

Multiple annual ovipositions of *Cancer setosus* along a latitudinal cline: aquaria experiments and analysis of field data

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Introduction

Cancer setosus (Brachyura) is one of the key predators in the shallow-water benthic ecosystem of the Humboldt current and of importance for artisanal diving and trapping fishery. Ovigerous females of *C. setosus* are present year-round throughout most of their range along the Chilean/Peruvian Pacific coast (2°S - 46°S) (Fig. 2). However, their annual number of egg-masses remains speculative and as such has not been considered in latitudinal comparisons of this species reproduction.

Material and methods

Female *C. setosus* were held in aquaria in Northern and Southern Chile to reveal the effect of temperature on egg-development and egg-mass production:

Antofagasta (23°S) - seasonal local temperature conditions (16 - 23°C; 10 month)

Puerto Montt (41°S) - constant temperatures of 12, 16 and 19°C (6 month)

The crabs were individually tagged and closely monitored for the occurrence of moult, oviposition and larvae hatching. The derived exponential relationship between temperature and the duration of egg-development and data on percentages of ovigerous females from field studies are used to calculate the annual number of egg-masses along latitude:

$$\text{Annual_egg_masses} = \sum_{i=1}^{n=12} \frac{N_i(\%) \times 30.4}{d_{ie}}$$

Ni (%) = monthly percentage of ovigerous females
 die = duration of egg-development for the mean SST (°C) at the respective location (days)
 30.4 = mean length of a month (days)

Results

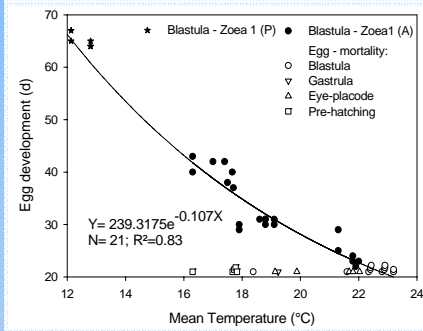


Fig 1. Duration of egg-development in Antofagasta (A) and Puerto Montt (P).

Table 1. Temporal sequence of reproductive events of *C. setosus* kept in aquaria in Antofagasta and Puerto Montt.

	T (°C)	Moult-oviposition (d)	Oviposition-oviposition (d)	Larvae hatching-moult (d)	Egg masses	
			1-2	2-3		
Antofagasta	16-23	62 ± 10 (N=9)	63 ± 8 (N=7)	74 ± 13 (N=11)	59 ± 19 (N=9)	up to 3 in 134 d
Puerto Montt	19		64 ± 10 (N=5)	67 ± 3 (N=2)		up to 3 in 124 d
Puerto Montt	16		83 ± 29 (N=4)		66 (N=1)	
Puerto Montt	12				137 (N=1)	

Conclusions

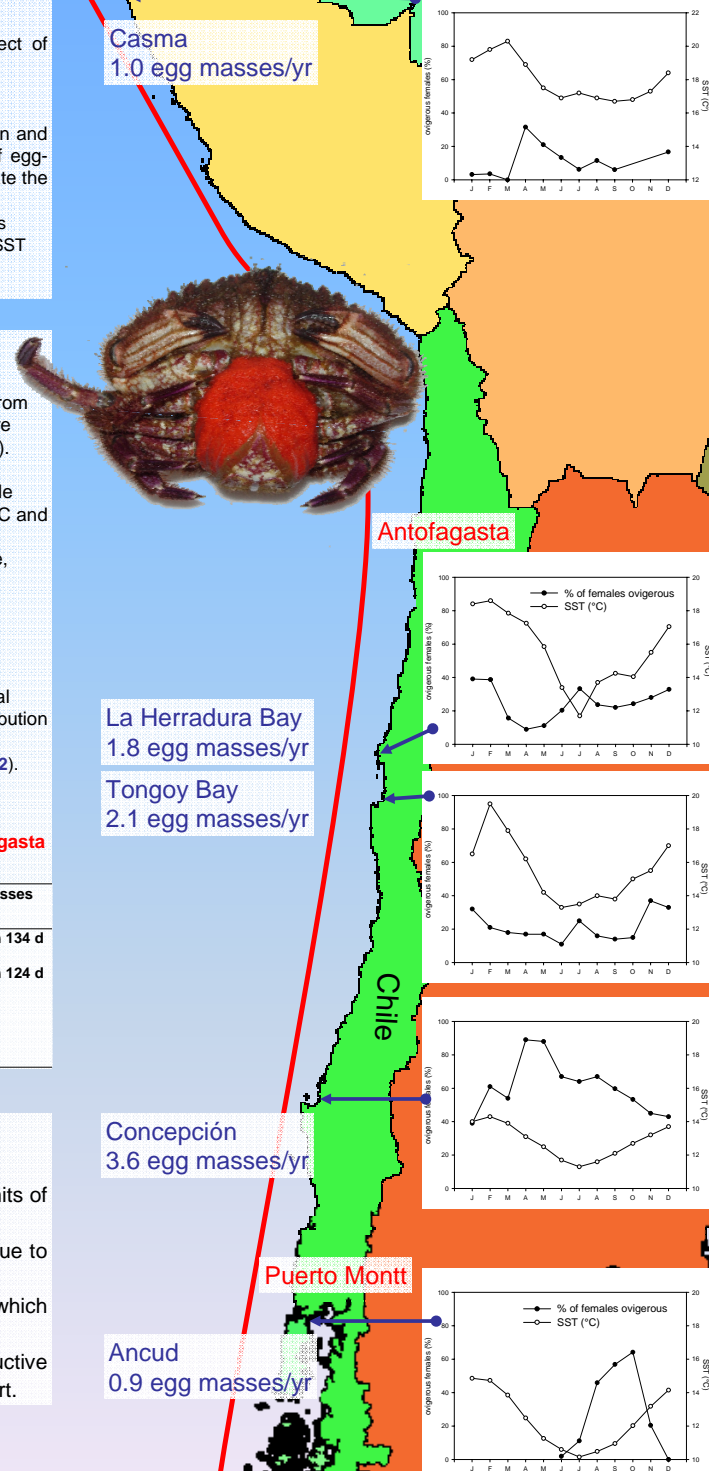
- *Cancer setosus* is one of the few *Cancrids* with continuous reproduction
- Egg-mass production is highest around Central Chile and decreases towards the limits of distribution
- Females are able to produce 3 healthy egg-masses without an intervening moult, due to sperm storage
- Successful egg-development in *C. setosus* is possible up to a temperature of 22°C, which is the highest reported temperature threshold for this genus
- The temperature-dependent change in egg-mass production is a key reproductive parameter, which has to be considered for latitudinal comparisons of reproductive effort.

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Fig. 2 Reproductive cycle and calculated number of egg masses



Data sources:
 Centro Nacional de Datos Hidrográficos y Oceanográficos de Chile, <http://www.shoa.cl/centrohidoc/index.jsp>
 Diaz, M.A.S., 1990. Dinámica poblacional de *Cancer setosus* Molina (Decapoda, Brachyura) en un sector de la Bahía de La Herradura, bajo un impacto de extracción continua
 Moya, J.F.M., 1995. Biología reproductiva y crecimiento del 'Cangrejo peluda' *Cancer setosus* MOLINA (Crustacea: Decapoda) en la Bahía de Guaymuna Casma (Perú).
 Pool, H., Montenegro, C., Canales, C., Barahona, N., Vicencio, C., 1998. Análisis de la pesquería de jaba en la X región: FIP-17/96-35. IFOP, Valparaíso, 1-219.
 Jesse, S., 2001. Comparative ecology of sympatric brachyuran crab species in the shallow subtidal of the Pacific Coast of North Chile and their importance for the artisanal fishery in Puerto Aldea. ZMT contribution: 12. ZMT, Bremen, 1-113.
 Venz, A.J.P., 1981. Estudio biológico-pesquero preliminar de la jaba peluda (*C. setosus* MOLINA, 1782) en Bahía Concepción y Bahía San Vicente.