the eight nets (i.e., over a 80-meter depth interval). At 2000, about 6 hours before the onset of maximum darkness, the population began to rise perceptibly above 200 meters and generally reached the upper portion of its nighttime excursion at 0100 (local time). Almost immediately thereafter, the downward migration began, returning the population to its daytime depth range by the time surface-light intensity had increased to about 10 percent of its daily maximum (figure 1a,b). The upper limit of the vertical excursion of the bulk of the population could not have been shallower than 15 meters, and sometimes was deeper. Based on these observations, we calculate a minimum migration velocity of 25 meters per hour.

Grazing activity, as indicated by the level of gut fluorescence, was strongly tied to the nightly vertical migration event (figure 1c). Mean gut pigment content during the day was less than 0.15 nanogram chlorophyll equivalents for each individual. As the animals migrated toward the surface, the gut contents began to increase, even at depths well below the chlorophyll maximum. This could have been due to feeding on pigment-rich fecal material, to sporadic occurrences of phytoplankton, or to individuals whose diel migration was slightly out of phase with the majority of the population. Maximum gut pigment content—almost two orders of magnitude greater than the daytime gut content—was attained simultaneously with arrival near the surface and persisted for some time after the population began its descent. The evacuation rate of the *in situ* population was not significantly different than that of individuals removed from the population and maintained in filtered seawater on deck for two hours. The absolute concentration of pigments in deck-incubated fauna was reduced to near zero about two hours before that of the field population, suggesting that the field population continues to feed during descent.

This research was conducted as part of the RACER (Research on Antarctic Coastal Ecosystem Rates) program, designed to study ecosystem dynamics during the spring bloom. Our continuing study will assess the relationship between diel feeding and vertical migration behavior to the bioenergetics of individual *M.gerlachei*. This will be done by comparing some of the results discussed here with cycles of activity as reflected by the RNA and DNA content, the activity of metabolic enzymes, and the respiration measurements made throughout the daily cycle.

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RACER: Composition and vertical distribution of larval fishes at a time-series station in Gerlache Strait, November 1989

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Among objectives of the 1989 Research on Antarctic Coastal Ecosystem Rates (RACER) Program were studies to determine whether the relatively high zooplankton abundance within Gerlache Strait is due to accumulation from physical processes or whether it originates there through high rates of local reproduction, development, and survival (Huntley et al. 1990). To address this question, an intensive program of vertically and horizontally stratified zooplankton sampling was undertaken by using a multiple-opening-closing-net-and-environmental-sensing system (MOCNESS) at grid stations within Gerlache Strait and southwest Bransfield Strait and at a time-series station (station A) located in the eastern Gerlache Strait (figure 1). About 1,200 MOCNESS samples were collected and they are being analyzed to provide information on the early life stages of fish in addition to the dominant euphausiid and copepod species.

Little is presently known about the planktonic fish assemblages in Gerlache Strait. Given the high primary productivity and zooplankton biomass (Huntley et al. 1990) and the prevalence of inshore habitats and coastal eddies (Niiler et al. 1990), Gerlache Strait has the potential for supporting a high abundance of larvae—some from species that are rarely encountered in offshore waters.

Presented here are the preliminary results from analysis of the fish collected during time-series sampling at station A. Drifter buoy studies indicate that the residence time of water near this station is in the order of two months (Niiler et al. 1990). It is of interest to consider whether this area may retain the pelagic larvae of species spawning in coastal waters, thereby reducing their advection offshore.

Data on larval fish at station A were obtained from vertically stratified MOCNESS samples collected over a 48-hour period during 20-21 November 1989 (Huntley et al. 1990). Each MOCNESS tow sampled 9 depth strata between 0 to 290 meters (0 to 5, 5 to 15, 15 to 50, 50 to 90, 90 to 130, 130 to 170, 170 to

210, 210 to 250, and 250 to 290 meters). The one-square-meter nets were of 330 micrometer mesh. Larval fish were sorted from 243 samples, representing 27 tows.

All of the tows contained larval fish and together yielded a total of 616 specimens and 12 species (table). The 0 to 290 meter abundance estimates ranged from 8.2 to 57.4 larvae per ten square centimeters with a mean of 27.2 larvae per ten square centimeters. This mean larval abundance value is 2.5 times that resulting from the 0 to 200 meter depth Nansen net samples collected in the western Bransfield Strait during the December 1986 RACER cruise (Loeb 1991).

Three species belonging to the family Nototheniidae, *Nototheniops larseni*, *Trematomus lepidorhinus*, and *T.newnesi*, dominated the catches and comprised up to 91 percent of the individual and total estimated abundance. All three species were present in 22 of the 27 tows, and their abundance relations were fairly consistent across the sampling period. Another Nototheniid, *Nototheniops nudifrons*, was rarely found. Other notothenioids collected were *Chionodraco rastrospinosus* and *Champsocephalus gunnari* (Channichthyidae), *Artedidraco skottsbergi* (Artedidraconidae), *Racovitzia glacialis* (Bathydraconidae), and a small unidentified bathydraconid. Midwater fishes were mostly represented by *Bathylagus* sp. (5 percent of total); *Electrona antarctica* (Myctophidae) and *Notolepis* sp. (Paralepididae) were represented by only a few individuals.

Among the dominant species at station A only *N.larseni* was also abundant in the 1986-1987 RACER samples from the western Bransfield Strait (Loeb 1991); those samples yielded only one *T.lepidorhinus* larva (identified in Loeb 1991 as *T.loennbergi*) and six *T.newnesi* larvae. The occurrence and abundance of larval fish species in the Antarctic Peninsula area are known to vary seasonally and interannually (Kellerman and Kock 1988; Kellerman 1989a). This species composition difference could thus be due to an earlier sampling period (e.g., November 1989 vs. December-March 1986-1987) as well as to interannual events. Given the long residence time in the vicinity of station A, however, the difference could also result from retention of the newly hatched larvae in the coastal zone. *T.lepidorhinus* larvae have been rare in past ichthyoplankton collections from the Antarctic Peninsula area (Kellermann 1989b); *T.newnesi* larvae have been mostly collected in shallow and inshore waters and are believed to be underrepresented in samples from the predominantly offshore station grids (Kellermann and Kock 1988).

Most of the larval fish were collected in the upper 90 meters with maximum estimated abundance within the 15- to 50-meter depth layer. Among the more abundant species, only *Bathylagus* sp. was regularly collected at greater depths (table, figure 2). *T.newnesi* was collected almost exclusively within the upper 50 meters with over 50 percent of the estimated abundance in the 5- to 15-meter layer. *T.lepidorhinus* was also predominantly collected within the upper 50 meters but was most abundant (more than 55 percent estimated abundance) within the 15- to 50-meter layer. *N.larseni* had a broader and deeper distribution with 41 percent and 48 percent of its estimated abundance within the 15- to 50-meter and 50- to 90-meter layers, respectively. The vertical stratification in abundance by the larval stages of the dominant Nototheniids suggests an adaptation to avoid interspecific competition for food.

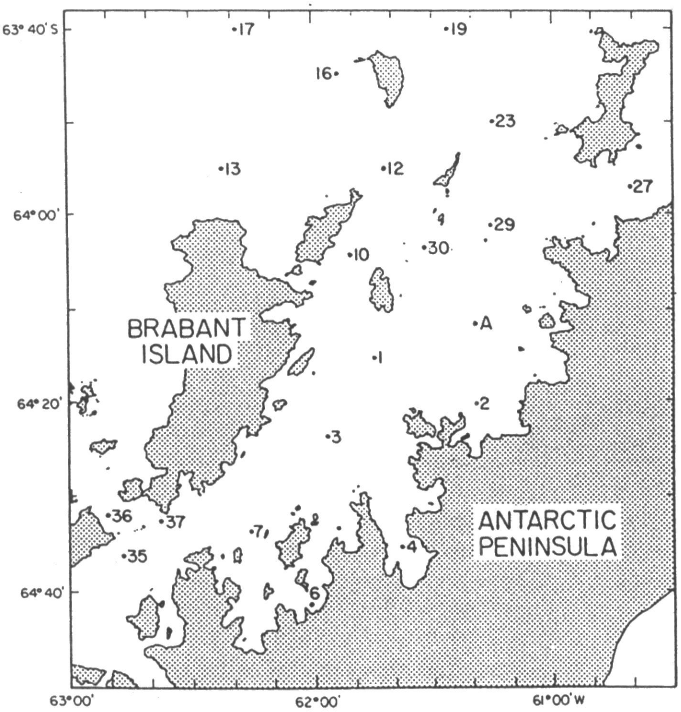

Figure 1. Study area and location of zooplankton sampling stations during the 1989 RACER cruise. Station A is the time-series station located in the eastern Gerlache Strait.

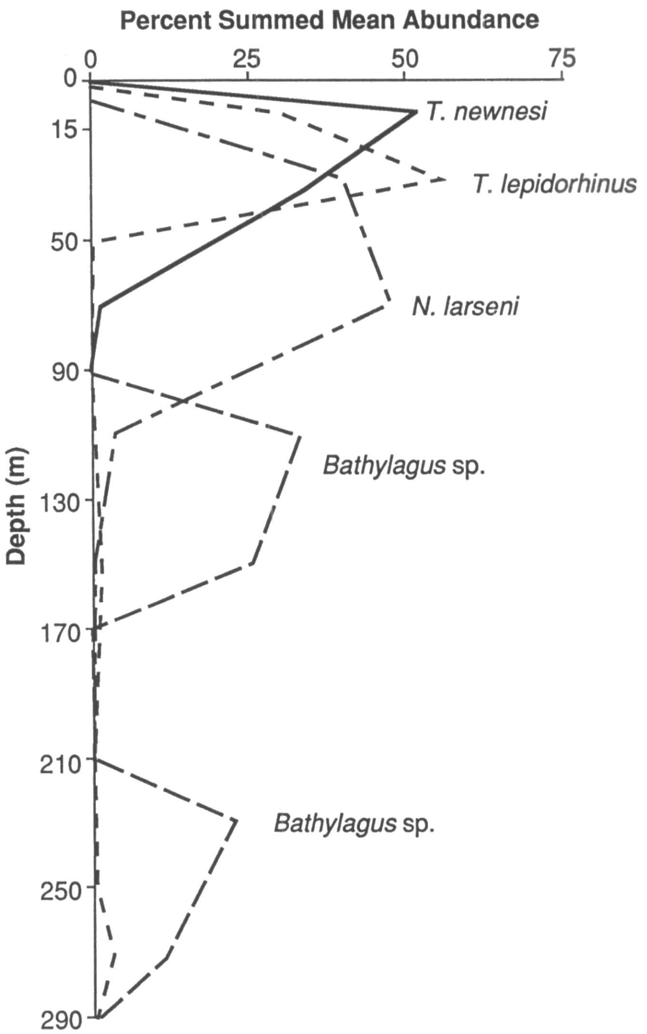

Figure 2. Vertical distributions of the four most abundant species of fish collected by MOCNESS samples at station A.

Larval fishes collected in MOCNESS samples at station A, 20-21 November 1989

	Number	Mean no/10 m²	Percent	Depth range(m)	Depth of maximum abundance of larvae
Nototheniops larseni	260	15.50	57.5	5-210	50-90
Trematomus lepidorhinus	156	5.61	20.8	0-290	15-50
Trematomus newnesi	143	3.56	13.2	0-90	5-15
Bathylagus sp.	18	1.33	4.9	50-290	90-130
Chionodraco rastrospinosus	9	0.30	1.1	0-90	
Artedidraco skottsbergi	8	0.15	0.6	0-50	
Nototheniops nudifrons	6	0.11	0.4	0-15	
Electrona antarctica	2	0.14	0.5	50-130	
Bathydraconidae	2	0.10	0.4	5-50	
Champsocephalus gunnari	2	0.06	0.2	5-15	
Racovitzia glacialis	1	0.04	0.1	15-50	
Notolepis sp.	1	0.04	0.1	210-250	
Damaged/unidentified	8				
TOTAL	616	27.15			

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RACER: The Marguerite Bay ice-edge reconnaissance

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Two fundamentally different, but not necessarily mutually exclusive, southern oceans habitats are known to sustain dense phytoplankton blooms and elevated levels of biological productivity at all levels of the marine food web: the highly stratified coastal regions of the Antarctic Peninsula (Holm-Hansen et al. 1989; Holm-Hansen and Mitchell 1991; Mitchell and Holm-Hansen 1991) and the receding zone of seasonal pack ice (Smith and Nelson 1985; Sullivan et al. 1988). The Research on Antarctic Coastal Ecosystem Rates (RACER) program was designed to gain a better understanding of interaction between physical, biological, chemical, and optical elements in these regions of elevated ecosystem productivity. In our field experiments, we have specifically emphasized the comprehensive documentation of the inception, progression, and demise of the spring bloom of phytoplankton. [See special (1991) RACER volume of *Deep-Sea Research,* 38(8/9A) and the series of RACER articles in the 1990 *Antarctic Journal,* 25(5).] To date, the RACER program productivity hypotheses have been tested in the generally ice-free areas of Gerlache Strait. However, during the 1991-1992 austral summer, we had an opportunity to extend our measurements south along the west coast of the Antarctic Peninsula and into the marginal ice-edge zone of Marguerite Bay (figure 1). In addition to the standard ship-based methods of data and sample collection (see below), our studies at the ice-edge also includ-