

MONTHLY CHANGES IN MUSSEL SPAT (*MYTILUS PLATENSIS* D'ORB) SETTLEMENT ON ARTIFICIAL COLLECTORS IN THE SAN JOSE GULF, ARGENTINA

VARIACIONES MENSUALES EN EL ASENTAMIENTO DE SEMILLA DE MEJILLON (*MYTILUS PLATENSIS* D'ORB) SOBRE COLECTORES ARTIFICIALES EN EL GOLFO SAN JOSE, ARGENTINA

Zulma I. Lizarralde*

ABSTRACT

The monthly settlement of mussel spat (*Mytilus platensis* d'Orb) in the San José Gulf (Argentina, 42°20' S, 64°30' W) was analyzed. Data were collected using artificial substrata immersed for two months. Juveniles settled throughout the year, with a period of maximum settlement in spring and a smaller peak of recruitment in late summer/early fall. The main settlement of plantigrades on immersed substrata was simultaneous with the two annual peaks of chlorophyll "a". The periods of main settlement were dominated by the prevalence of the < 2 mm post-larval fraction.

Key words: Recruitment, seed, collection, culture.

RESUMEN

En el presente trabajo se analizan los cambios mensuales en el asentamiento de semilla de mejillón (*Mytilus platensis* d'Orb) en el Golfo San José (Argentina, 42°20'S, 64°30' W). Los datos fueron obtenidos utilizando colectores artificiales, los cuales permanecieron sumergidos por un período de dos meses. Los juveniles se asientan durante todo el año, con un pico máximo en primavera y uno menor a fines de verano/principios de otoño. El principal asentamiento de plantígrados en los sustratos sumergidos fue simultáneo con los dos picos anuales de clorofila "a". Los períodos de mayor asentamiento se caracterizan por la prevalencia de postlarvas de talla menor a 2 mm.

Palabras clave: Reclutamiento, semilla, recolección, cultivo.

Fecha de recepción: 15 - 06 - 97. Fecha de aceptación: 11 - 11 - 97.

INTRODUCTION

Mussel culture in Argentina has so far remained undeveloped

Nevertheless, there seems to be a rising interest in the field at present due to the fact that natural

populations are becoming limited and wild harvests are not sufficient to meet consumer demand.

Viable commercial mussel culture relies on sufficient availability of mussel spat. In Argentina, there are no areas with dense, regular spatfalls on natural substrates (sublittoral or intertidal) to base a large scale intensive cultivation of mussel on wild seed, so the results of settlement studies on artificial collectors could be of particular importance.

*Universidad Nacional de la Patagonia S. J. Bosco. Boulevard Brown s/n, 9120 Puerto Madryn, Chubut, Argentina.

Very little is known about the period of main settlement of the mussel *Mytilus platensis* in the San José Gulf (Argentina, 42°20'S, 64°30' W).

The study of settlement periods represents a useful tool, not only from a scientific point of view, allowing a better understanding of the life cycle and biology of the species, but also in order to choose suitable planning for optimizing mussel culture (Tursi *et al.*, 1990).

Monthly variation in spat settlement of *Mytilus platensis* on artificial collectors was studied in this paper, in order to determine the peaks of recruitment for potential aquaculture applications.

MATERIALS AND METHODS

The experiment was carried out over a two years period, starting in September 1987 and finishing in August 1989. The collector used was a net of 11.02 mm of mesh size, cut into strips of 0.30 m in width and 1 m length.

Each month, a set of three collectors was suspended and buoyed at 1 m depth at El Bote (San José Gulf, Fig. 1). The depth at this location was 10 m at high tide.

The collectors were removed after remaining under water for two months. Mussel larvae were counted and their length measured from

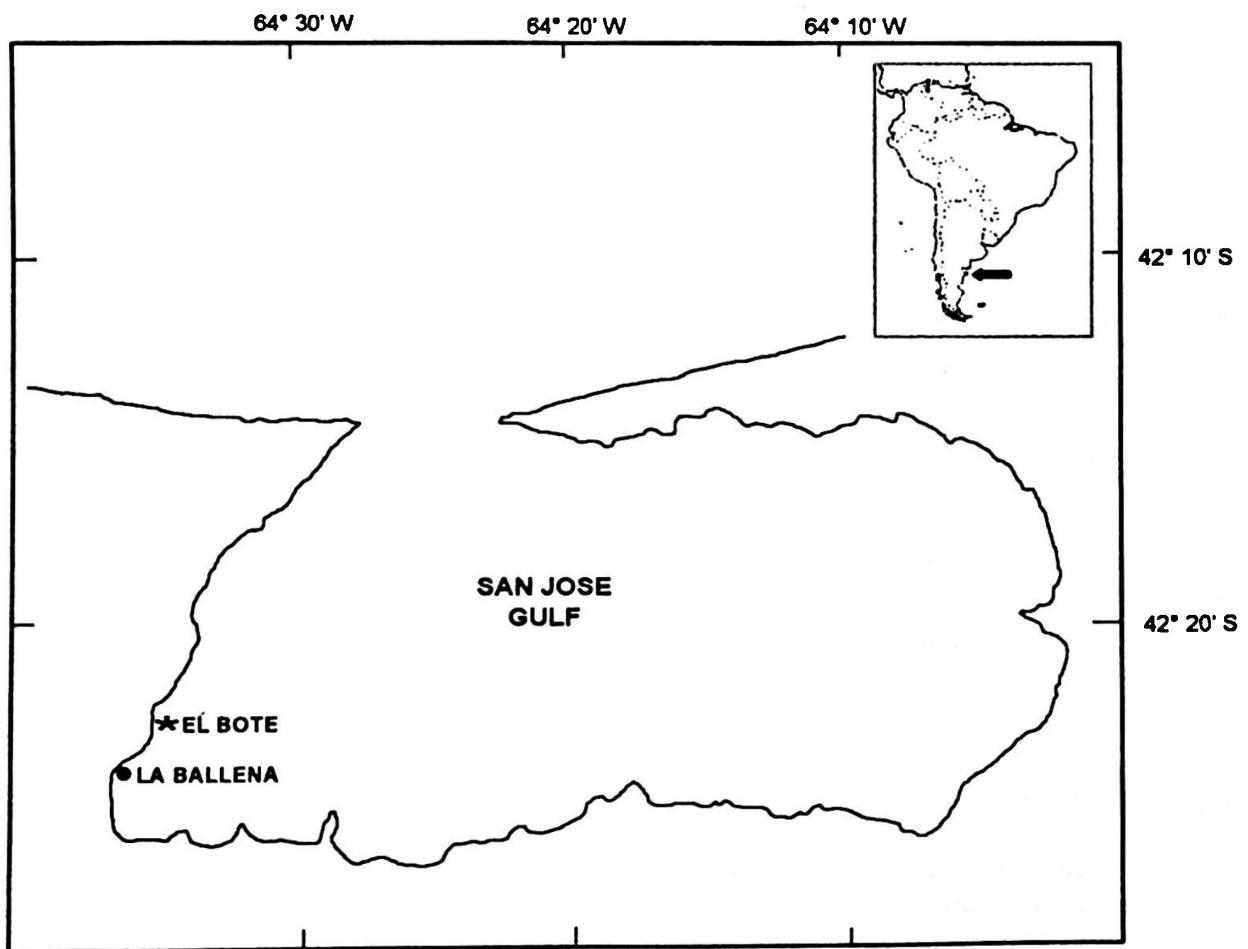


Figure 1: Map of San José Gulf, Patagonia, Argentina.

(*): site of mussel spat collection.

Mapa del Golfo San José, Patagonia, Argentina.

(*): lugar de captación de semilla de mejillón.

the umbo to distal edge using a microscope and an ocular micrometer. When the spat was numerous, only one-fourth of the sample was examined.

The temperature was recorded continuously by thermographs, located 1 m above the bottom. The annual curves were obtained by computing the mean for 5 days from four daily measurements. The food availability was measured monthly as chlorophyll "a" by a fluorometric method (Yentsch and Menzel, 1963).

RESULTS

Water temperature ranges seasonally from approximately 8 to 17 °C (Fig. 2). Minimum values were recorded in August 1988 (8.1 °C) and August 1989 (8.0 °C), and maximum in February 1988 (17.1 °C) and February 1989 (17.2 °C).

The values of chlorophyll "a" are given in Fig. 2. Minimum values occur in May-June and increase to a maximum during spring

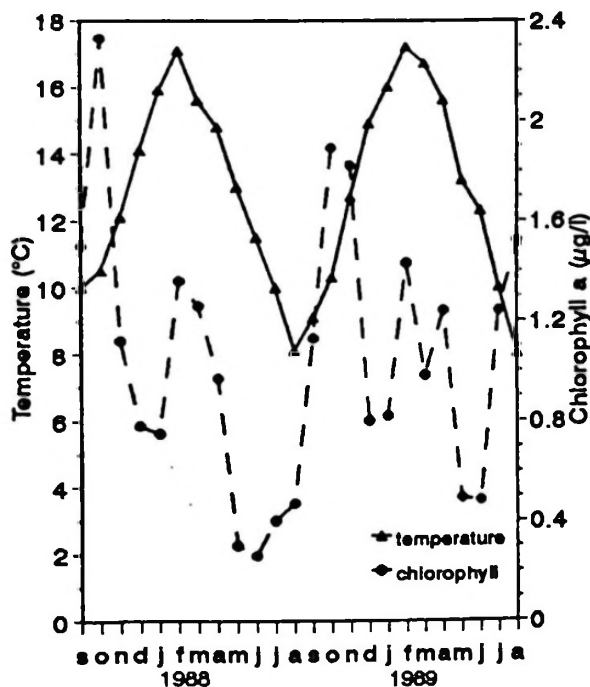


Figure 2: Mean water temperature and values of chlorophyll "a".

Temperatura media del agua y valores de clorofila "a".

(September, October and November). A second smaller peak occurs in late summer/early fall (February, March and April).

The mean number of plantigrades recorded on the collectors is shown in Fig. 3.

Mussel spat settled throughout the year, with a period of maximum settlement in spring (September, October and November) and a smaller peak of recruitment in late summer/early fall (February, March, April).

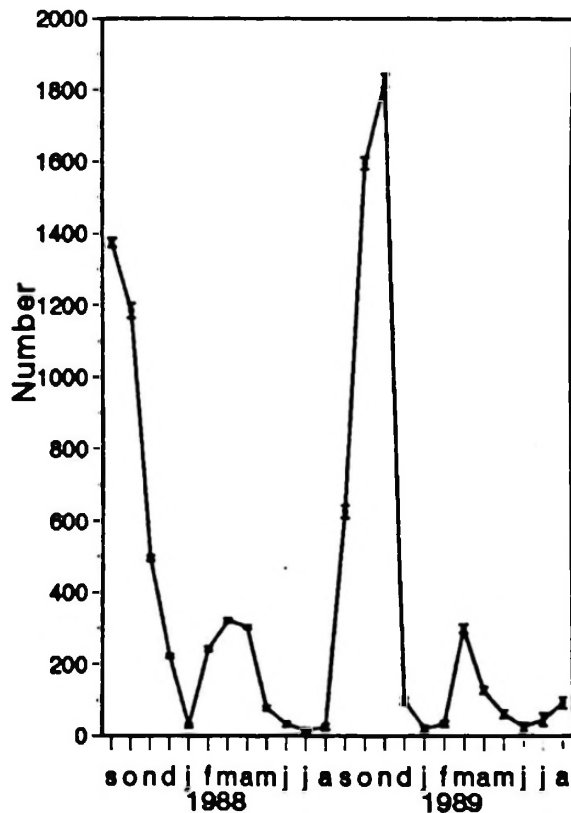


Figure 3: Mean monthly number (± 1 standard error) of plantigrades settled on the collectors.

Promedio mensual (± 1 error estándar) del número de plantígrados asentado sobre los colectores.

The size frequency distribution of mussel spat is shown in Fig. 4. In general, the periods of main settlement, during the months of spring and fall were dominated by the prevalence of the < 2 mm post larval fraction, with the exception of December 1987 and November 1988 when the sample consisted of > 2 mm mussels.

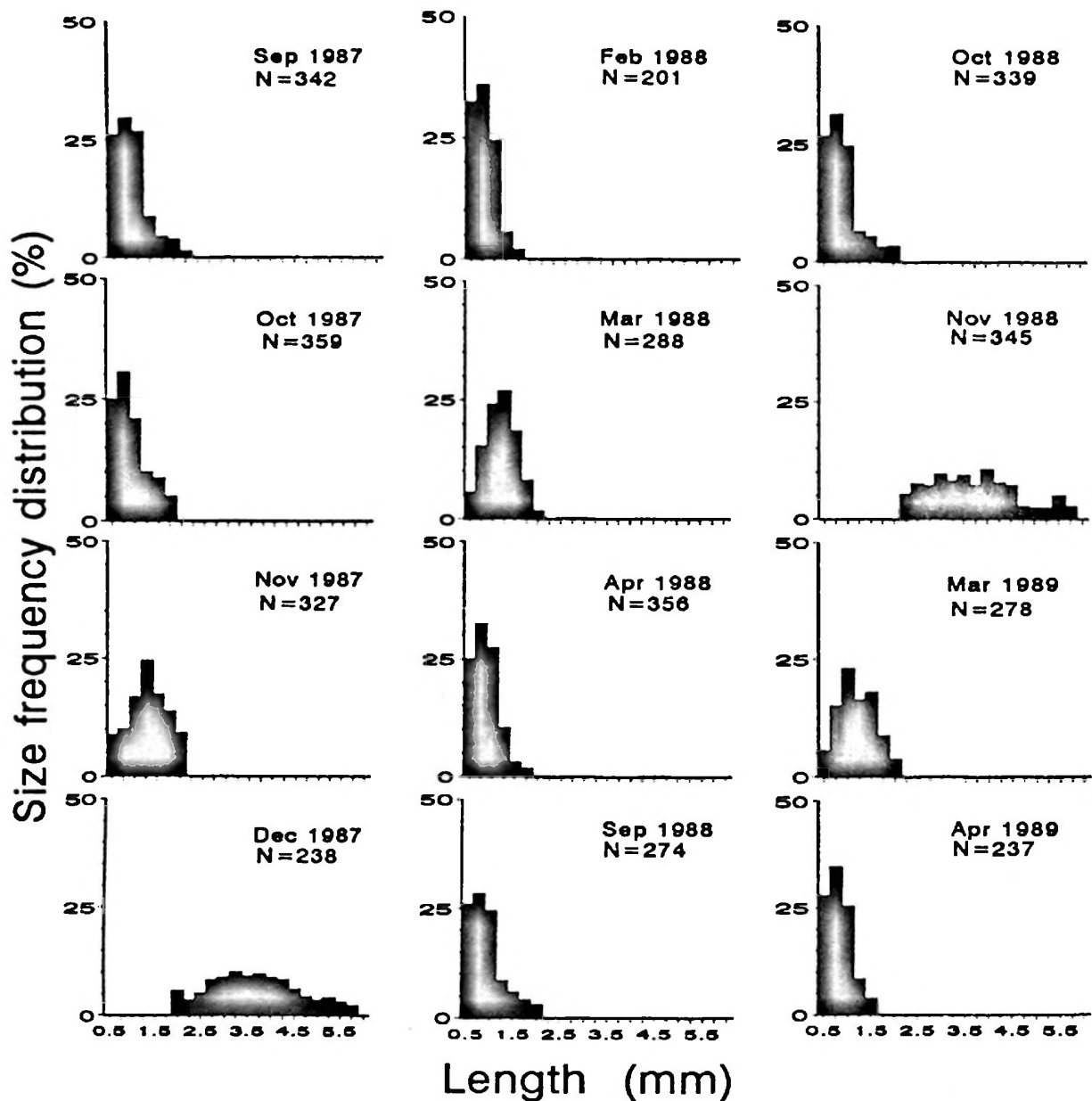


Figure 4: Size frequency distribution (%) of mussel spat during the months of spring and autumn. N = number of measured individuals. Date = initial collector placement.

Distribución de frecuencia de tallas (%) de semilla de mejillón durante los meses de primavera y otoño. N = número de individuos medidos. Se indica la fecha de colocación del colector.

DISCUSSION

The data from this study show a relatively precise pattern of attachment of mussel spat to artificial substrata in the San José Gulf. The major settlement of plantigrades in the study area occurring in spring; this period may be followed by a second, lower settlement in early fall.

The present observations support that of Ruzzante & Guerrero (1984) who found that maximum settlement of mussels on collectors in the San José Gulf occurs from October/November until January.

Bala (1989) described the reproductive cycle of two mussel populations in the San José Gulf, one sublittoral (El Bote) and one intertidal (La Ballena) (Fig. 1). He not only found differences

in the spawning periods of animals from different habitats, but also between animals from the same locality in different years. In El Bote he recorded one or two spawning in spring/early summer and in the intertidal locality he recorded one spawning in spring and a second peak in January.

In the sublittoral population he also recorded mussels spawning throughout the year, and this could explain the continuous settlement of plantigrades on the collectors during the period of investigation.

Mussels start spawning at a sea temperature of approximately 8°C (Bala, 1989). During the period of study this temperature was reached in August (1988 and 1989). One month later mussel spat began to settle on the collectors.

According to Seed (1969) the length of time spent by mussel larvae in the plankton prior to their settlement varies with temperature and local food supply; 3-4 weeks appears to be the most usual duration of planktonic life. But in the absence of suitable substrates for attachment, mussels are known to be able to delay their settlement (Bayne, 1965).

Newell *et al.*, (1982) found that mussel spawning and expected larval occurrence were strongly correlated with food availability. Spawning might be synchronised to coincide with maximum food availability for developing larvae (Seed, 1976).

In the present study, the main settlement of larvae on immersed substrata was simultaneous with the two annual peaks of chlorophyll "a".

During the months of spring and fall, samples contained a large proportion of < 2 mm plantigrades. The size of *Mytilus edulis* larvae at settlement ranges from 250 to 350 µm with a post-settlement growth rate estimated at 25 µm/day (Bayne, 1964). Given a sampling interval of 2 months larvae could have grown on the collectors to a 2 mm shell length.

Mussel size in December 1987 and November 1988 (> 2 mm) was too large for direct settlement from the plankton and could be interpreted as representing recruits from other sites. De Block & Geelen (1958) found that mussel larvae settle preferentially on filamentous substrata and that these young mussels subsequently disappear from the filaments. In British waters Bayne (1964) described the settlement taking place in two steps, a primary settlement (larvae of 250

µm) on filamentous algae and a secondary one, in which the same larvae (juveniles of 900-1500 µm) having detached from the algal filaments migrate to sites of more permanent attachment near adult beds. In Maine, Newell *et al.* (1991) observed a primary attachment of mussel larvae to eelgrass substrate and a late movement of bysally drifting juveniles to a final recruitment site.

The results indicate the seasonality in the attachment of plantigrades of *Mytilus platensis* in the San José Gulf. The prospects for mussel seed procurement by immersed artificial substrata appear to be favorable; mussel farms could obtain the highest number of mussel seed during spring months.

ACKNOWLEDGMENTS

I thank H. Zaixso for helpful discussions and the Centro Nacional Patagónico (CONICET, Argentina) for the facilities for this study. This research was supported by the Universidad Nacional de la Patagonia S.J.B.

LITERATURE CITED

- BALA, L. 1989. Biología y ecología del mejillón (*Mytilus edulis platensis*) en el golfo San José, provincia del Chubut. Tesis Doctoral. Universidad Nacional de la Plata. La Plata. Argentina.
- BAYNE, B. L. 1964. Primary and secondary settlement in *Mytilus edulis* L. (Mollusca). *Journal of Animal Ecology*, 33: 513-523.
- BAYNE, B. L. 1965. Growth and the delay of metamorphosis of the larvae of *Mytilus edulis* (L.). *Ophelia*, 2:1-47.
- DE BLOK, J. W. and H. J. GEELLEN, 1958. The substratum required for the setting of mussels (*Mytilus edulis* L.). *Arch. néerl. Zool.*, Vol. Jubilaire 13: 446-460.
- NEWELL C. R., H. HIDU, B. J. MC ALICE, G. PODNIESINSKI, F. SHORT & L. KINDBLUM. 1991. Recruitment and commercial seed procurement of the blue mussel *Mytilus edulis* in Maine. *Journal of the World Aquaculture Society*, 22 (2): 134-152.
- NEWELL, R. I. E., T. J. HILBISH, R. K. KOEHN & C. J. NEWELL. 1982. Temporal variation in the reproductive cycle of *Mytilus edulis* L. (Bivalvia, Mytilidae) from localities on the east coast of the United States. *Biological Bulletin* 162: 299-310.
- RUZZANTE, D. E. & M. T. GUERRERO DE. 1984. Captación de mitflidos sobre colectores. I. Variaciones mensuales en la captación de *Mytilus platensis* d'Orb. y de *Aulacomyza ater* (Molina). *Physis, Argentina*, 42: 55-62.
- SEED, R. 1969. The ecology of *Mytilus edulis* L. (Lamellibranchiata) on exposed rocky shores. I. Breeding and settlement. *Oecologia* 3: 277-316.

- SEED, R., 1976. Ecology. In *Marine mussels: Their ecology and physiology*: 13-65. B. L. Bayne (ed). Cambridge Univ. Press. Cambridge.
- TURSI, A., A. MATARRESE, G. COSTANTINO, R. POLLICORO, E. CECERE & C. CAROPPO. 1990. Settlement periods of mussels larvae on artificial substrata, dipped in the "Mar

- Piccolo" and the "Mar Grande" of Taranto (Southern Italy). *OBELIA*, XVI: 87-97.
- YENTSCH, C. S. & D. W. MENZEL. 1963. A method for the determination of phytoplankton chlorophyll and phaeophytin by fluorescence. *Deep Sea Res.*, 10: 221-231.