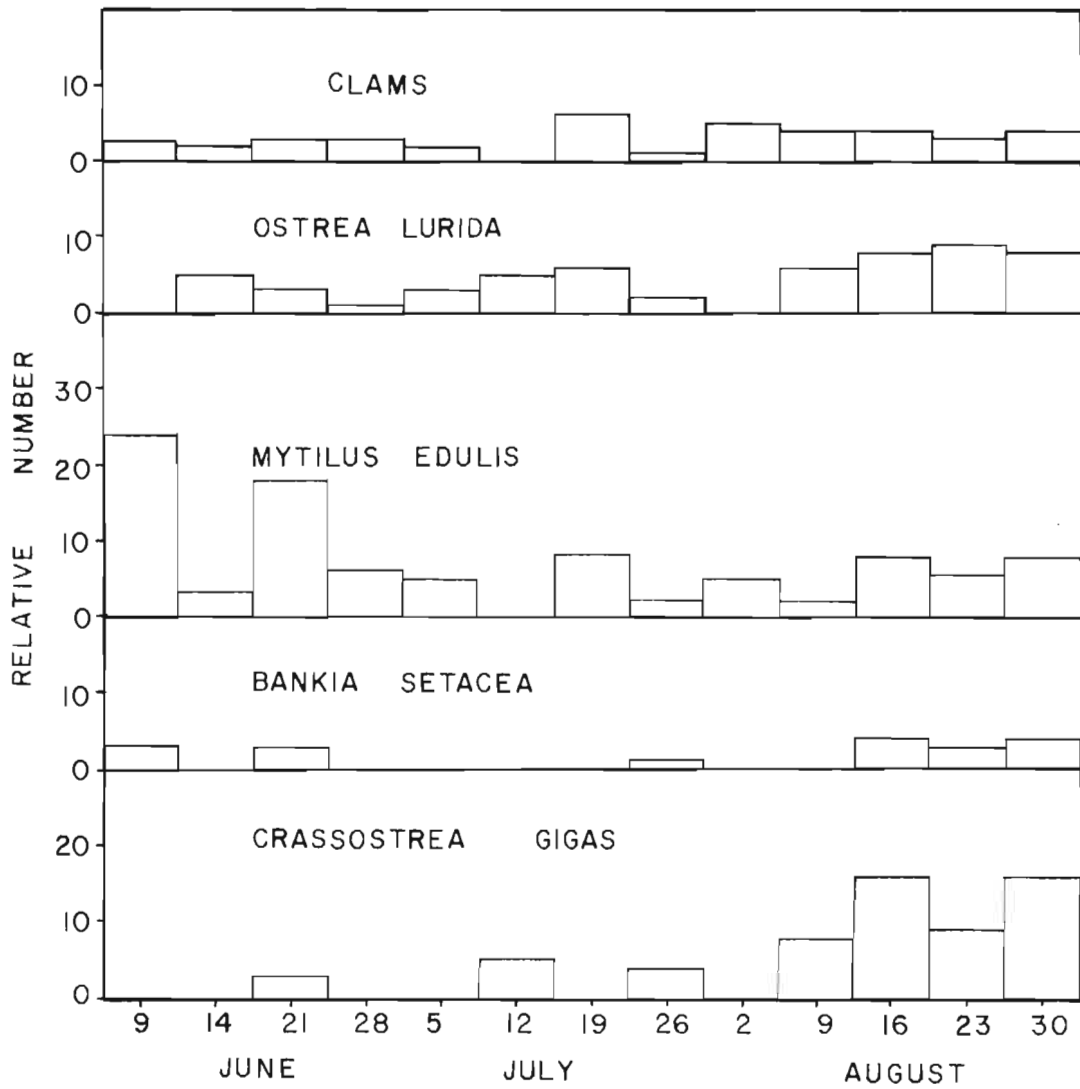


Fig. 50. Relative number of the different bivalve larvae in weekly surface plankton tows taken at Station 1, Hotham Sound, June 9 - August 30, 1977. Samples were taken on dates shown.

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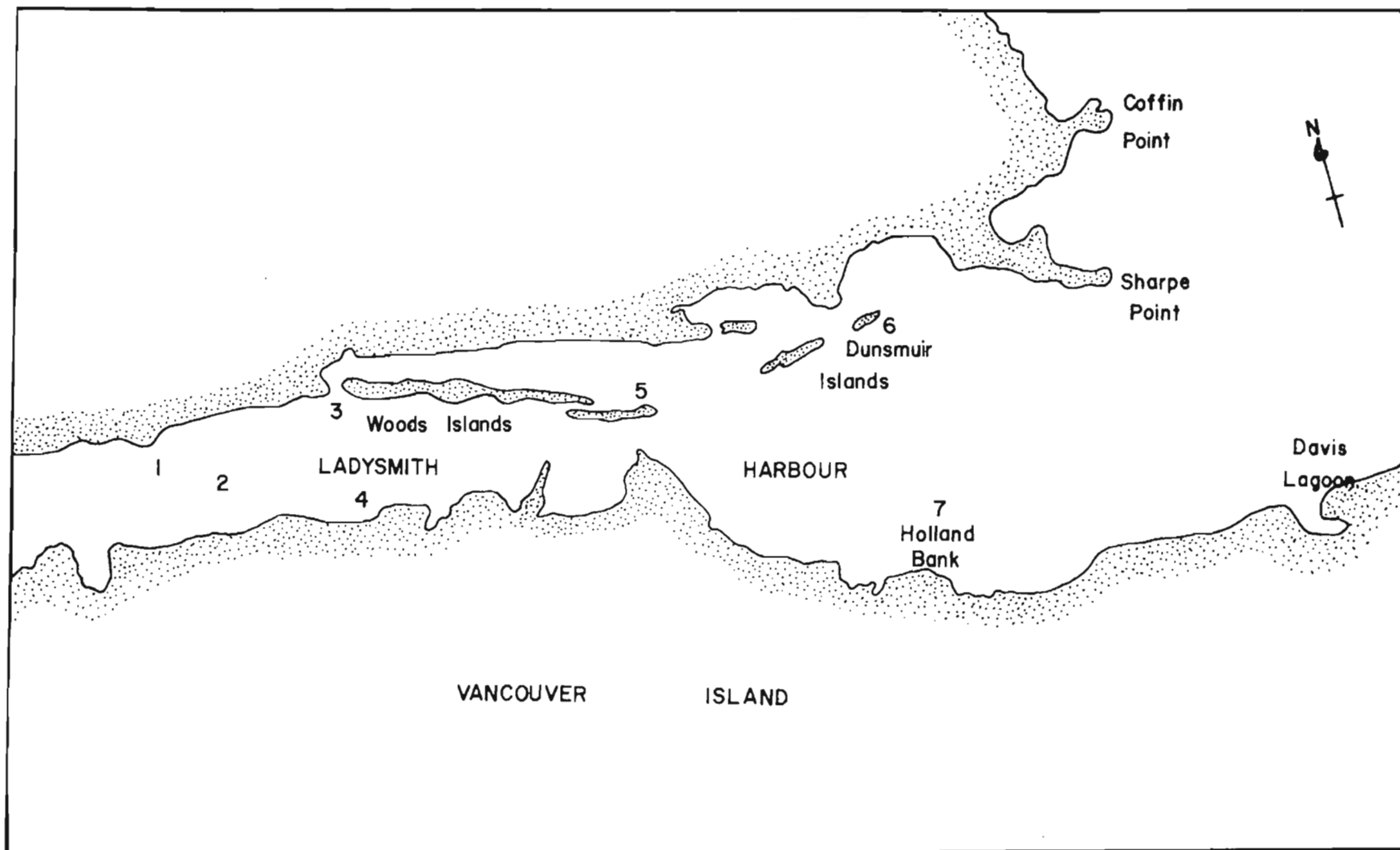


Fig. 51. Map of Ladysmith Harbour showing permanent sampling stations.

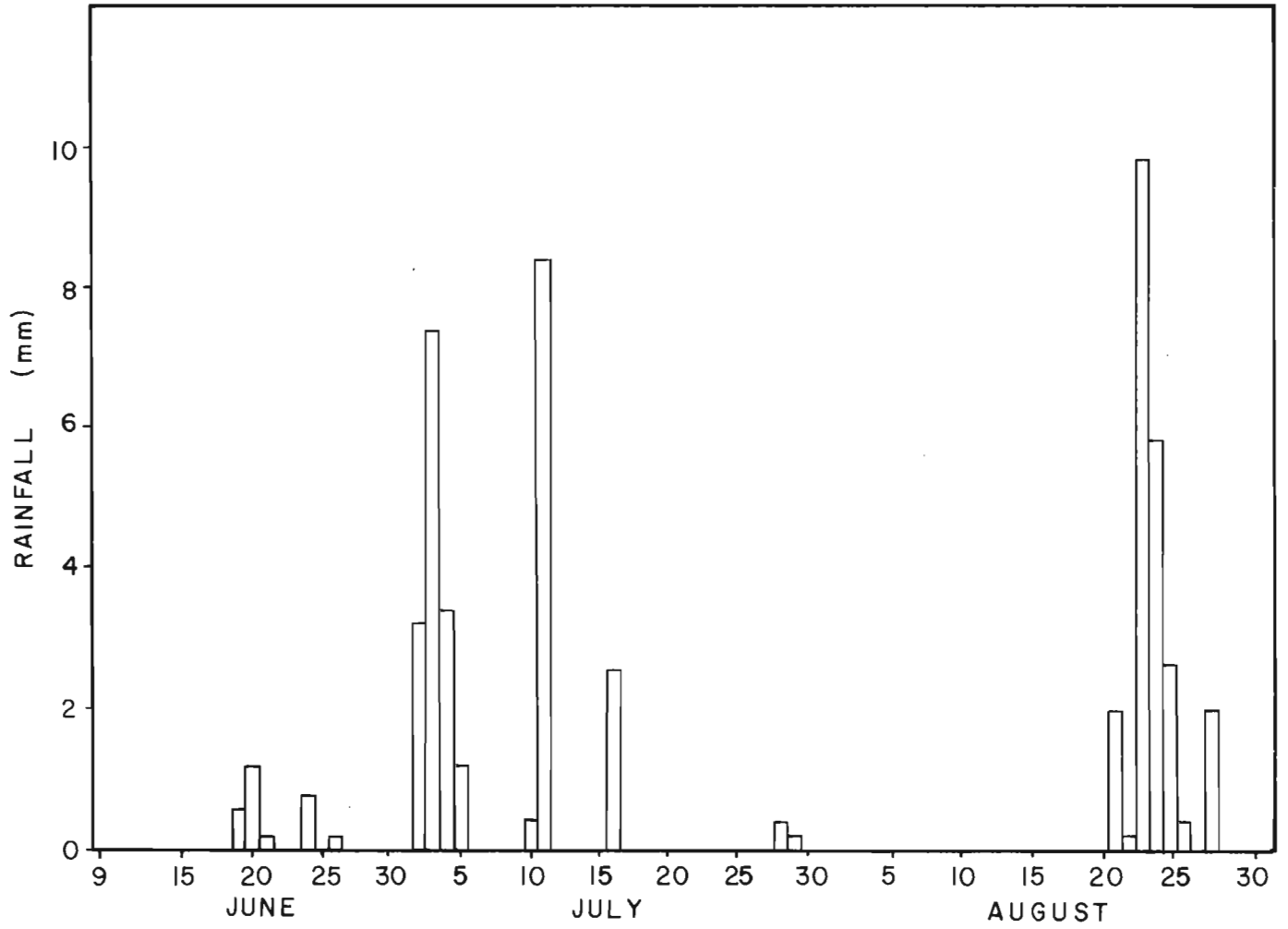


Fig. 52. Daily rainfall at Nanaimo Airport, June 9 - August 30, 1977.

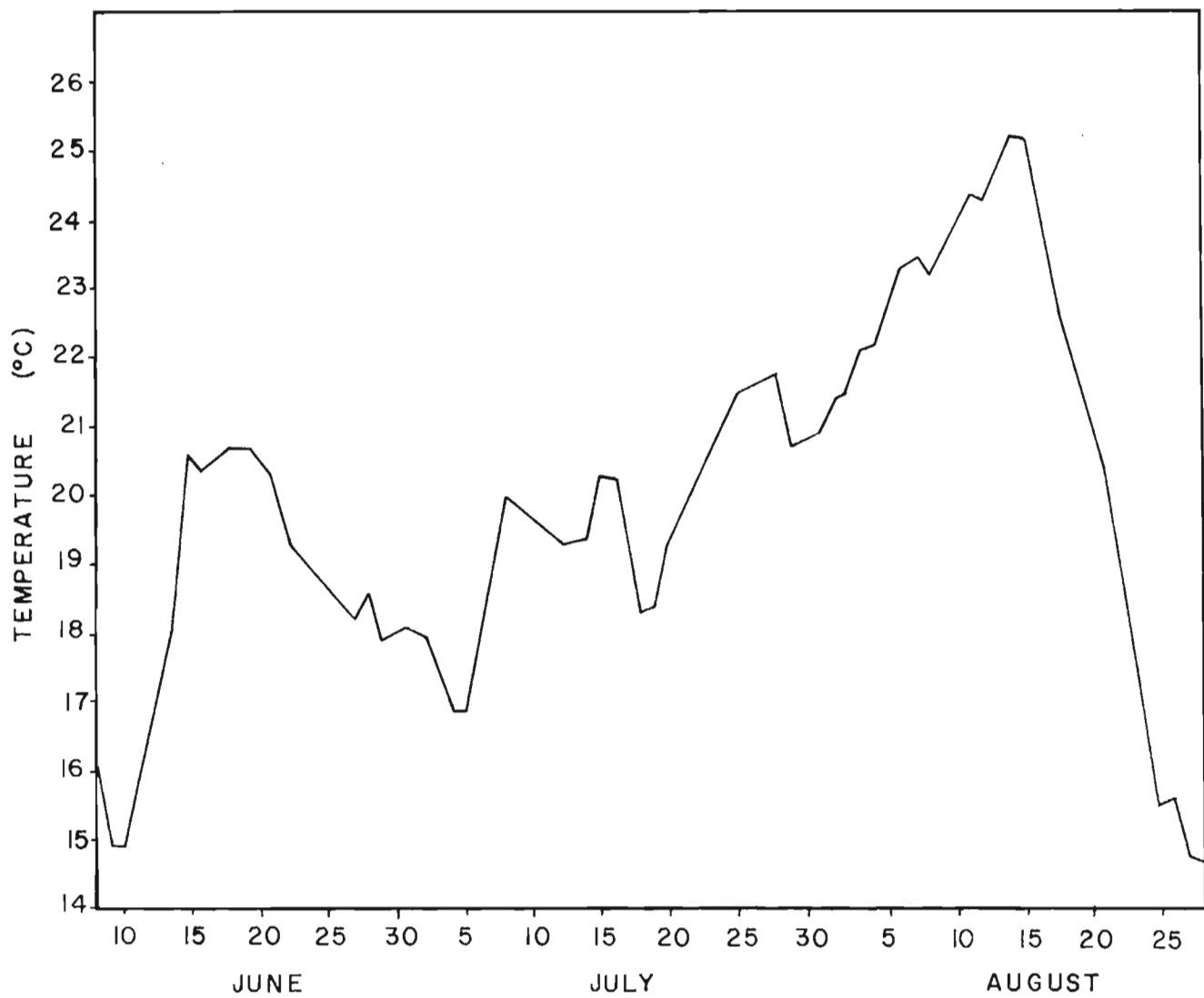


Fig. 53. Mean daily water temperature at the 1 m depth, Station 2, Ladysmith Harbour, June 8 - August 28, 1977.

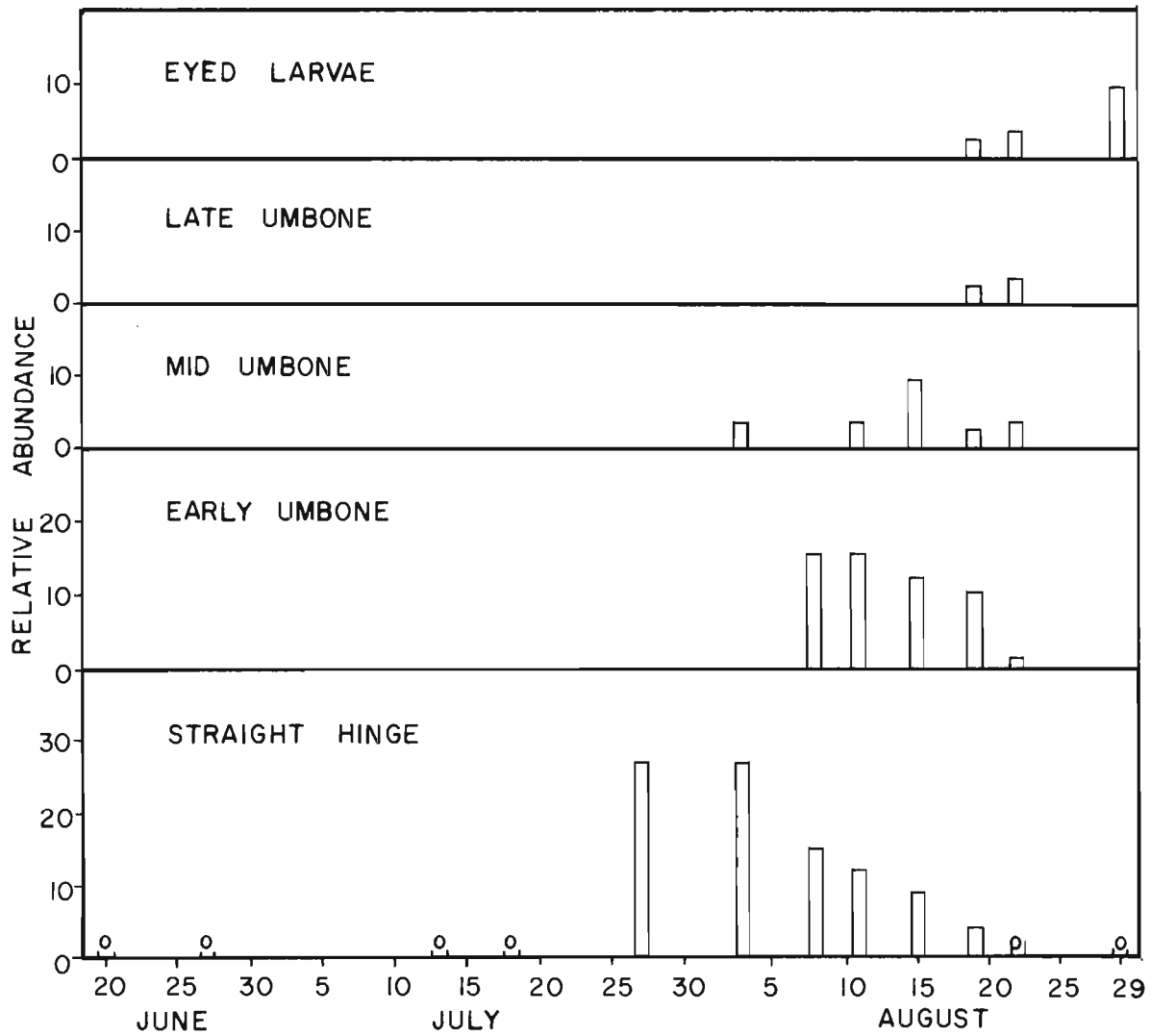


Fig. 54. Relative number of the five larval stages of *C. gigas* in surface plankton tows taken at Station 2, Ladysmith Harbour, June 20 - August 29, 1977.

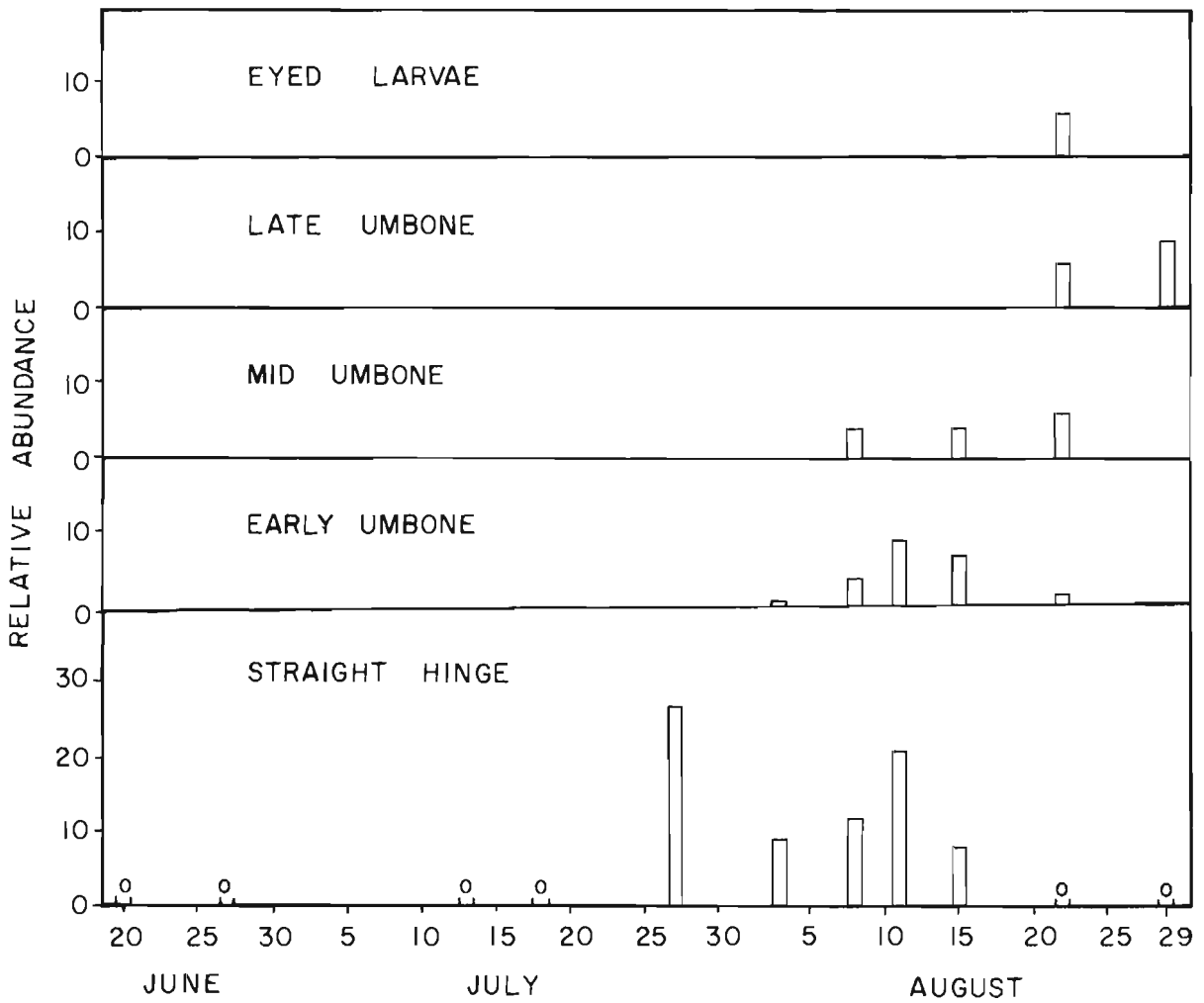


Fig. 55. Relative numbers of the five larval stages of *C. gigas* in surface plankton tows taken at Station 6, Ladysmith Harbour, June 20 - August 29, 1977.

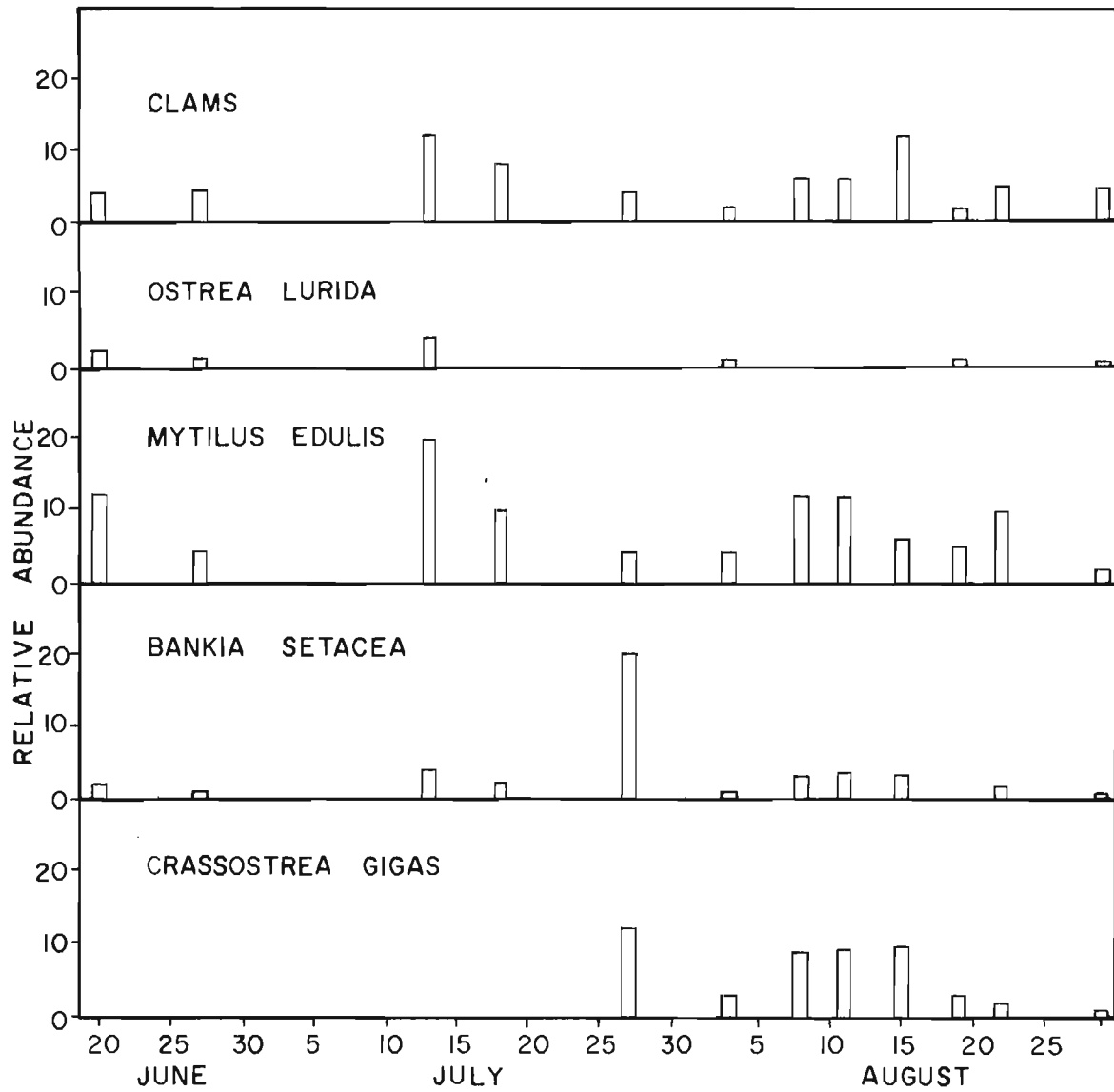


Fig. 56. Relative number of the different bivalve larvae in surface plankton tows taken at Station 2, Ladysmith Harbour, June 20 - August 29, 1977.

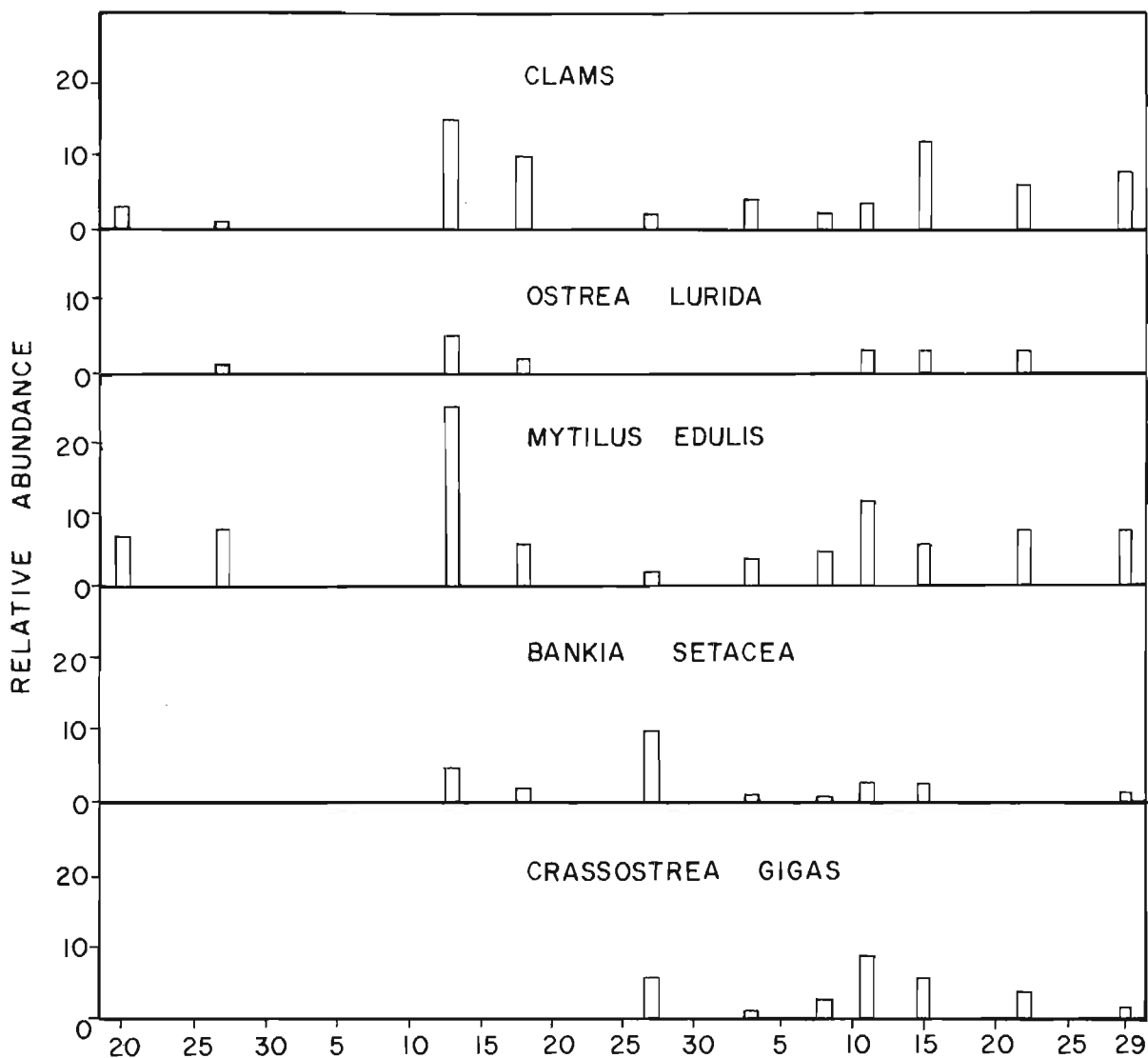


Fig. 57. Relative number of the different bivalve larvae in surface plankton tows taken at Station 6, Ladysmith Harbour, June 20 - August 29, 1977.



APPENDIX

ENVIRONMENT CANADA
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Pacific Oyster Breeding Newsletter



June 16, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 1

INTRODUCTION

This is the first issue of the 1977 British Columbia Pacific Oyster Breeding Newsletter. The Newsletter is intended to inform the British Columbia oyster industry of Pacific oyster breeding in British Columbia.

The prediction service for Pendrell and Hotham sounds will again be carried out jointly by the Pacific Biological Station, Fisheries and Marine Service, Department of Fisheries and the Environment and the Shellfish Section, Marine Resources Branch, Department of Recreation and Conservation. The program will be carried out by Neil Bourne, Dwight Heritage, and Dave Smith.

The prediction service in Ladysmith Harbour will be carried out by the Shellfish Section, Marine Resources Branch, Department of Recreation and Conservation. The program will be directed by Mr. Dave Smith and he will be assisted by Norm Martin and Carol Swan.

PENDRELL SOUND

Temperature recording equipment was installed in Pendrell Sound on June 8 and regular weekly sampling has commenced.

Water temperatures and salinities

Temperature profiles measured on June 8 and 14 indicate that a warming trend has occurred. Surface temperatures at Stations 1, 2, and 4 (Fig. 1) on June 8 were 17.3, 16.6, and 16.3 C, respectively; on June 14 they had risen to 20.7, 21.0, and 20.1 C. Temperature profiles taken on June 14 indicate that a warm surface layer has formed with a thermocline at a depth of 3 m. Temperature recorders indicate that a maximum temperature of 22.4 C occurred on June 11 at Station 2 at a depth of 1 m.

Salinity profiles on June 8 and 14 show salinities are stable and remain high. The lowest surface salinity measured was 25.0‰ at Station 4 on June 14.

Larvae

No Pacific oyster larvae were found in surface plankton samples on June 8 or 14.

Condition of adults

A sample of adult Pacific oysters taken on May 11 from Station 1 showed all individuals are ripe and in spawning condition.

HOTHAM SOUND

Water temperatures and salinities

Temperature profiles taken on June 9 and 14 at Station 1 (Fig. 2) show surface water temperatures have increased and a thermocline is present at a depth of 2 m. The surface temperature on June 9 was 19.5 and 19.6 C on June 14.

Surface salinities were 22.4 and 22.7‰ on the two sampling dates.

Larvae

No Pacific oyster larvae were found in surface plankton tows on either sampling date.

Condition of adults

Samples of adult oysters taken on June 14 showed they are ripe and in spawning condition.

LADYSMITH HARBOUR

Regular weekly sampling began on June 1 at Ladysmith Harbour and will continue through the summer.

Water temperatures and salinities

Temperature profiles measured at Stations 2 and 6 (Fig. 3) show a warming trend has occurred and a maximum surface temperature of 21.1 C was recorded at Station 2 on June 15.

Larvae

Surface plankton tows taken at Stations 2 and 6 had no Pacific oyster larvae.

If the warm sunny weather of the past 2 weeks continues, spawning of Pacific oysters could occur before the end of June. This is earlier than usual so members of the oyster industry should gear up now to avoid missing a possible early spatfall.

Anyone seeking more information on current oyster breeding news can call Neil Bourne or Dwight Heritage at the Pacific Biological Station, 758-5202 or Dave Smith at the Marine Resources Branch, 387-1537.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

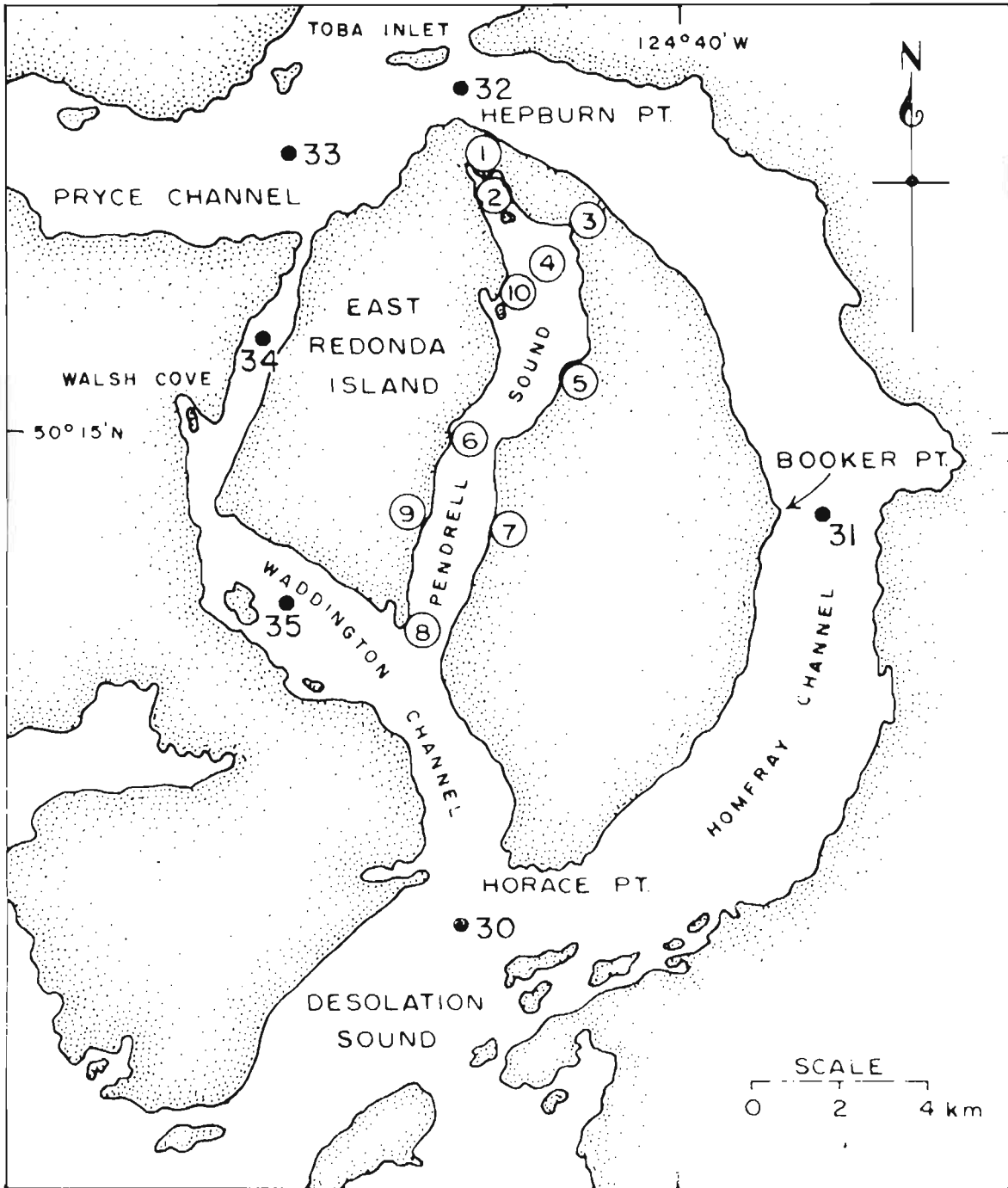


Fig. 1. Map of Pendrell Sound showing permanent sampling stations.

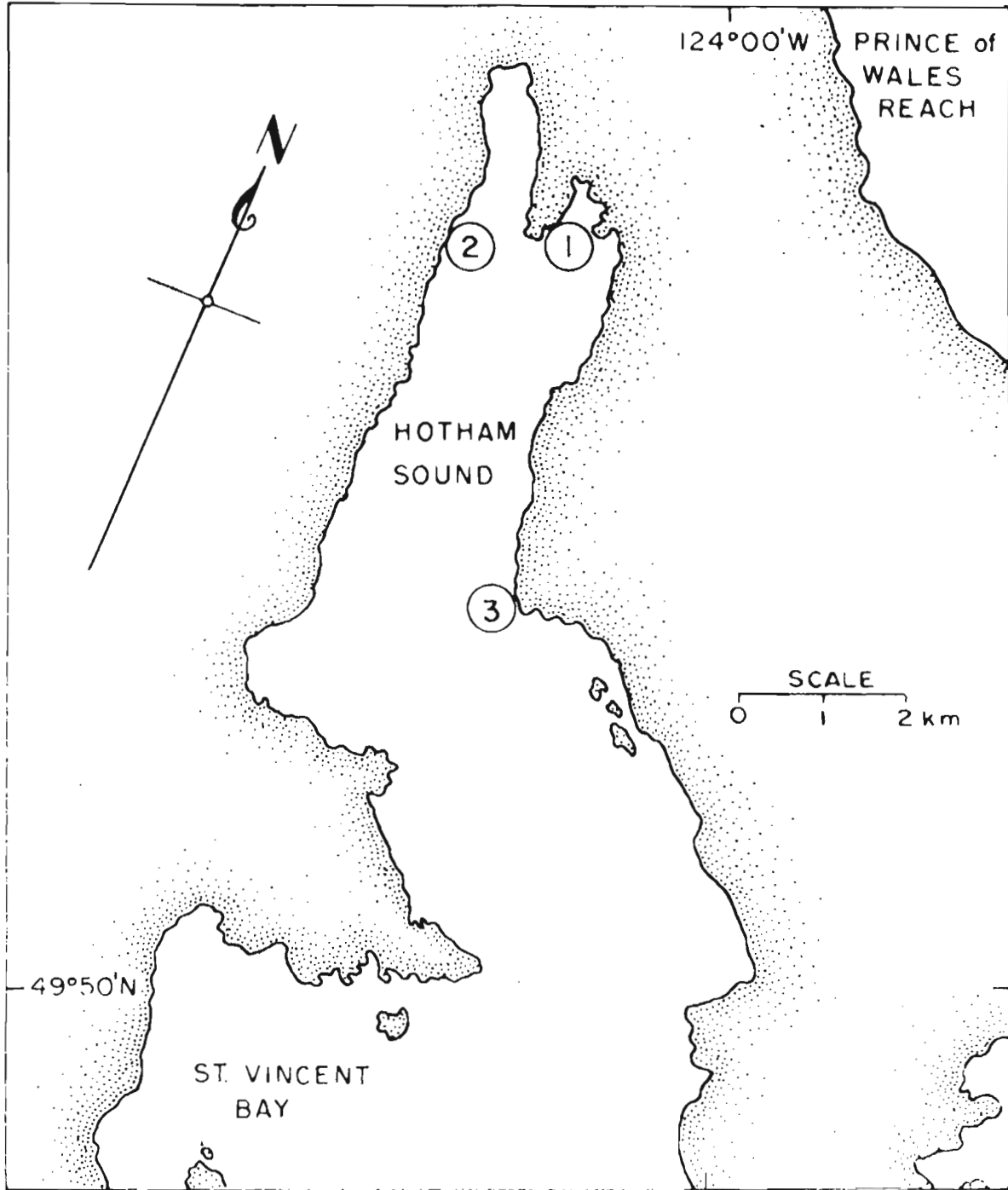


Fig. 2. Map of Hotham Sound showing sampling stations.

LADYSMITH HARBOUR

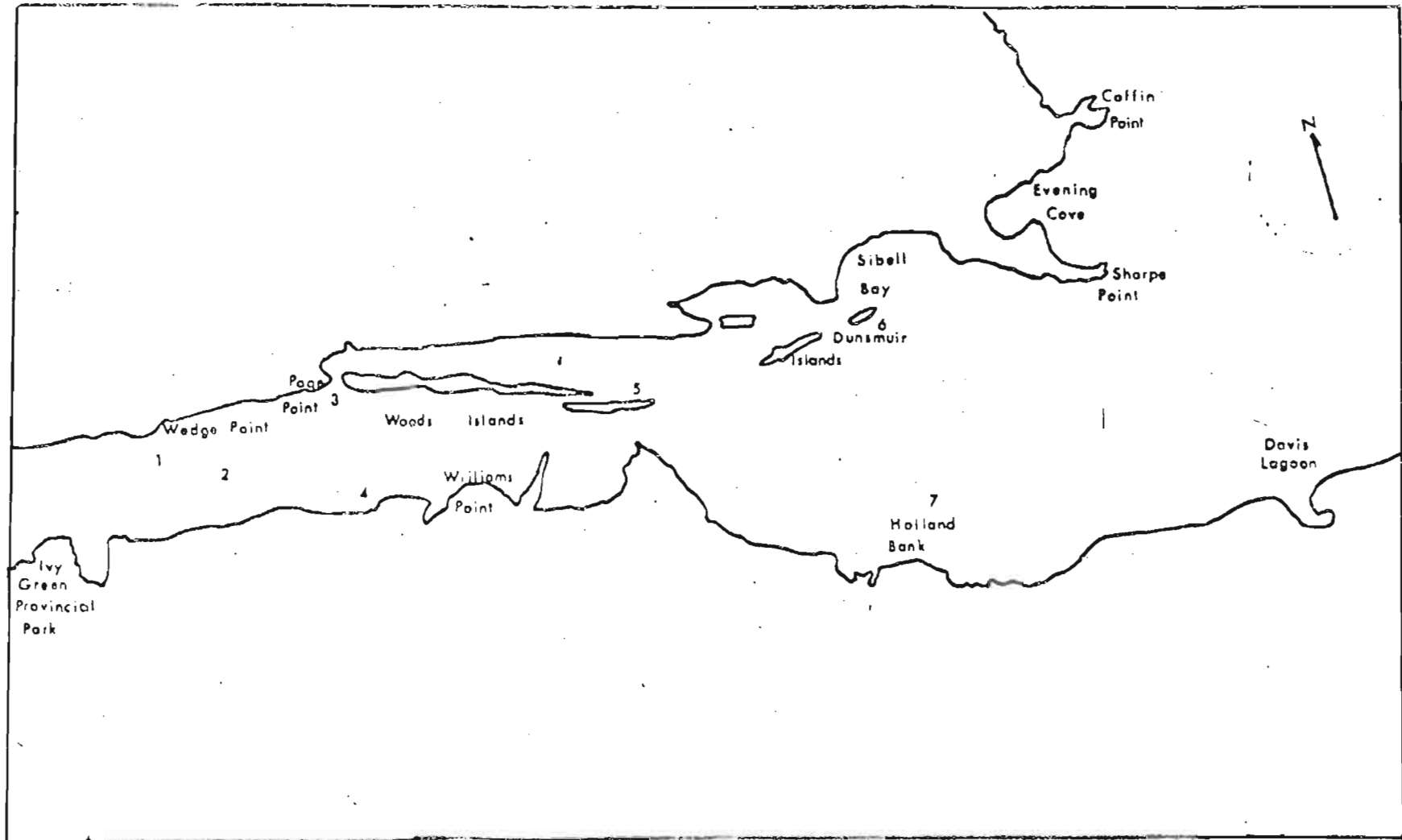
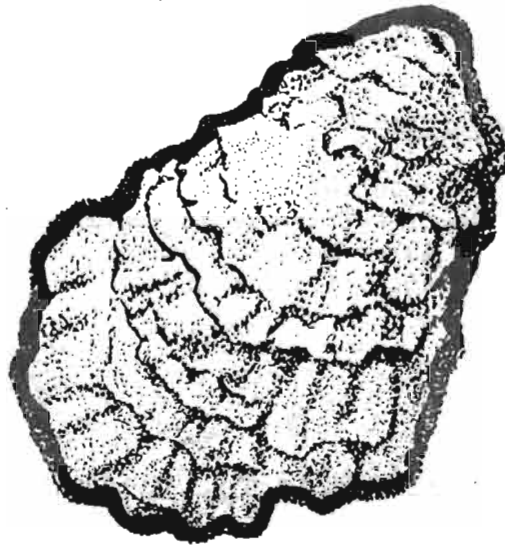


Figure 3. Map of Ladysmith Harbour, showing sampling stations.

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Pacific Oyster Breeding Newsletter



June 23, 1977

PACIFIC OYSTER BREEDING NEWSLETTER

No. 2

PENDRELL SOUND

Water temperatures and salinities

Surface water temperatures continued to rise as a result of the good weather until a maximum of 23.3 C was recorded at Station 1 on July 19. Cloudy wet weather since then has caused a slight decrease in surface water temperatures but they remained above 20 C on the last sampling date (June 21). The warm surface water layer is 3 m in depth at Stations 1 and 2 and 2 m deep at Station 4.

Surface water salinities remain high, around 24‰ at all sampling stations. No halocline is present in the Sound.

Spawning and larvae

Small numbers of straight hinge Pacific oyster larvae were present in surface plankton tows on June 20, indicating light spawning had occurred on June 18 or 19. Larvae were present at Stations 1, 2, 4, and 5 on June 21, the last sampling date. Numbers of larvae are very small and unless further spawning occurs, it is not felt that a significant spatfall will result from this spawning.

HOTHAM SOUND

Water temperatures and salinities

Surface water temperatures in Hotham Sound increased during the past week and a layer of 20 C, or above, extends down to a depth of 5 m. Surface salinities are high, around 24‰ and no halocline is present.

Spawning and larvae

Surface plankton tows on June 21 had small numbers of straight hinge Pacific oyster larvae indicating a light spawning had occurred about June 18 or 19. As in Pendrell Sound, larval numbers in Hotham Sound are too small to yield a significant spatfall.

LADYSMITH HARBOUR

Water temperatures and salinities

Surface water temperatures were similar to those reported in the previous Newsletter; a maximum of 19.9 C was recorded at Station 2 on June 18.

Spawning and larvae

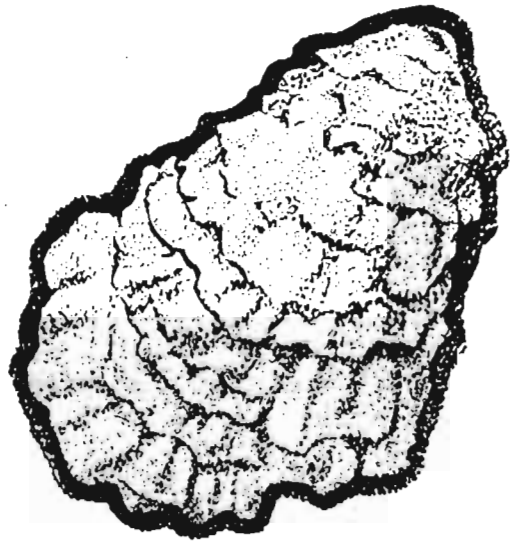
No Pacific oyster larvae were found in surface plankton tows taken on June 20 at Stations 2 and 6.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



June 28, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 3

PENDRELL SOUND

Temperatures and salinities

Cool, cloudy weather during the past week has caused a decline in surface water temperatures in Pendrell Sound. On June 28, the last sampling date, temperatures at depths of 1 and 3 m remained at, or above, 18 C at Stations 1, 2, and 4. The highest surface water temperature recorded was 22 C at Station 1 on June 22 and 23.

Surface salinities have decreased to 17.8‰ at Stations 1, 2, and 4 as of June 28, and a slight halocline has formed at a depth of 1 m.

Larvae

Surface plankton samples taken on June 28 contained no Pacific oyster larvae.

HOTHAM SOUND

Temperatures and salinities

Surface water temperatures at Station 1 in Hotham Sound decreased during the past week; on June 28 the surface temperature was 18.8 C. Surface salinities remain high, around 22‰, and no halocline is present.

Larvae

No Pacific oyster larvae were present in the surface plankton tow taken on June 28.

LADYSMITH HARBOUR

Water temperatures

Water temperatures remain low in Ladysmith Harbour with a minimum of 19 C recorded on June 22. Surface temperatures have remained above 18 C at Station 2, and close to 16 C at Station 6 during the past week, ending June 27.

Larvae

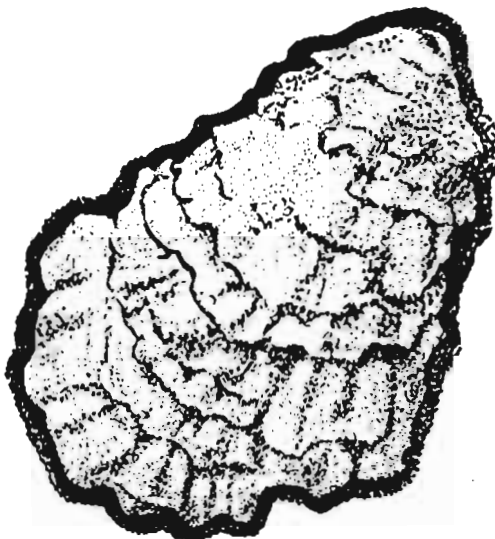
No Pacific oyster larvae were found in surface plankton tows taken on June 27 in Ladysmith Harbour.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



July 6, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 4

PENDRELL SOUND

Temperatures and salinities

The continued cool, wet weather has caused a decline in surface water temperatures during the past week. Mean daily surface water temperatures at Stations 1, 2, and 4 remained above 17 C until July 5, the last sampling date. The highest temperature recorded during the period June 28 to July 5 was 20.5 C, on June 29, 30, and July 1.

Surface salinities have risen slightly since June 28. On July 5 salinities at Stations 1, 2, and 4 were close to 18.8‰ and the halocline was 2 m deep at Station 1 and 1 m deep at Stations 2 and 4.

Larvae and spawning

Surface plankton samples taken daily from July 1 to 5 contained very small numbers of straight hinge Pacific oyster larvae. No later stage Pacific oyster larvae have been observed. It appears that a little spawning is taking place periodically but the larvae are dying within a few days.

HOTHAM SOUND

Temperatures and salinities

Surface temperatures in Hotham Sound decreased during the past week; on July 5 the surface temperature at Station 1 was 17 C. Surface salinities remain high, around 22‰ and no halocline is present.

Larvae

No Pacific oyster larvae were found in the surface plankton tow taken on July 5, the last sampling date.

LADYSMITH HARBOUR

Temperatures and salinities

Water temperatures remain low. Surface temperatures on July 5 were 17.5 C at Stations 2 and 6 and salinities at both Stations were around 27‰.

Larvae

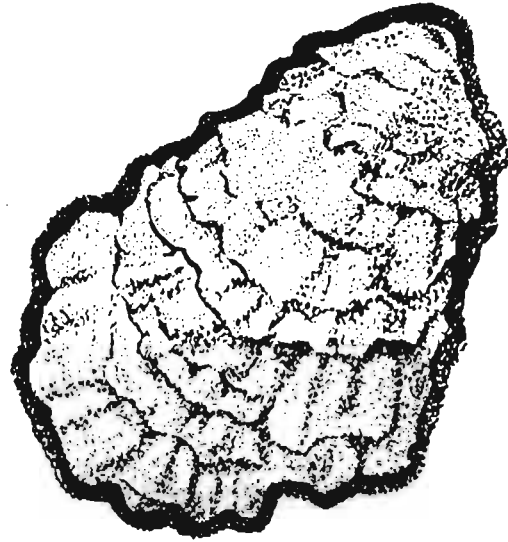
No plankton sampling was carried out during the past week. It is very unlikely that any Pacific oyster larvae are present.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



July 13, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 5

PENDRELL SOUND

Temperatures and salinities

Surface water temperatures increased slightly during the past week. Mean daily surface water temperatures at Stations 1, 2, and 4 ranged from 18.5 to 20.5 until July 12, the last sampling date. The maximum temperature recorded during the period July 6 to 12 was 23.1 C at 3 m at Station 2 on July 7.

Surface salinities have risen slightly during the past week and range from 19.1 to 19.7‰ at the three sampling stations. A halocline is present at a depth of 2 m.

Larvae and spawning

Small numbers of Pacific oyster larvae were found in daily plankton tows taken at Stations 1 and 4 during the past week. A small spawning occurred about July 7 since there was a slight increase in numbers of straight hinge larvae. A few larvae have grown to the early umbone stage. However, numbers of Pacific oyster larvae are too low to yield a commercial set

HOTHAM SOUND

Temperature and salinities

Surface water temperatures in Hotham Sound increased slightly during the past week; a temperature of 19.1 C extends to 3 m; no thermocline present. Surface salinities are 21.5‰; no halocline is present.

Larvae

Small numbers of straight hinge Pacific oyster larvae were found in the surface plankton tow taken on July 12. Numbers of larvae are too low to yield a commercial set.

LADYSMITH HARBOUR

Temperature and salinities

Water temperatures remain low; mean daily surface water temperatures at Station 2 ranged from 16.3 to 18.3 C.

Larvae

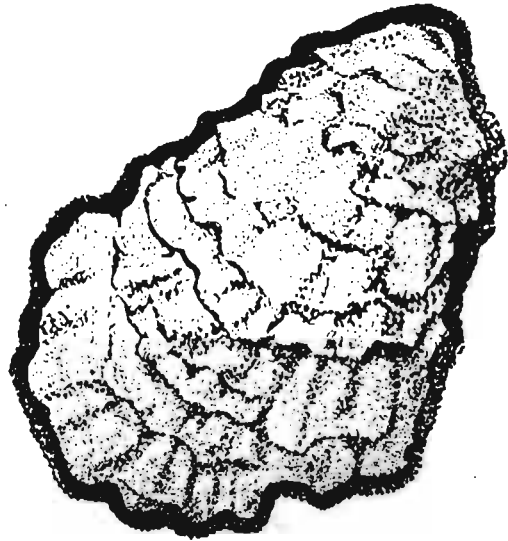
No Pacific oyster larvae were found in surface plankton tows made at Stations 2 and 6 on July 13.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



July 20, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 6

PENDRELL SOUND

Temperatures and salinities

The continuing cool weather has caused a slight decrease in surface water temperatures during the past week. The mean daily surface water temperatures at Stations 1, 2, and 4 ranged from 18.4 to 19.6 until July 18, the last sampling date.

Surface salinities have decreased slightly from the previous week and range from 18.1 to 19.5‰. A halocline is present at 2 m.

Larvae and spawning

Small numbers of Pacific oyster larvae were found in daily plankton tows taken at Stations 1 and 4 during the past week. A small spawning about July 12 caused a slight increase in the numbers of straight hinge larvae from July 13-16. A few of these larvae barely grew to the early umbone stage. Towards the end of the sampling week, numbers of the few larvae in the water declined even further.

Hot sunny weather is needed to stimulate the adult oysters to spawn and provide suitable water temperatures for the larvae to develop.

HOTHAM SOUND

Temperature and salinities

Surface water temperatures have declined in Hotham Sound and are now 17.5 C; a layer of 17 C water extends to a depth of 5 m. Surface salinities are 21‰; a slight halocline exists at 2 m.

Larvae and spawning

No Pacific oyster larvae were found in the surface plankton tow.

LADYSMITH HARBOUR

Temperature and salinities

Water temperatures remain low; mean daily surface water temperatures at Station 2 ranged from 17.9 to 19.1 C. Surface water salinities are around 26‰.

Larvae

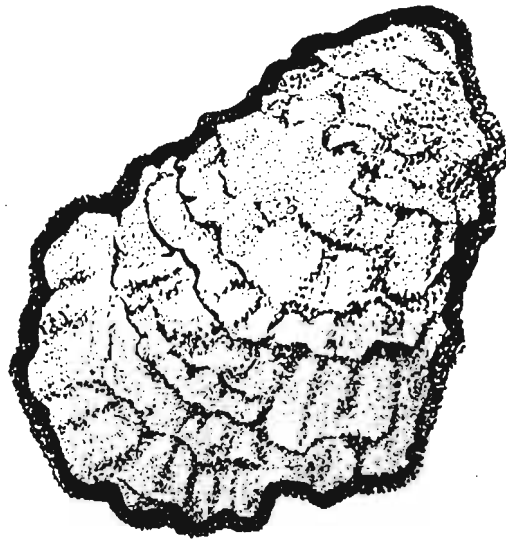
No Pacific oyster larvae were found in surface plankton tows made at Stations 2 and 6 on July 18.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



July 28, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 7

PENDRELL SOUND

Temperatures and salinities

Hot sunny weather of the past week has caused a decided increase in surface water temperatures in Pendrell Sound. Daily mean water temperatures at the 1 m depth increased from a low of 18.8 C on July 19 to highs of 23.3 C at Station 1, 23.0 C at Station 2, and 21.8 C at Station 4 on July 26, the last sampling date.

Surface salinities have decreased slightly from the previous week and on the last sampling date, July 26, ranged from 16.9‰ at Station 4 to 17.8‰ at Stations 1 and 2.

A strong halocline is present at the 2 m depth and a fairly pronounced thermocline also exists at this depth.

Spawning and larvae

Extensive spawning occurred on July 20 or 21 since large numbers of straight hinge Pacific oyster larvae were found in plankton tows on July 22. Extensive spawning was observed at Station 2 and from Station 10-6 on July 23; from Stations 2-3 on July 24; and at Stations 1 and 2 on July 25. Evening surface plankton tows at Stations 1 and 4 had large numbers of Pacific oyster larvae; about 15% had advanced to the early umbone stage by July 25. Pipe samples, which sample larvae in the top 2.5 m of the surface water, were made from July 23-26 at Station 2, and results are shown in the Table.

Numbers of Pacific oyster larvae in 100 l of water from 2.5 m pipe samples at Station 2, Pendrell Sound, 1977.

Date	Time	Numbers of larvae	
		Straight hinge	Early umbone
July 23	0900	795	
July 23	1130	1,101	
July 23	1400	337	
July 24	0725	506	11
July 24	1200	387	11
July 24	1700	531	15
July 25	0710	267	38
July 25	1700	783	137
July 26	0650	558	119

Numbers of Pacific oyster larvae now in Pendrell Sound are sufficient to produce a commercial set provided of course that the larvae survive and the hydrographic conditions continue to be favourable. With present hydrographic conditions the set should begin about August 7. People are advised to place their cultch in Pendrell Sound as soon as possible

HOTHAM SOUND

Temperatures and salinities

Surface water temperatures have increased in Hotham Sound and are now 21.5 C; a layer of 20 C or warmer water extends to a depth of 4 m. Surface salinities are 20‰. A thermocline and halocline exists at 4 m.

Spawning and larvae

Some spawning has occurred in Hotham Sound since a few Pacific oyster larvae were found in a plankton tow made on July 26. Some of these larvae had advanced to the early umbone stage so spawning probably occurred about July 20. However, numbers of larvae are small and not sufficient to produce a commercial spatfall.

LADYSMITH HARBOUR

Temperatures and salinities

Water temperatures have increased during the past week; the mean daily surface water temperatures at Station 2 increased from 17.4 C on July 18 to 20.4 C on July 25. A layer of 20 C or warmer water extends to 6 m at Station 2 and to 2 m at Station 6. Salinities at both stations are around 26‰.

Spawning and larvae

Spawning was reported on July 25. Surface plankton tows taken on July 27 had fair numbers of straight hinge Pacific larvae at Station 2, but only a few at Station 6.

Neil Bourne
Dwight Heritage
David Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



August 3, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 8

PENDRELL SOUND

Temperatures and salinities

A few days of cool cloudy weather during the past week caused a slight decline in water temperatures in Pendrell Sound but recent hot weather has resulted in a rapid increase in temperatures in the surface water. On August 1, the last sampling date, surface temperatures of 23.3, 24.2, 24.7, 25.4, and 23.4 C were measured at Stations 1, 2, 4, 5, and 6, respectively. Daily mean water temperatures remained at, or above, 21 C at a depth of 1 m; and at, or above, 19.8 C at a depth of 3 m at Stations, 1, 2, and 4 for the period July 26 to August 1. On August 1 the thermocline ranged from 4 to 6 m in depth in Pendrell Sound.

Surface salinities have increased from the previous week and on August 1 the halocline had disappeared at Stations 1, 2, and 4, was just below the surface at Station 5 and was at a depth of 1 m at Station 6. Surface salinities measured on August 1 were 21.3, 20.8, 20.4, 19.8, and 19.7‰ at Stations 1, 2, 4, 5, and 6, respectively.

Spawning and larvae

Small spawnings of Pacific oysters were observed at Station 10 on July 31 and near Station 6 on August 2. Evening surface plankton tows at Stations 1, 4, 5, and 6 had large numbers of Pacific oyster larvae on July 26 to 28; larval numbers then dropped considerably. On August 1 larger numbers of straight hinge Pacific oysters were found at Station 6 while numbers remained moderate at Stations 1, 4, and 5. The decrease in numbers of larvae may have been caused by a lack of a halocline and the deepening of the thermocline. The larvae, instead of being concentrated in the top 1 or 2 m, may have dispersed into the deeper waters. Results of running pipe samples taken at Transects 1, 3, 5, and 7 (Fig. 1) are shown in the Table.

Stage	Transect 1				Transect 3				Transect 5				Transect 6			
	July		Aug.		July		Aug.		July		Aug.		July		Aug.	
	27	29	31	2	27	29	31	2	29	31	2	27	29	31	2	
St. Hinge	5150	777	255	32	355	673	425	126	420	849	209	125	571	295	72	2443
Early Umb.	371	165	45	20	35	137	57	53	21	279	23	100	9	107	19	191
Mid Umb.	0	2	1	1	0	1	0	3	2	0	0	13	1	9	1	18
Late Umb.	0	0	0	1	0	1	0	0	0	0	0	4	0	0	0	3
Eyed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Oyster larval counts per 100 litre on 4 transects in Pendrell Sound.

Although the numbers in the Table are small and variable, it is felt there are adequate numbers to produce a good commercial set. People who have not yet put out their collectors are advised to do so immediately.

HOTHAM SOUND

Temperatures and salinities

Surface water temperatures have increased in Hotham Sound and are now 22.6 C; the 20 C surface layer of water extends to the thermocline at a depth of 4 m. Surface salinities remain above 20‰. No halocline is present.

Larvae

No Pacific oyster larvae were found in the surface plankton tow taken at Station 1 on August 2, the last sampling date.

LADYSMITH HARBOUR

Temperatures and salinities

Water temperatures in Ladysmith Harbour continued to rise during the past week, with a high temperature of 21.2 C occurring at Station 2 on August 2. Water temperatures of 20 C, or above, extend to a depth of 6 m at Station 2 while temperatures at Station 6 remain below 19 C.

Surface salinities remain above 25‰ at both stations, a halocline does not exist.

Spawning and larvae

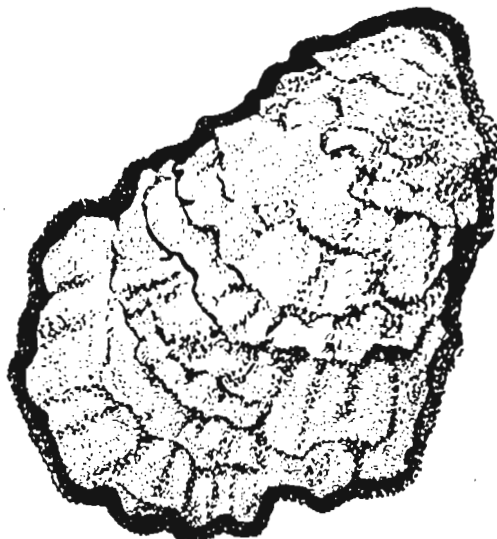
No spawning was observed during the past week but surface plankton tows taken at Stations 2 and 6 on August 3 contained a few straight hinge Pacific oyster larvae. This indicates that a light spawning occurred on, or near, August 1. Larval numbers do not indicate a commercial set in Ladysmith Harbour.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



August 10, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 9

PENDRELL SOUND

Hydrographic Conditions

The hot sunny weather of the past week has produced an increase in surface water temperatures in Pendrell Sound. The maximum water temperature recorded at the 1 m level was 25.5 C on August 6; mean daily temperatures have been above 22 C. A thermocline is present at the 2 to 3 m depth.

Salinities remain high; the lowest recorded was 18.8‰ at Station 6 on August 9. Elsewhere salinities are above 20‰. A halocline is present at the 2 to 3 m level.

Spawning and Larvae

Daily spawning was observed from August 2-6 and large numbers of all stages of larvae are now in the water. The table shows the numbers of larvae per 100 litre in running samples on August 4, 6 and 8. (Transect 1 is at the head of the Sound; Transect 7 is at Station 6.) The numbers of larvae are sufficient to produce a commercial set. If present hydrographic conditions continue and the larvae survive, setting should continue to at least the middle of the month.

Numbers of Pacific Oyster Larvae per 100 Litres
in Running Pipe Samples, Pendrell Sound, 1977.

	Straight Hinge	Early Umbone	Mid Umbone	Late Umbone	Eyed
AUGUST 4					
Transect 1	1869	292	56	31	2
Transect 3	2033	66	30	14	0
Transect 5	965	288	121	51	0
Transect 7	3402	801	206	78	0
AUGUST 6					
Transect 1	5845	648	237	65	2
Transect 3	6064	324	171	48	2
Transect 5	1700	123	37	20	0
Transect 7	3002	305	146	73	0
AUGUST 8					
Transect 1	1317	463	204	109	9
Transect 3	1974	400	166	139	13
Transect 5	1647	308	60	63	3
Transect 7	1359	317	108	64	3

Spatfall

First spatfall was recorded on daily cultch put out at the barge (Station 2) on August 5 and examined on August 6. Average spatfall was 2.6 spat per shell on cultch exposed from August 6-7; and 3.2 on cultch exposed from August 7-8.

Mean numbers of spat per shell on cultch exposed for the week of August 1-8 was: 1.9 at Station 1; 3.2 at Station 2; 0.1 at Station 4; 3.7 at Station 5; and 0 at Station 6.

Setting intensity should increase towards the end of this week.

HOTHAM SOUND

Hydrographic Conditions

Surface water temperatures were 20.5 to 22.6 C in Hotham Sound; surface salinities are 21‰. A thermocline and halocline is present at 1-2 m.

Spawning and Larvae

A small spawning has occurred in the last week since a few straight hinge larvae are present in the plankton. The largest larvae are in the mid umbone stage. A fair number of eggs are in the plankton. Larval numbers are not sufficient to produce a commercial set.

Spatfall

No spat was found on the cultch exposed on August 2.

LADYSMITH HARBOUR

Hydrographic Conditions

Surface water temperatures have increased during the past week, the daily mean on August 7 was 23 C. At Station 2, 20 C water extends to 6 m. Surface salinities are above 25‰.

Larvae and Spawning

Some spawning has occurred in the past week since fair numbers of straight hinge larvae were present in plankton tows at the head of the harbor. Fair numbers of early umbone larvae are also present, the result of previous spawnings. If the larvae survive and hydrographic conditions continue to be favourable, a small set could result.

Spatfall

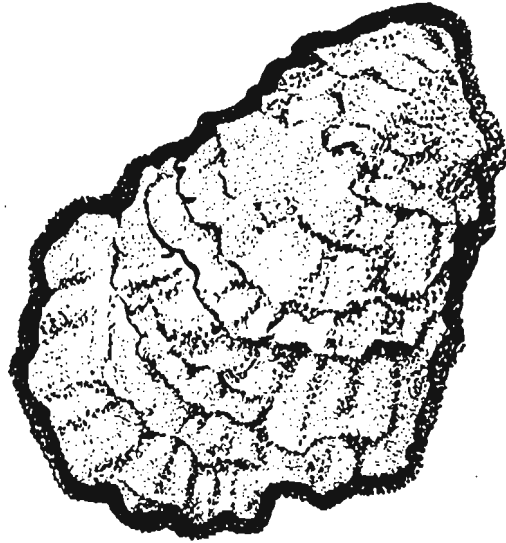
No spat was found on the cultch exposed on August 2.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

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Pacific Oyster Breeding Newsletter



August 18, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 10

PENDRELL SOUND

Temperatures and salinities

Continued hot, sunny weather produced increased surface water temperatures in Pendrell Sound during the past week. The lowest average daily water temperature at the 1 m depth was 23.6 C; the highest was 25.2 C. A fairly strong thermocline is present at the 2-3 m depth.

Surface salinities remained relatively stable during the past week and ranged from 18.6‰ to 21.2‰ on August 15, the last sampling date. A strong halocline is present at the 2 m depth.

Spawning and Larvae

No further spawning was observed during the past week and judging by the low number of straight hinge larvae in the plankton no significant spawning occurred during this period.

Results of surface plankton tows and running pipe samples indicate there are still good numbers of larvae in the water; sufficient to provide a commercial set, Table 1. Setting should continue until the end of next week provided present hydrographic conditions continue and the larvae survive.

Spatfall

Heavy spatfall was experienced at the monitoring station at the barge (Station 2) during the past week. Spatfall in daily cultch reached a maximum of an average of 90 spat per shell which was exposed from August 13-14. The average cumulative total of spatfall at this station on August 15 was 283 spat per shell.

The average number of spat on weekly cultch at Stations 1, 2, 4, 5, and 6 is shown in Table 2. It is interesting to note that heaviest spatfall has occurred in the head of the Sound although the largest numbers of larvae have been found off Station 5.

To date all commercial cultch examined has had an excellent commercial set. Additional spatfall is expected to continue to about August 25.

HOTHAM SOUND

Hydrographic Conditions

Surface temperatures were 20.3 C in Hotham Sound with a slight thermocline at 2 m. Surface salinities are 22.8‰; no pronounced halocline is present.

Spawning and Larvae

Small numbers of Pacific oyster larvae are present in the plankton and range from the straight hinge to late umbone stage; most are in the early umbone stage. Larval numbers could produce a light set but below the commercial level.

Spatfall

One spat was found on the ten pieces of test cultch examined.

LADYSMITH HARBOUR

Hydrographic Conditions

Surface water temperatures increased during the past week; the average daily surface water temperature at Station 2 was above 22.5 C. The warm water layer extends to at least 6 m. Surface salinities are above 25‰.

Spawning and Larvae

Some spawning has occurred in the past week since moderate numbers of straight hinge larvae are in the planktons. Modest numbers of half-grown larvae were found in plankton tows on August 15 and these could produce a small set providing the larvae survive. Spatfall should begin about August 24.

Spatfall

No spat was found on cultch exposed from August 8-15.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

Table 1. Numbers of Pacific Oyster Larvae per 100 Liters
in Running Pipe Samples, Pendrell Sound, 1977.

	Straight Hinge	Early Umbone	Mid Umbone	Late Umbone	Eyed
AUGUST 10					
Transect 1	284	1646	51	39	5
Transect 3	876	2712	92	62	3
Transect 5	632	1863	784	742	15
Transect 7	294	3887	198	145	8
AUGUST 12					
Transect 1	0	174	877	84	29
Transect 3	42	1717	273	111	68
Transect 5	47	880	50	24	4
Transect 7	59	567	31	8	2
AUGUST 14					
Transect 1	0	20	40	34	59
Transect 3	8	45	104	16	10
Transect 5	10	198	192	20	5
Transect 7	5	90	341	48	9

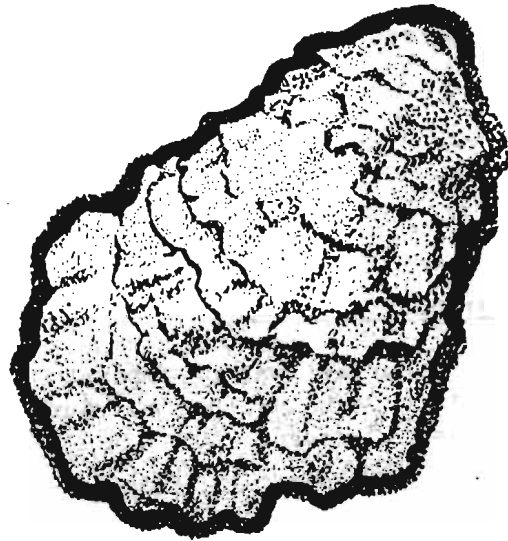
Table.2. Average number of spat per piece of oyster shell cultch exposed in Pendrell Sound from August 8-15, 1977.

Station	Number of Spat
1	432
2	649
4	169
5	170
6	67

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Pacific Oyster Breeding Newsletter



August 24, 1977

PACIFIC OYSTER BREEDING NEWSLETTER

No. 11

PENDRELL SOUND

Temperatures and Salinities

Surface water temperatures remained quite high until August 21 when cloudy, cool weather caused them to decrease. However, on August 22 the mean daily water temperature at the 1 m depth at Stations 1, 2, and 4 ranged from 21.8 to 22.5 C. The thermocline is tending to break down and the warm water layer extends to a depth of 4-6 m.

Surface salinities remain above 17.5‰; a strong halocline is still present at the 2-3 m depth.

Spawning and Larvae

Results of surface plankton tows and running pipe samples show there are still good numbers of larvae in the water, particularly the later stages, (Table 1). Setting should continue until about the end of the month.

Spatfall

Extremely heavy spatfall occurred at the monitoring station at the barge during the past week, particularly during the last 2 days, (Table 2). Cultch exposed for the 24-hr period August 20-21 had an average count of 4761 spat per shell.

The average count of spat on weekly cultch exposed at Stations 1, 2, 4, 5, and 6 is over 3000 spat per shell. Heavier setting has occurred in the head of the Sound (Stations 1 and 2) than at the other stations.

All commercial cultch examined has an excellent set.

HOTHAM SOUND

Hydrographic Conditions

Surface water temperatures were 20.6 C and a layer of warm water (above 19 C) extends to 8 m. Surface salinities are above 23‰; no pronounced halocline is present.

Spawning and Larvae

Moderate numbers of Pacific oyster larvae are present in the plankton and range from the straight hinge stage to the eyed stage. Some spawning has occurred during the past week as indicated by the number of straight hinge and early umbone larvae. Moderate numbers of eyed, mid, and late umbone stage larvae are present and could produce a commercial set (up to 25 spat per shell) if they survive.

Spatfall

The average number of spat on cultch exposed for the period of August 16-23 was 4 per shell; range 0-8 per shell. Spatfall should continue through until the end of the month.

LADYSMITH HARBOUR

Hydrographic Conditions

Surface water temperatures have cooled during the past week; on August 22 they were 21 C at Station 2, and 19.6 C at Station 6. The warm water layer is shallow and only extends to a depth of about 1 m at both stations. Surface salinities remain above 25‰.

Spawning and Larvae

No spawnings were observed or reported during the past week. Modest numbers of larvae were found in plankton tows on August 19 and 22; slightly greater numbers occurred at Station 6 than at Station 2. Most larvae are in the mid umbone to eyed stages and could produce a small set providing the larvae survive.

Spatfall

One spat was found on ten pieces of cultch exposed from August 15-22 at Station 2. At Station 6, average spatfall was 0.8 spat per shell (range 0-2) on cultch exposed for the same period.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin

Table 1. Numbers of Pacific oyster larvae per 100 liters in running pipe samples, Pendrell Sound, 1977.

	Straight Hinge	Early Umbone	Mid Umbone	Late Umbone	Eyed
AUGUST 16					
Transect 1	25	75	745	178	42
Transect 3	15	536	2068	332	28
Transect 5	5	103	400	48	21
Transect 7	14	91	692	140	9
AUGUST 18					
Transect 1	2	14	364	166	22
Transect 3	34	118	1076	938	161
Transect 5	19	29	425	564	68
Transect 7	12	41	483	516	98
AUGUST 20					
Transect 1	5	7	33	224	173
Transect 3	96	107	301	1026	627
Transect 5	5	1	29	211	203
Transect 7	8	5	26	141	91

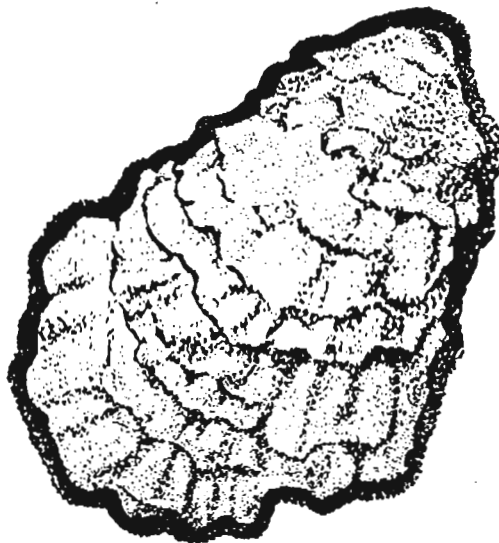
Table 2. Average number of spat per piece of oyster shell cultch exposed for 24-hr periods at Station 2, Pendrell Sound, 1977.

Period of Exposure	Number of Spat
August 15-16	16
16-17	55
17-18	131
18-19	170
19-20	636
20-21	4761
21-22	2342

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Pacific Oyster Breeding Newsletter



August 31, 1977

PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

No. 12

PENDRELL SOUND

Temperatures and Salinities

Surface water temperatures declined during the past week, at the 1-m depth water temperatures are below 20 C. Slightly warmer water is present at the 3-m depth and on the last day of sampling (August 30) it was around 20 C. The warm-water layer (above 18 C) extends to a depth of 8-10 m.

Surface salinities are above 19.5‰; a strong halocline remains at the 3-m depth.

Spawning and Larvae

A few Pacific oyster larvae were found in surface plankton tows but they are not expected to produce significant spatfall. All larvae are in the late developmental stages.

Spat fall

Extremely heavy spatfall continued during the past week; spatfall was heavier in the central part of the Sound than in the head. Estimates of numbers of spat per piece of shell on cultch exposed for the week of August 23-30 were: 5,000 at Station 6; 4,000 at Stations 4 and 5; 3,000 at Station 6E; 2,000 at Station 10; and 1-2,000 at Stations 1 and 2.

HOTHAM SOUND

Hydrographic Conditions

Surface waters have cooled during the past week and are now below 20 C. The layer of warm water (above 18 C) extends to 8 m. Surface salinities are above 23.8‰; no halocline is present.

Spawning and Larvae

Moderate numbers of Pacific oyster larvae remain in the plankton and range from straight hinge to eyed but most are in the later developmental stages. The moderate numbers of late umbone and eyed larvae should provide significant spatfall into the first week of September.

Spatfall

Average spatfall on cultch exposed for the 2-week period, August 16-30 was 20.5 spat per piece of shell.

LADYSMITH HARBOUR

Hydrographic Conditions

Surface water temperatures declined during the past week and are now below 17.4 C at Station 2 and 13.9 C at Station 6. Salinities are above 25.8‰ at both stations.

Spawning and Larvae

Only a few Pacific oyster larvae were found in plankton tows on August 29 and these were in the late umbone or eyed stages.

Spatfall

Average spatfall on cultch exposed for the 1-week period August 22-29 was 0.3 spat per piece of shell at both Stations 2 and 6.

PREDATORS

Growers are advised to examine their cultch regularly for starfish; the sudden appearance of numbers of starfish on cultch should be reported to the Pacific Biological Station or to the Marine Resources Branch. Personnel of these two organizations will also monitor cultch for the presence of starfish or other predators.

This is the final weekly Newsletter for the year. We will be issuing a summary Newsletter and a Manuscript Report summarizing all results later in the year. Copies of both will be mailed to all those on the mailing list.

Neil Bourne
Dwight Heritage
Dave Smith
Norm Martin