

INTERANNUAL GROWTH VARIATIONS ON PENAEID SHRIMPS IN RELATION
TO POPULATION DENSITY IN HUIZACHE-CAIMANERO LAGUNAR SYSTEM
NW MEXICO) DURING 1972-1987.

by

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Introduction

Coastal lagoons and estuaries are part of a highly dynamic biophysical system, with conditions determined by the meteorological events in the hydrologic basin and oceanographic events in the adjacent coastal zone.

The lagunar system of Huizache- Caimanero (figure 1) has been considered as the most productive in Mexico due to high catches of penaeid shrimps. In the last 20 years (data from 1969 to 1987; Del Valle, 1989) seasonal mean catch in the South of Sinaloa, with white shrimp (Penaeus vannamei) and blue shrimp (Penaeus stylirostris) as predominant species, was 1013.5 tones, with a coefficient of variation of 36.58%. White shrimp represents 90% of catches in the estuaries and coastal lagoons in the South of Sinaloa.

The lagunar system of Huizache- Caimanero is conformed by two basins with smooth slopes connected by meandric channels to the sea and to River Presidio and River Baluarte. Annual oscillation of sea level (maximum in August and minimum in September) determines the flooding area. Main recruitment of penaeid shrimp postlarvae starts in June, finishing by the middle of August, when fishermen install filtering barriers ("tapos"), in order to avoid the postlarvae exiting to the sea with the decrease of sea level. Magnitude of recruitment is associated with temperature during the spawning season of P. vannamei (Del Valle, 1989).

The fishing season begins in September and casting nets with 20-15 mm mesh size are used; in the last five years, even 8 mm mesh size has been used. Fishermen are organized in cooperatives; their number duplicated from 1981 and the fishing season has shortened. Catches are divided into two fractions depending on length (head-on): foreign trade, from

97 mm, and domestic trade, between 65 and 97 mm. These last lengths represent already in November more than 50% of catches.

Material and Methods

The information related with annual length frequency composition of total catches was provided by the Fishing Department and by 16 among 21 Fishing Cooperatives operating in Huizache- Caimanero. Catches of these 16 Cooperatives represent more than 80% of total catch. Monthly mean discharge of River Baluarte and River Presidio was obtained from the Department of Control of Rivers, of the Department of Hydraulic Resources; and monthly mean temperatures were collected from the Meteorological Station in Mazatlan.

Catch by length was transformed to number of organisms and mean length of total catch, foreign trade and domestic trade were calculated. Daily mean growth rate, from mean length of catch and considering a period of four months, was estimated.

Results

The wide interannual modal variation of length frequency distribution of foreign trade and quantities of domestic trade are shown in figure 2. On the right, we can see monthly mean of river discharge during June, July and August, accumulated temperatures during the reproduction period (June and July) and mean length of foreign trade.

Seasons with higher abundance of small organisms are 1972, 1980, 1982-83 and 1987, when the warm event El Niño/Southern Oscillation developed, while during 1973, 1975, 1981, 1984 and 1986 negative anomalies were registred (Del Valle and Villa, 1987)

Linear correlation coefficients between growth rate and environmental factors are shown in table 1, with high values in all cases.

Seasonal mean length of total and foreign catches have been graphed (figure 3). It is to be noticed that starting from 1981 the difference between total catch mean length and foreign fraction mean length has decreased, due to the increase in fishing effort.

Discussion and Conclusions

Annual mean growth rates are directly related with volume of water/habitable surface and supply of nutrients, represented by river discharge. They are inversely related with temperatures representing the magnitude of spawning/survival and magnitude of recruitment (accumulated temperatures during the reproduction period). Growth rates are also inversely related with the number of organisms in catches. Thus, we may affirm that in penaeid shrimps growth is inversely dependent on density of organisms.

The decrease of differences between total catch mean length and foreign trade mean length, and also, the increase of small lengths in catches in the last years, due to the fishing intensity developed since the beginning of the fishing season, are a consequence of the inefficient strategy of exploitation developed by the fishing cooperatives in the zone.

References

- Del Valle, I. and E. Villa, 1987. Aproximación a la estrategia de producción de camarones peneidos en las costas de Sinaloa, México. Mem. VII Congreso Nac. Oceanogr. Julio 1987. Ensenada. México.
- Del Valle, I., 1989. Estrategia de producción y explotación en una laguna costera de Mexico. Tesis doctoral. Universidad Politécnica de Cataluña. 266 pp.

Table 1. Linear correlation coefficients between growth rate and environmental factors.

	1	2	3	4
1 growth rate total catch	1.0	0.97	-0.83	0.62
2 growth rate foreign trade		1.0	-0.80	0.58
3 temperature June + July (reproduction period)			1.0	-0.58
4 mean river discharge June, July, August				1.0

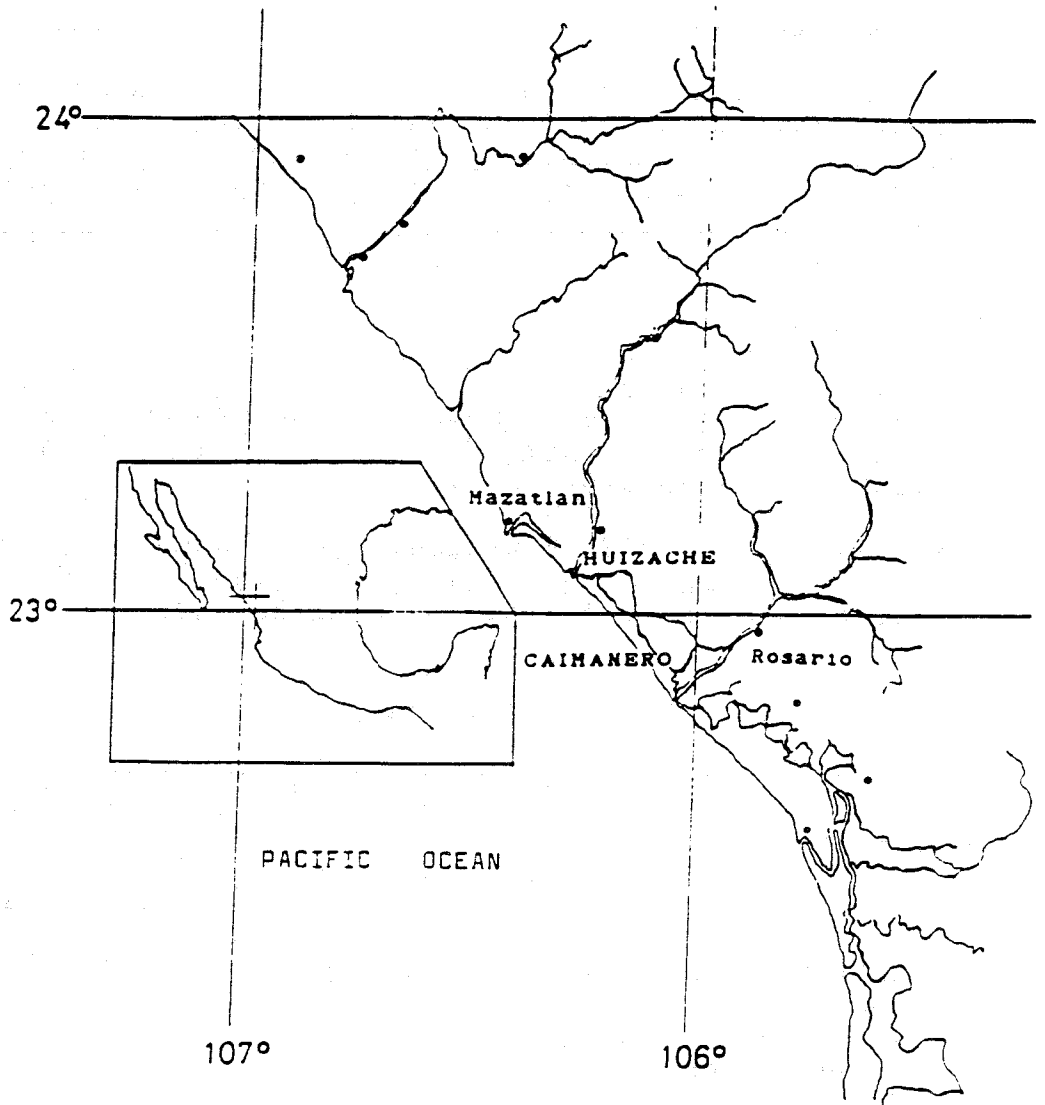


FIGURE 1.- The Northwest Mexican region and localization of the Huizache - Caimanero lagoon.

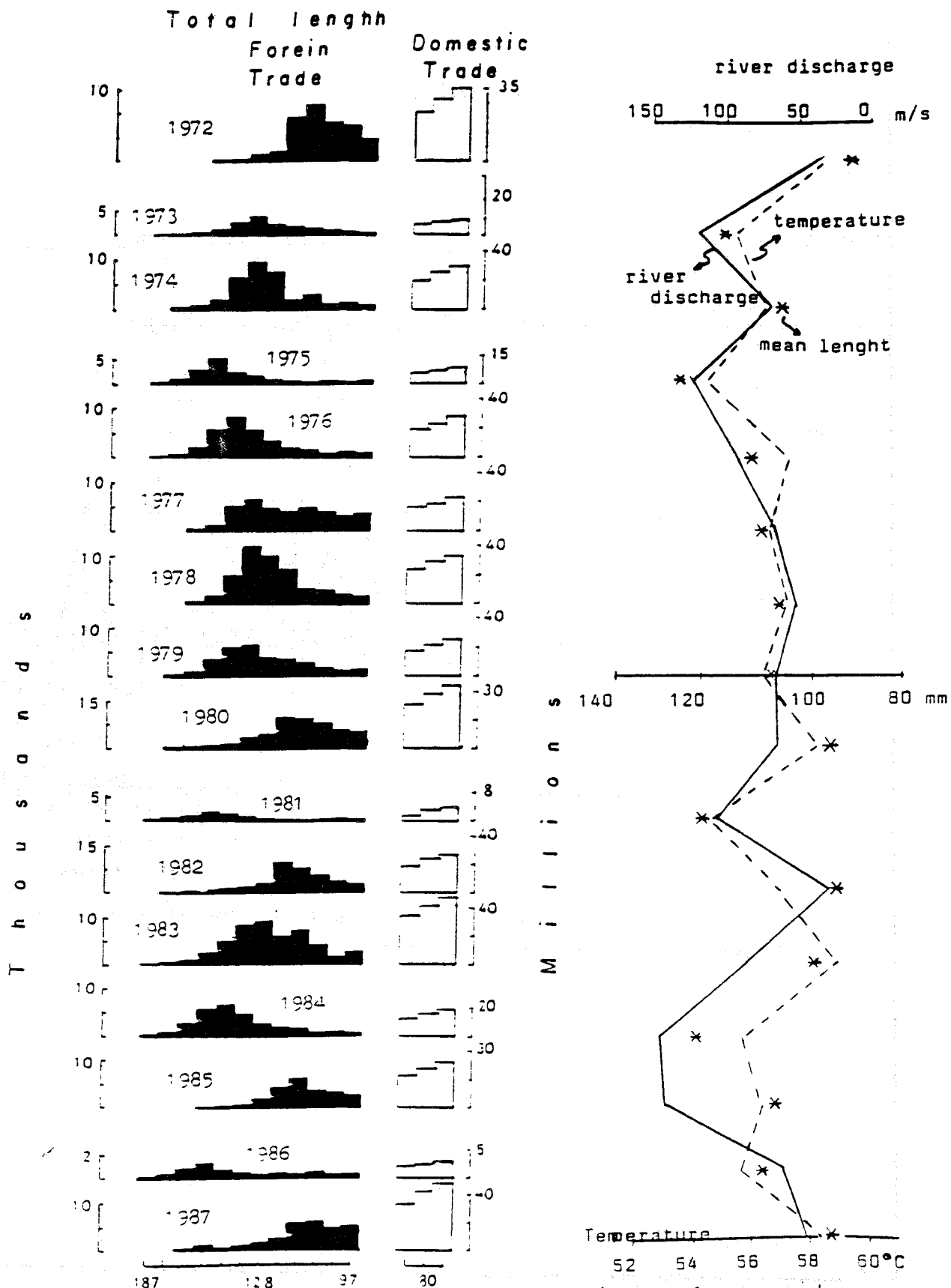


Figure No. 2. Length frequency distributions of penaeids shrimps catches (export and domestic fractions) of Caimanero lagoon, Mexico. Mean river discharge (June, July, August) and spawning period temperatures (June, July)

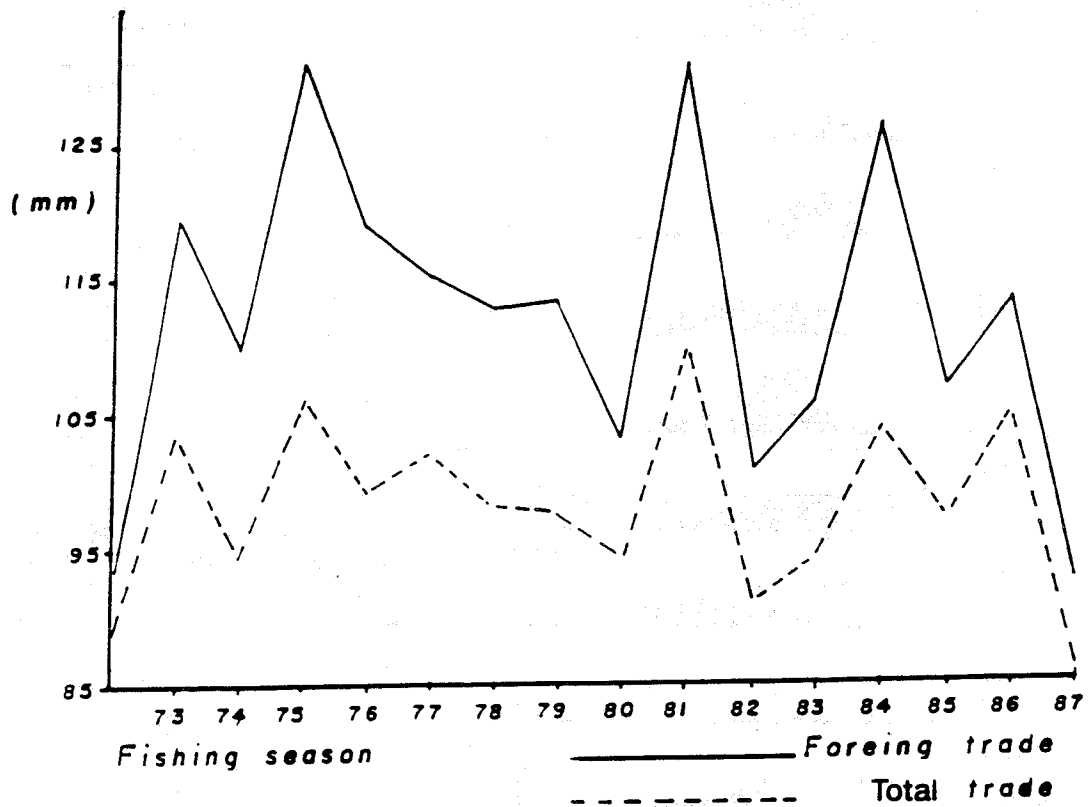


Figure No. 3 Annual mean length of penaeid shrimp catches in Hizache - Caimanero Lagoon.