

Processa pippinae Wicksten and Méndez, 1985: a pelagic processid shrimp from the Gulf of California, México

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Resumen: El camarón carideo *Processa pippinae* fue descrito por Wicksten y Méndez en 1985 a partir de 3 especímenes colectados con una red de arrastre, frente a Isla Angel de la Guardia, Golfo de California, México. El material colectado entre 1981 y 1985 en redes de plancton, indica que *P. pippinae* es una especie pelágica de la familia Processidae, cuya distribución abarca el Golfo Central y parte del Alto Golfo, apareciendo frecuentemente en el estrato epipelágico (0-200 m).

Shrimps of the family Processidae are essentially epibenthic. They are usually found in dredges or bottom-trawl samples and in some cases are caught in sediment grabs.

Although they are quite common in subtropical and tropical waters of America (Manning and Chace 1971, Wicksten 1983, Hendrickx and Wicksten 1987), there is still much to be learned about their biology and distribution. In the Atlantic, they seem to be mostly nocturnal and occur abundantly in shallow waters, although at least two species of *Processa* are known from deep water (to 346 m) (Manning and Chace 1971). On the Pacific coast of America, where less species have been recognized, processids occur on sandy and muddy bottoms from beach-level to 146 m (Wicksten 1983, Hendrickx 1988) and one species *Processa pippinae* Wicksten and Méndez (1985), was described from material reportedly collected in bottom-trawls between 265 and 644 m in the Gulf of California.

Over 200 species of pelagic shrimps are currently known (Omori 1974), but in many cases little is known of their depth distribution. A probable reason is that specimens of micro-nektonic species are often caught in non-closing trawling devices, operated at or near the bottom when these are being lifted off to deck.

Furthermore, some species are captured in a real "pelagic-state" by midwater nets operating over a wide section of the water column (e.g. 0-1000 m), hence the difficulty to determine accurately their depth distribution.

From 1981 to 1985, samples of plankton were obtained from the entire Gulf of California, Mexico, by the R/V "El Puma" of the Universidad Nacional Autónoma de México (COR- TES 1 and 2, PU 8403 and PU 8503 cruises) and the R/V "Antonio Alzate" of PESCA, México (AA 8110 cruise). A bongo structure equipped with two 550 μ m nets was towed obliquely at night between surface and about 200-300 m.

In most cases, towing depth was determined with an automatic time-depth recorder.

A total of 109 specimens of *Processa pippinae* were obtained from 16 sampling stations (Fig.1), including 22 ovigerous females. All specimens were found between 28° 07' and 30° 05' latitude and depth at the collecting stations was often considerably higher than sampling depth (Table 1), thus excluding the possibility for *P. pippinae* to be part of the near-bottom shrimp fauna that might occur in the benthopelagic environment (< 100 m above bottom, see Domanski 1986) in the Gulf of California. Indeed, samples of *P. pippinae*

TABLE I

Specimens of Processa pippinae examined in this study for each sampling station (juv. = juveniles).

Cruise	Station	Depth (m) Sampling/total	Position (LAT. and LONG.)	Date	Number of Specimens
AA 8110	32	300*/250	29°33'N-113°03'W	16/X/81	8
AA 8110	44	300*/330	28°42'N-112°28'W	17/X/81	22 (2 juv.)
AA 8110	50	300*/600	28°07'N-111°30'W	18/X/81	10
AA 8110	50	300*/810	28°17'N-112°12'W	18/X/81	15
CORTES I	22	192/730	28°24'N-112°33'W	6/V/82	3
CORTES I	23	210/460	28°45'N-117°44'W	7/V/82	7 (2 ♀♀)
CORTES I	28	205/277	29°31'N-113°07'W	7/V/82	4 (2 ♀♀)
CORTES I	30	225/628	29°50'N-113°49'W	8/V/82	9 (6 ♀♀)
CORTES 2	24	170/380	28°59'N-112°39'W	14/III/85	21 (10 ♀♀; 7 juv.)
CORTES 2	28	198/295	29°32'N-113°07'W	17/III/85	3 (1 juv.)
CORTES 2	35	200*/340	30°05'N-114°08'W	15/III/85	3 (2 ♀♀)
PU 8403	12	210/800	29°46'N-113°51'W	21/III/84	3 (2 ♀♀)
PU 8403	20	207/300	29°33'N-113°03'W	21/III/84	3 (♀♀)
PU 8503	26	208/300	29°42'N-113°57'W	2/IV/85	6 (4 ♀♀)
PU 8503	26	206/300	29°42'N-113°57'W	1/IV/85	2 (1 ♀♀)
PU 8503	32	200*/192	29°19'N-113°34'W	2/IV/85	18

(*) Estimate. Actual sampling depth probably less.

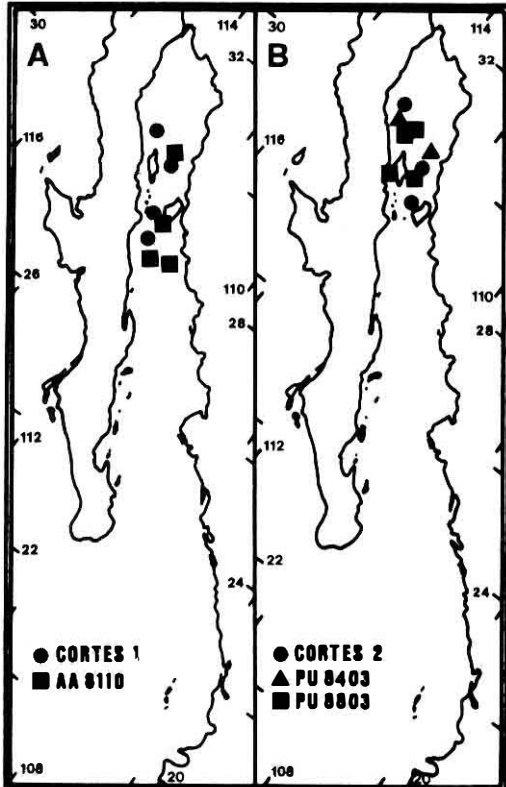


Fig. 1. Sampling stations of *Processa pippinae* in the Gulf of California. A) October 1981 and May 1982. B) March 1984, March and April 1985.

were often caught more than 300 m above bottom.

Ovigerous females were found in May 1982, March 1984, March and April 1985 but not in October 1981. During another cruise, the CORTES 3, in July-August 1985, no *P. pippinae* were collected although sampling stations and times of day were identical. Water temperature data are not available for the AA 8110, PU 8403 and PU 8503 cruises, but comparison of surface (2-5m) and subsurface (50, 75 and 100 m) temperatures obtained during the CORTES cruises indicate that water in the 0-200 m depth range might be too warm for this species during summer. This might also explain why the species is apparently absent from the southern Gulf (at least between 0 and 300 m) where the temperatures are generally higher below surface (Table 2). Evidently, no migration pattern can be inferred from the present study, but additional sampling might demonstrate that *P. pippinae* moves to greater depth during the summer and submerge to below 300 m in the southern Gulf (and maybe even further south).

A check-list of pelagic shrimps of the eastern Pacific, now being completed, includes 46 species of Caridean shrimps of the families Pasisphaeidae (16 species), Opolophoridae (27) and Pandalidae (3), but only one Processidae. As far as we could find out, there are no previous re-

TABLE 2

Water temperatures at zooplankton sampling stations (range) in the Gulf of California. *Processa pippinae* was found in the Northern and Central Gulf in May 1982 (CORTES 1) and March 1985 (CORTES 2)

Area	Depth (m)	CORTES 1 (May 1982)	CORTES 2 (March 1985)	CORTES 3 (July-August 1985)
Northern Gulf	2-5	19.0-21.1°C	15.3-16.9°C	28.0-29.4°C
	50	15.3-15.8°C	14.5-15.6°C	18.6-27.2°C
	75	15.0-15.5°C	13.6-15.0°C	16.1-23.5°C
	100	<15.0°C	12.7-14.2°C	19.4-20.8°C
Central Gulf	2-5	18.1-22.2°C	14.0-18.7°C	28.4-30.2°C
	50	15.0-16.7°C	13.6-16.6°C	18.9-26.8°C
	75	16.0°C	13.6-15.8°C	16.0-23.4°C
	100	14.2-15.0°C	12.5-13.2°C	16.3-18.9°C
Southern Gulf	2-5	23.9-25.1°C	18.7-23.0°C	27.0-30.0°C
	50	16.0-19.6°C	16.8-19.5°C	16.7-25.5°C
	75	14.8-16.5°C	14.3-16.7°C	15.2-20.3°C
	100	<14.0°C	13.0-13.8°C	16.3-17.8°C

cords of a processid shrimp being considered as pelagic (Omori 1974), although several species have apparently been taken in plankton at night (Abele and Felgenhauer 1982). According to Omori (1974), amplitude of vertical migration ranges from less than 100 m in most neritic species to 600-700 m or more in several species of *Gennadas* and *Sergia*, but in most mesopelagic species the range is from 100 to 400 m.

Considering that *P. pippinae* could stay on the bottom at day and migrate to the epipelagic zone at night, our study indicates that it would correspond to a vertical migration of between 72 and 590 m (see Table 1), although we cannot discard the possibility that the specimens that were captured at the deepest stations might have started their upward movement in shallower water and drifted with currents.

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