Producción de semillas de ostra de roca *Striostrea prismatica* (Gray, 1825)

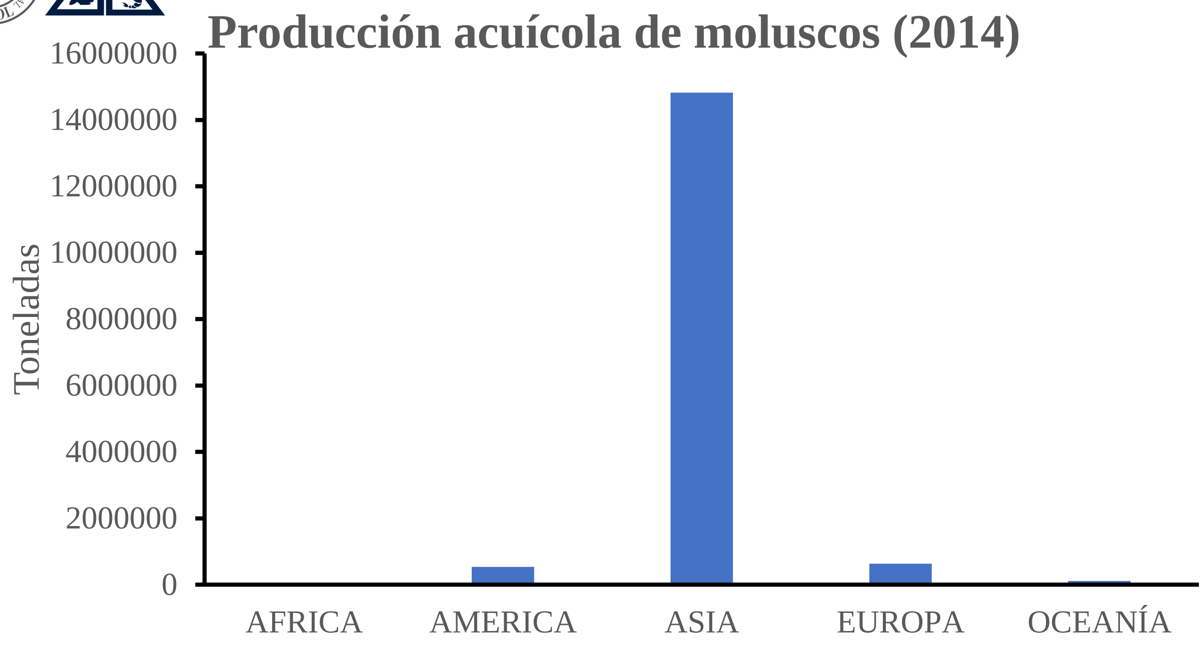
XIX CONGRESO ECUATORIANO DE ACUICULTURA

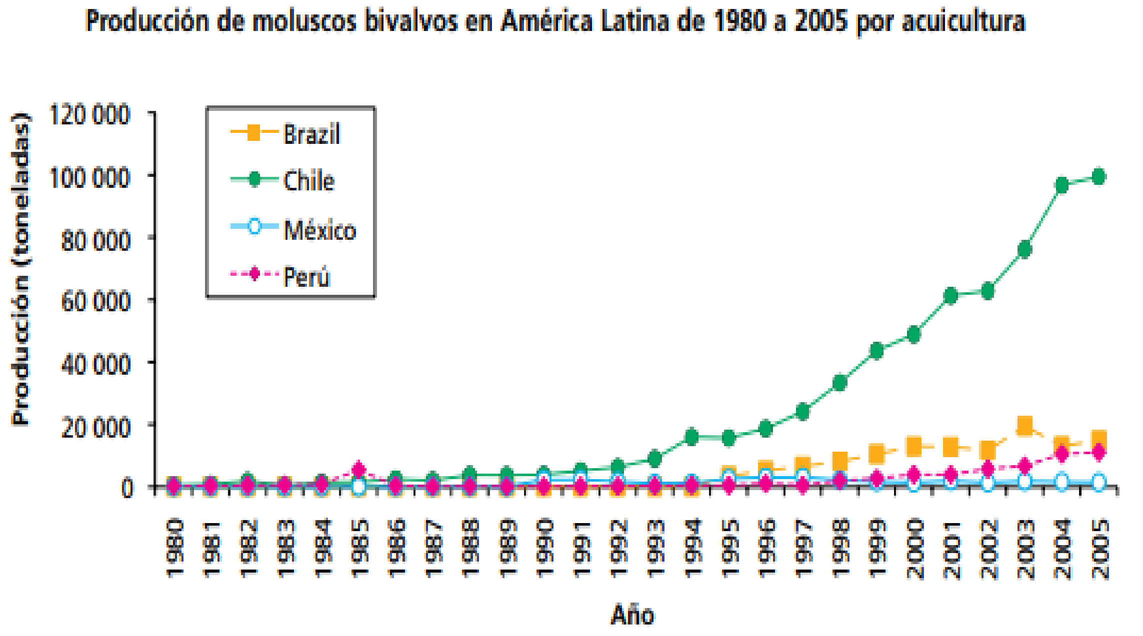
Tecnologías para una producción sustentable

Secretaría de Educación Superior, Ciencia, Tecnología e Innovación

ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL ESPOL

Antecedentes: Acuicultura de moluscos bivalvos



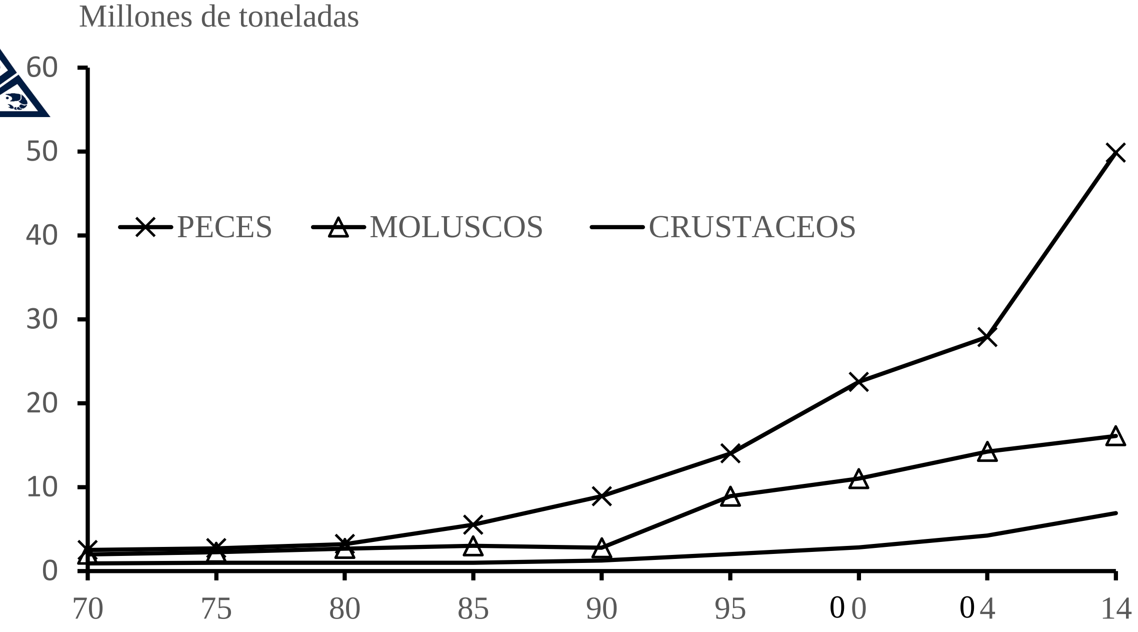


Fuente: FAO.

En 2014 se alcanzó un hito cuando la contribución del sector acuícola al suministro de pescado para consumo humano superó por primera vez la del pescado capturado en el medio natural.

FAO, 2016

Antecedentes: Acuicultura de moluscos bivalvos



En 2014, la producción acuícola ascendió a 73,8 millones de toneladas, (160.200 millones de USD).

- 49,8 millones de toneladas de peces (99.200 millones de USD).
- **16,1 millones de toneladas de moluscos (19.000 millones de USD).**
- 6,9 millones de toneladas de crustáceos (36.200 millones de USD)

FAO, 2016

Top 10 Productores de Moluscos : Acuicultura Marina

China	12 728 046	83.4%
Japan	332 460	2.2%
Republic of Korea	291 024	1.9%
Chile	252 528	1.7%
Thailand	217 467	1.4%
Viet Nam	179 163	1.2%
Spain	164 976	1.1%
United States of America	160 458	1.1%
France	156 980	1.0%
Italy	110 645	0.7%
Others	668 875	4.4%
WORLD	**15 262 622**	**100%**

www.acuiculturaperu.blogspot.com

http://acuiculturaperu.blogspot.com/2016/03/estadisticas-de-produccion-acuicola.html

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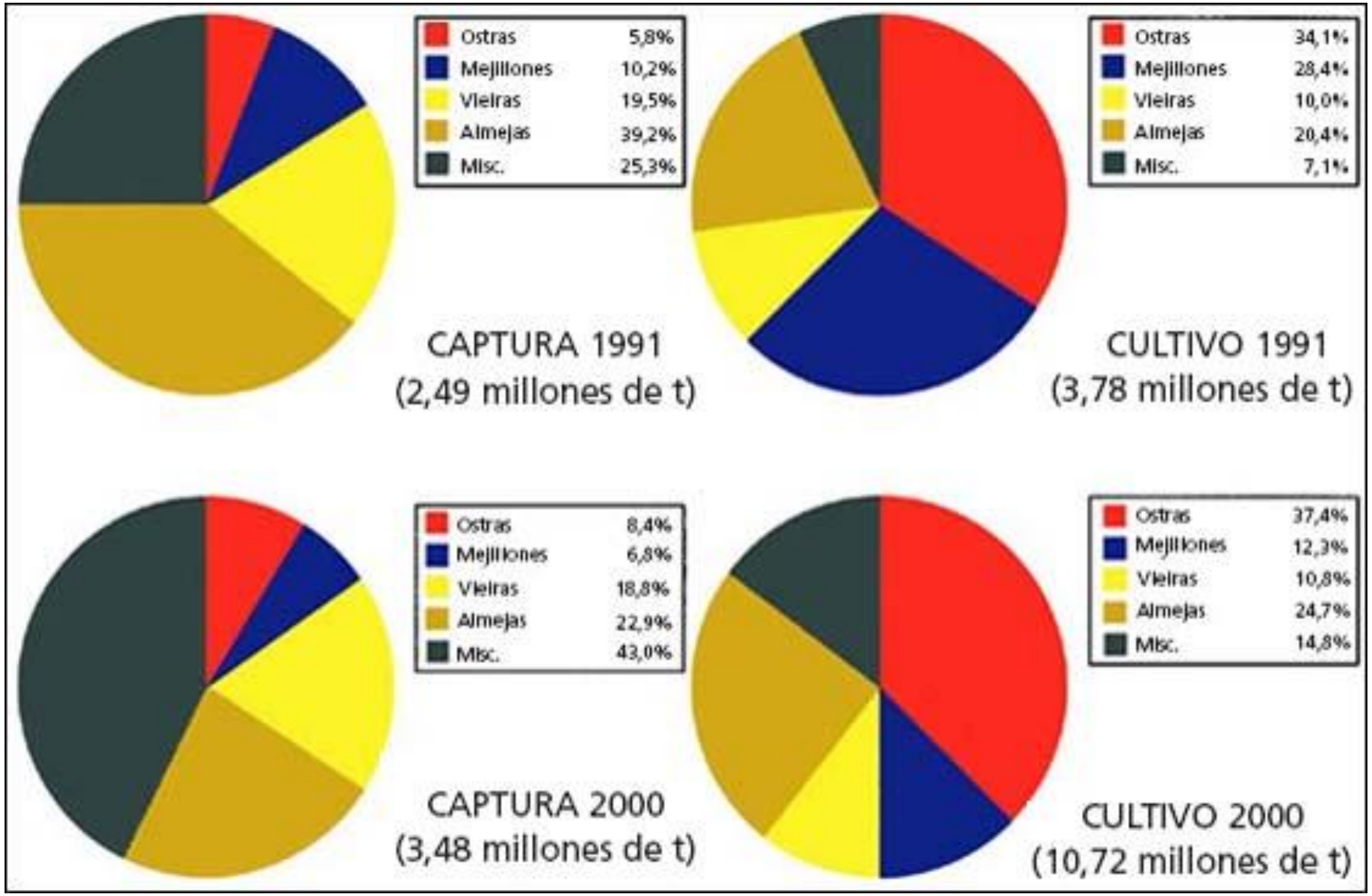
Antecedentes: Acuicultura de moluscos bivalvos

"Servirnos más productos de la acuicultura significa explotar menos las poblaciones salvajes, depender menos de las importaciones, crear más empleo e impulsar el crecimiento en nuestras economías locales"



Tomado de los Anuarios de Estadísticas de Pesca de la FAO, http://acuiculturaperu.blogspot.com/2016/03/estadisticas-de-produccion-acuicola.html

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Distribución

La ostra de roca *Striostrea prismatica* (*Gray, 1825*)= *Crassostrea iridescens* u *Ostrea iridescens*

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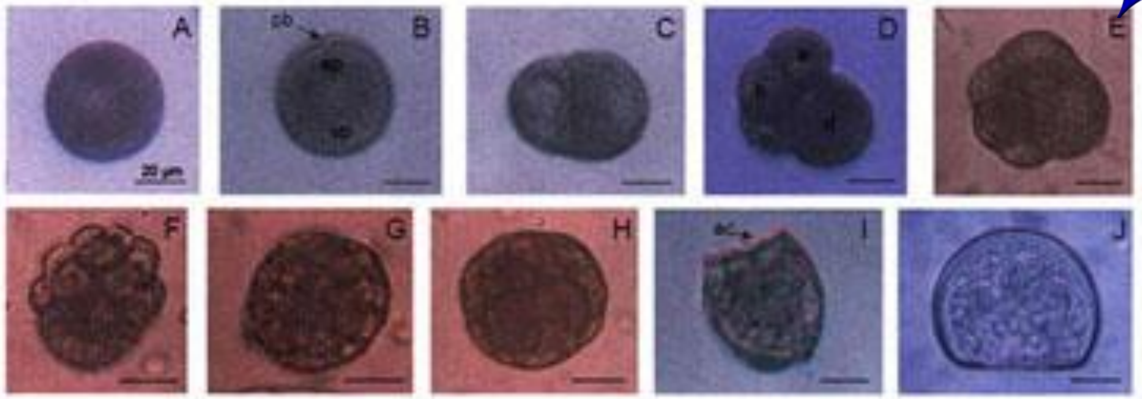
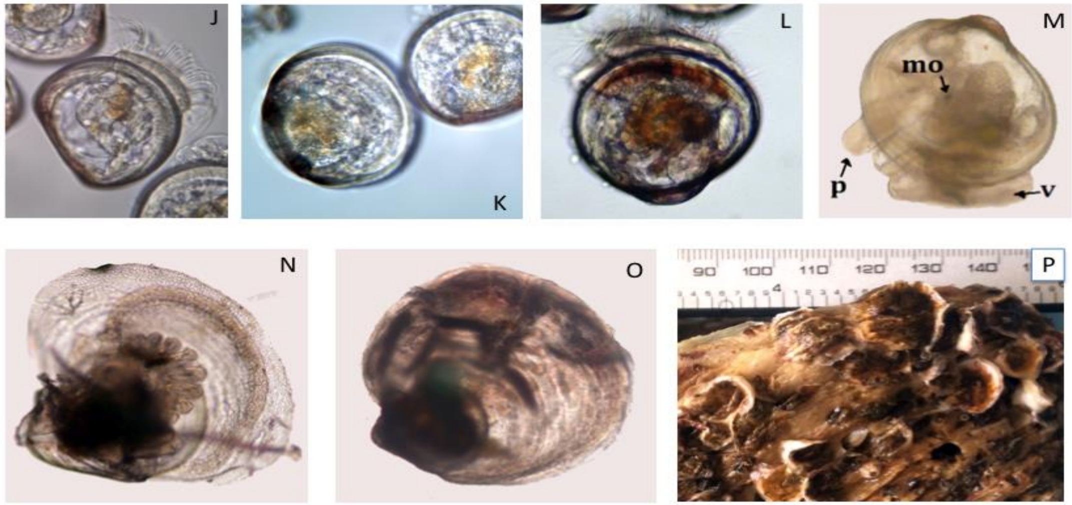
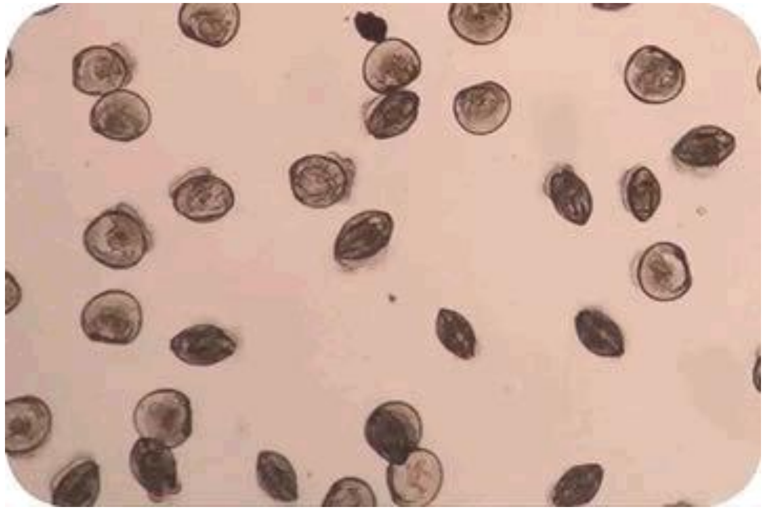
Qué más se conoce de la especie…???

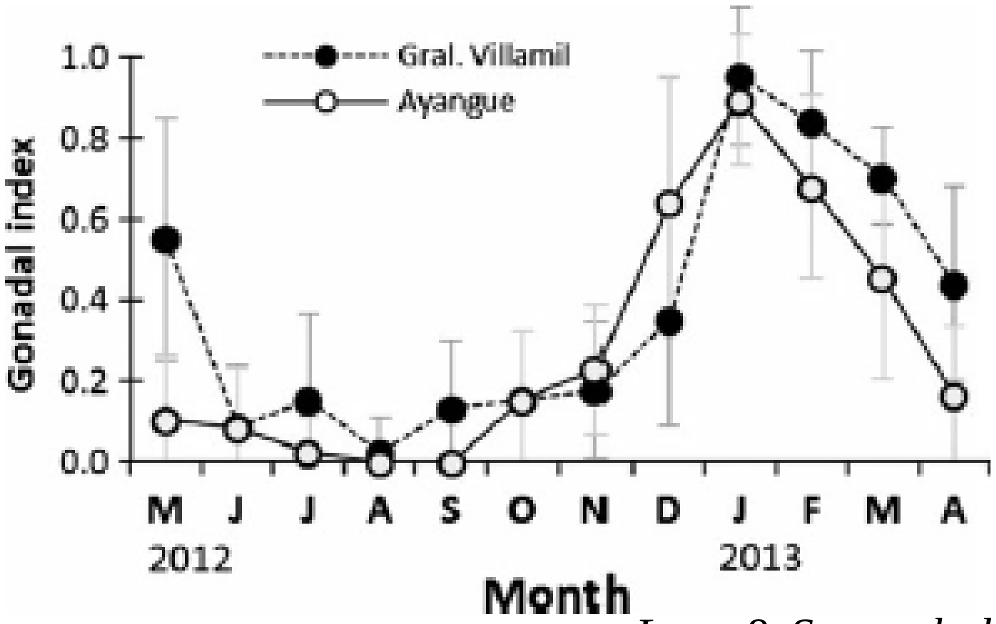


Arguello et al., 2013



Lodeiros et al., 2017





Loor & Sonnenholzner, 2014

Etapa 3: Evaluación de sustratos para el asentamiento

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Procedimientos de cultivo

Bioseguridad

Recambios de agua 100% diario

Agua microfiltrada 0.45 micras y UV

Aireación moderada y constante

Lavado y desinfección de tanques con solución de hipoclorito de sodio

Alimentación *Tisochrysis lutea* y/o *P. lutheri* +*Chaetoceros gracilis*

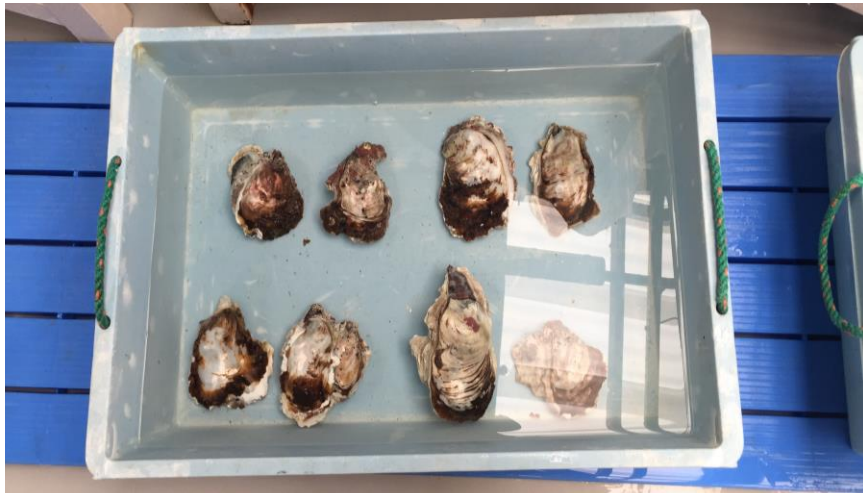
Análisis de índices de condición

Medición de crecimiento en longitud AP y DV

Densidad recomendada: 6, 3 y 1 larvas mL-1

Duración del larvario: 22 días

Obtención de reproductores, inducción a desove, producción de veligers y fase larval



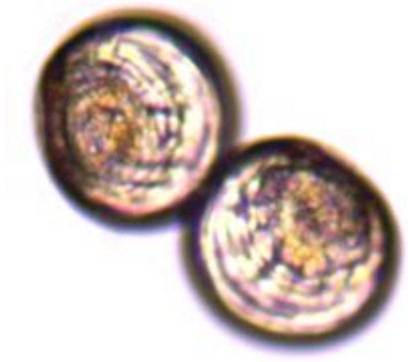
Protocol described by Argüello-Guevara et al. (2013), with some modifications: immersed in sea water at 90 °C for 30 s (Argüello-Guevara et al. suggest freshwater for asepsis), cleaned, desiccated for 60 min, and exposed to thermal stimulus

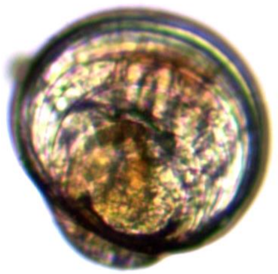
Planktonic stage

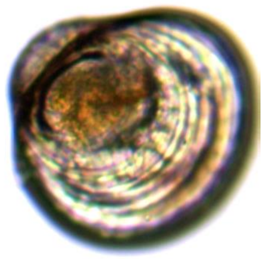
Los huevos fertilizados se incubaron en tanques de 1000 L, a una densidad de 20 huevos / mL, con de agua de mar filtrada 1 µm y tratada con UV.

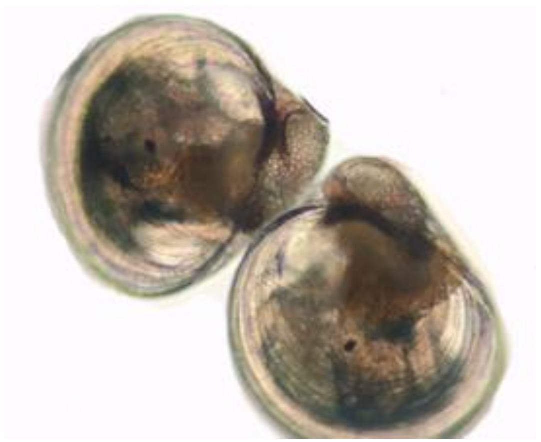
Para el desarrollo larval las larvas D se drenaron y retuvieron en un tamiz de malla de 40 µm y se asignaron a un tanque de 1000 L. La densidad fue 6, 3 y 1 larva / mL al día 6, 10 y 16, respectivamente.

La alimentación consistió en una mezcla *de T. luthea* y *C. gracilis* en proporción 3: 1, hasta el día 8, cuando la proporción se estableció en 1: 1, hasta el día 16 que varió a 1: 3. (aumentando en 5 000 células / mL cada 2 días)









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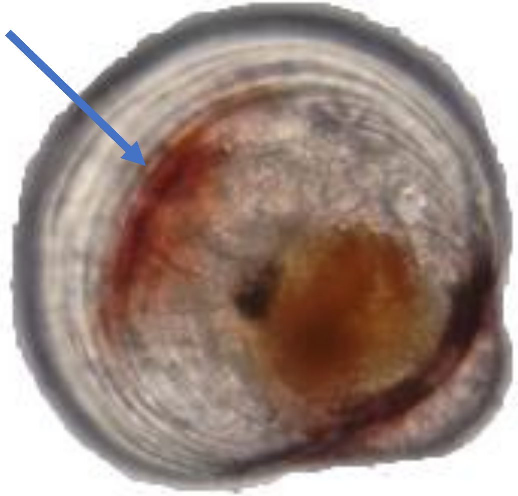
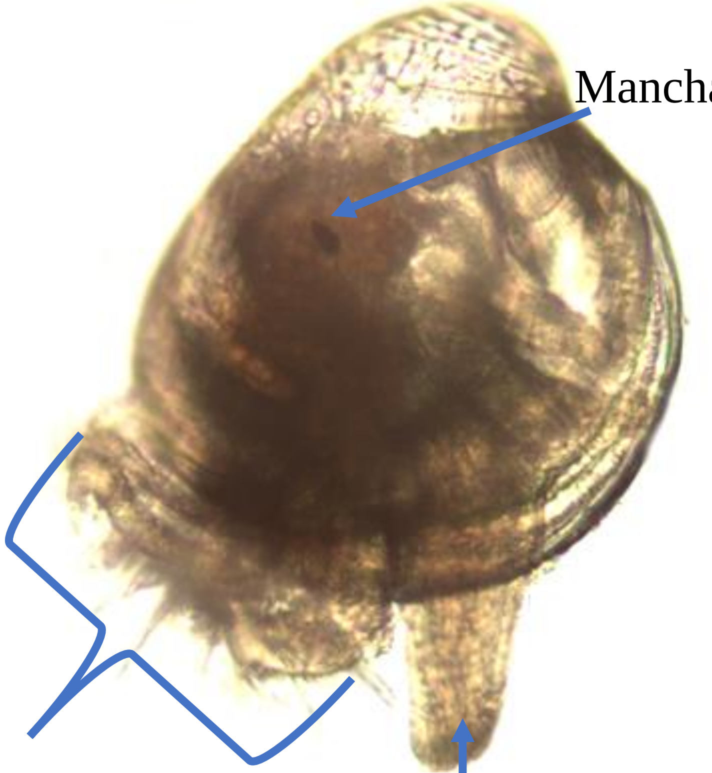
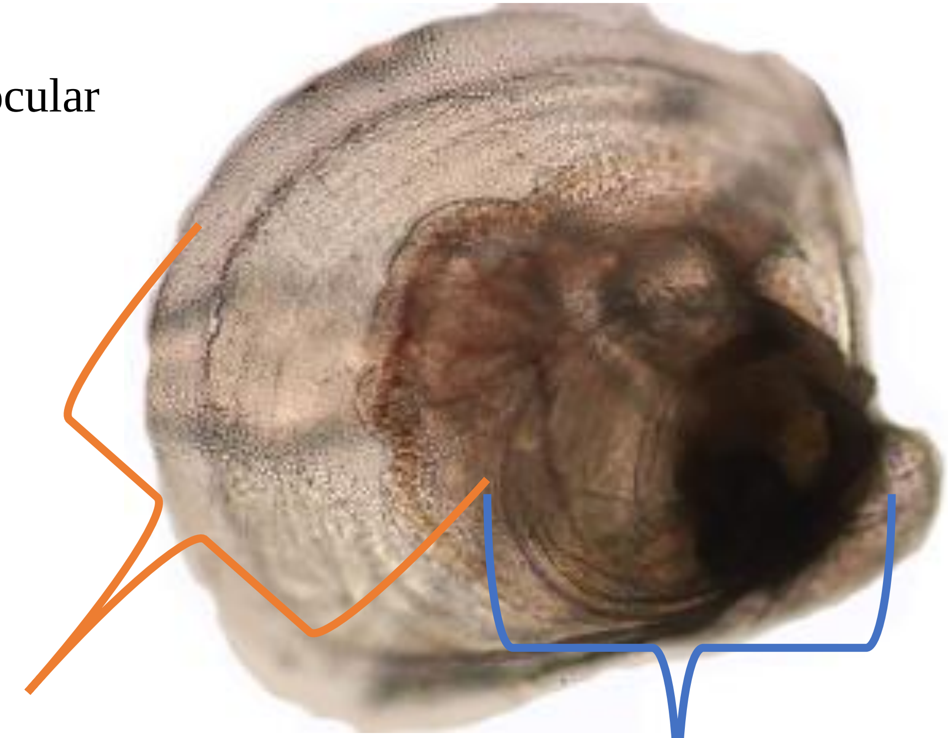
Bentonic stage

Cuándo enviar a fijación…???

Las larvas pediveliger competentes se transfirieron a sistemas circulares (30 cm de altura y 50 cm de diámetro) con una base de malla (150 micras) con fragmentos de *S. prismatica* (aprox. 0,2 - 2,0 mm).







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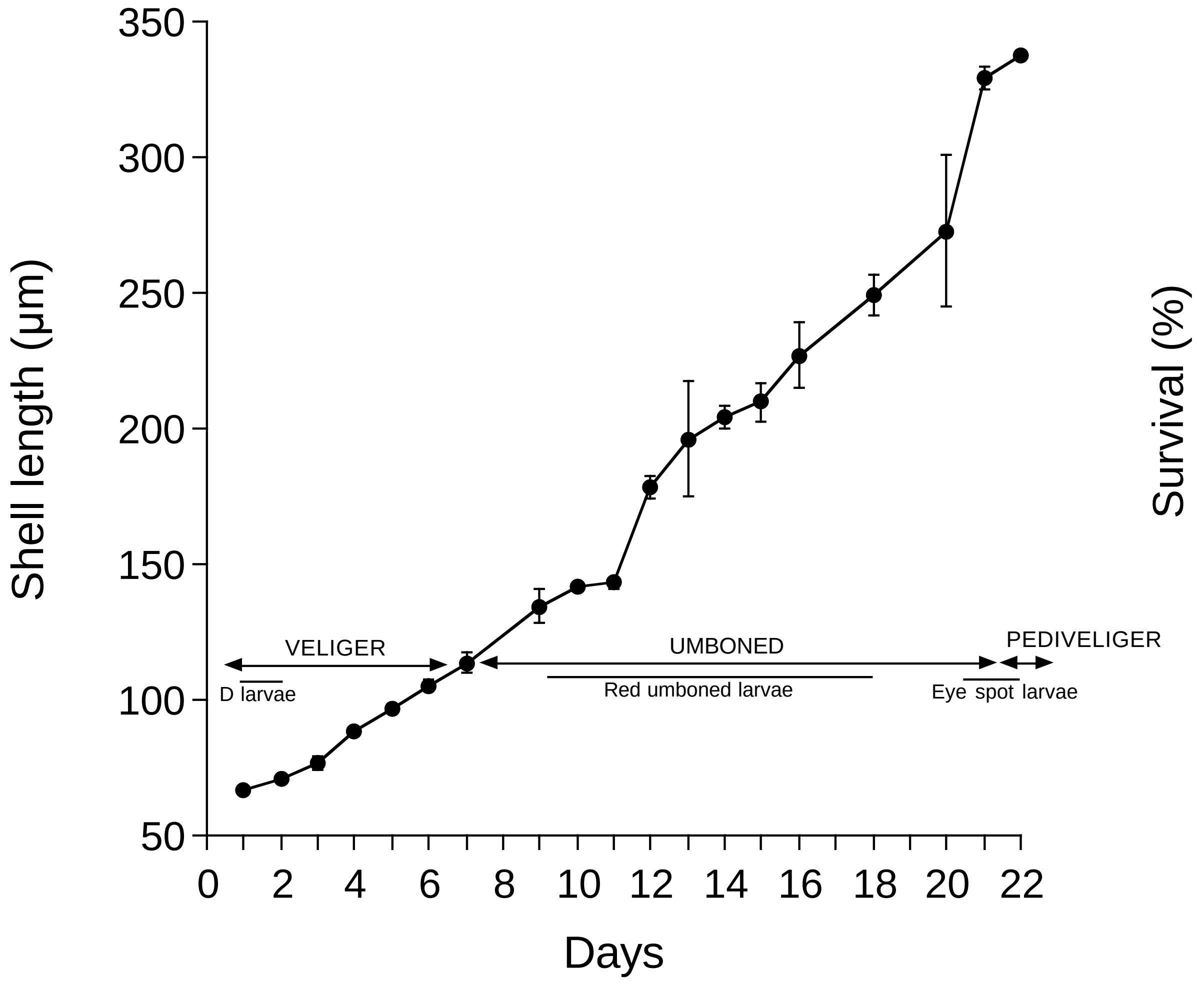
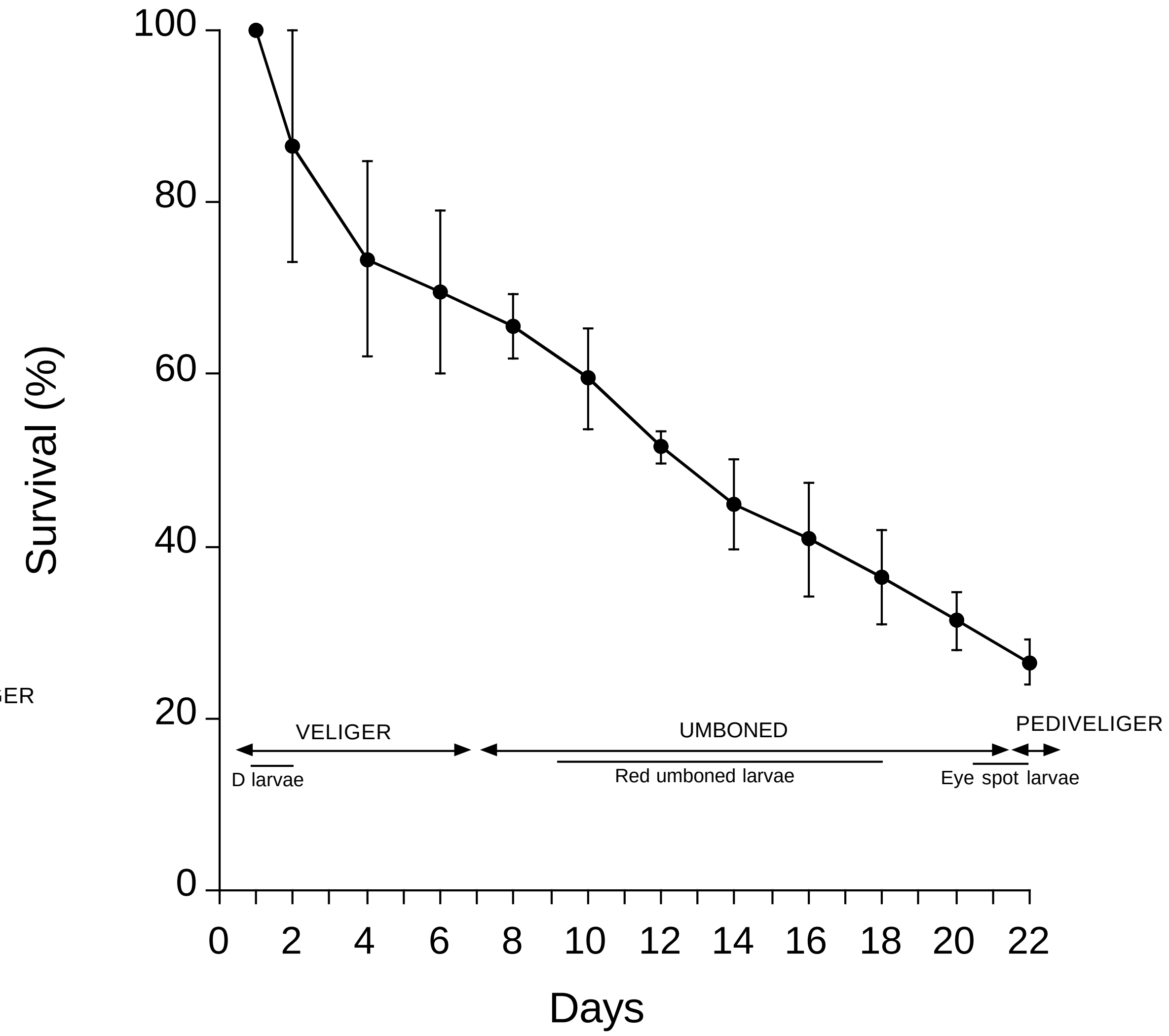
Crecimiento y Supervivencia de larvas de *S. prismatica*





Lodeiros et al., in press

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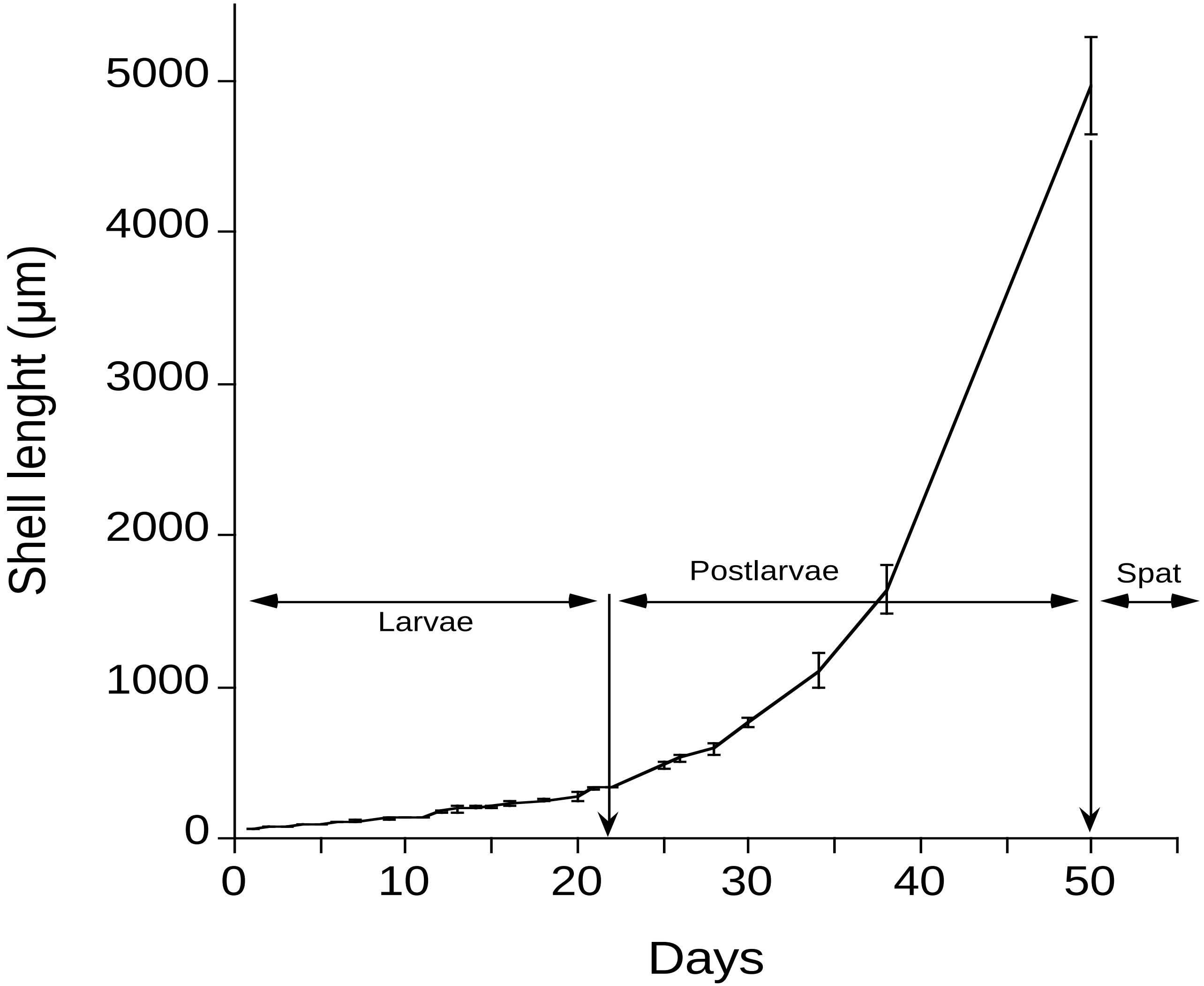
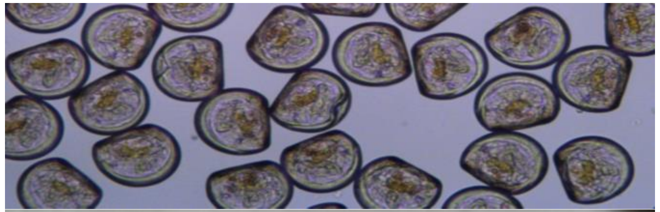
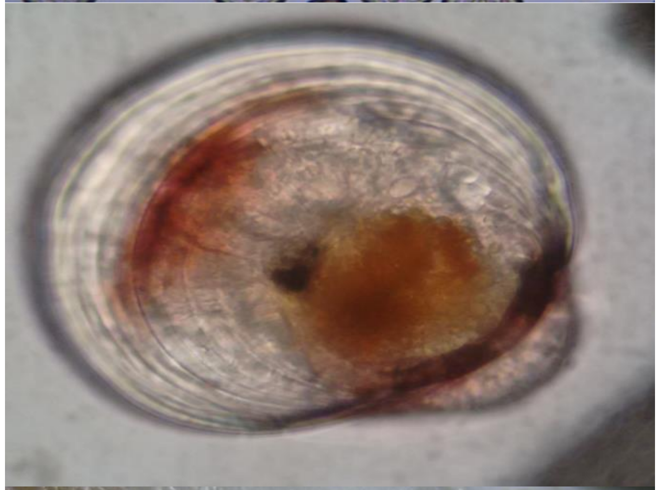
Crecimiento de *S. prismatica* hasta semillas de 5 mm

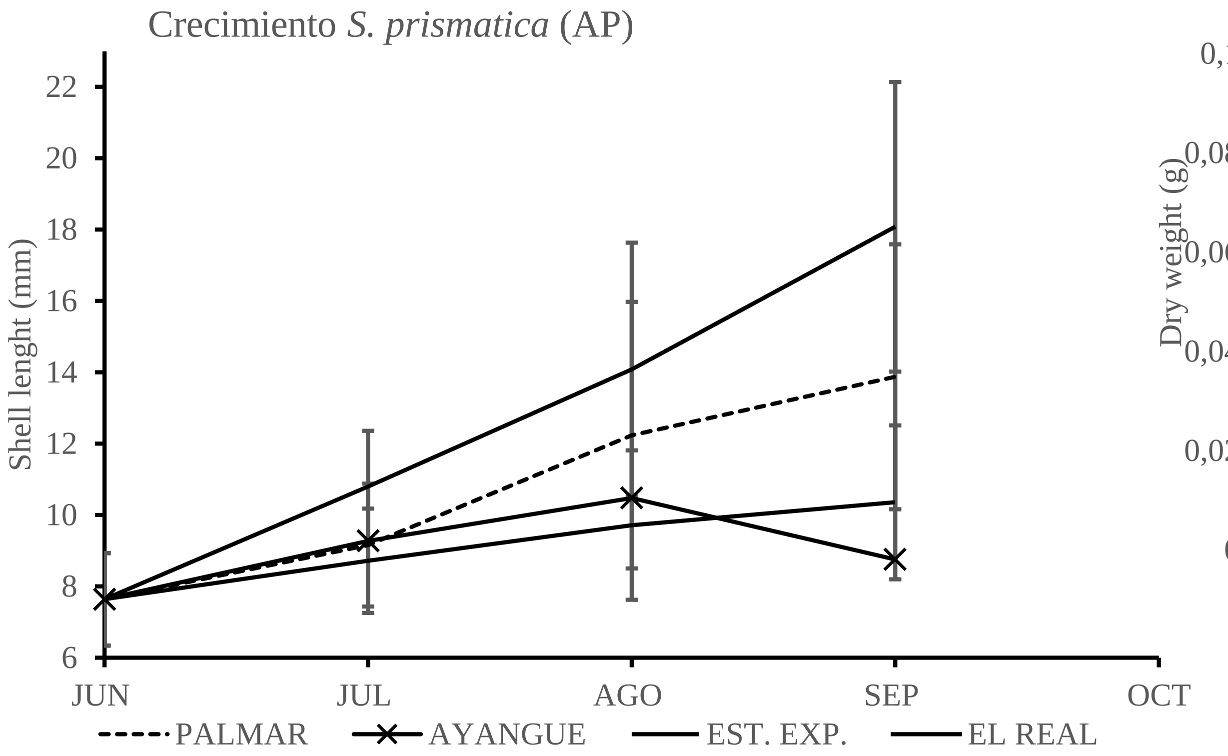


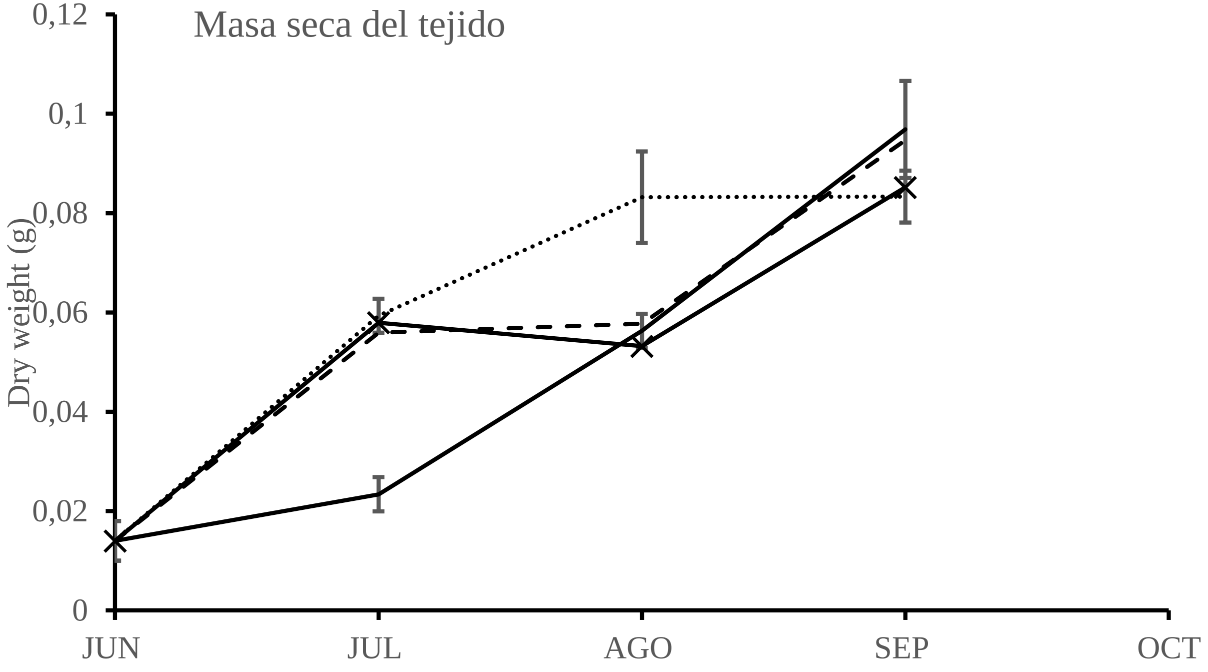




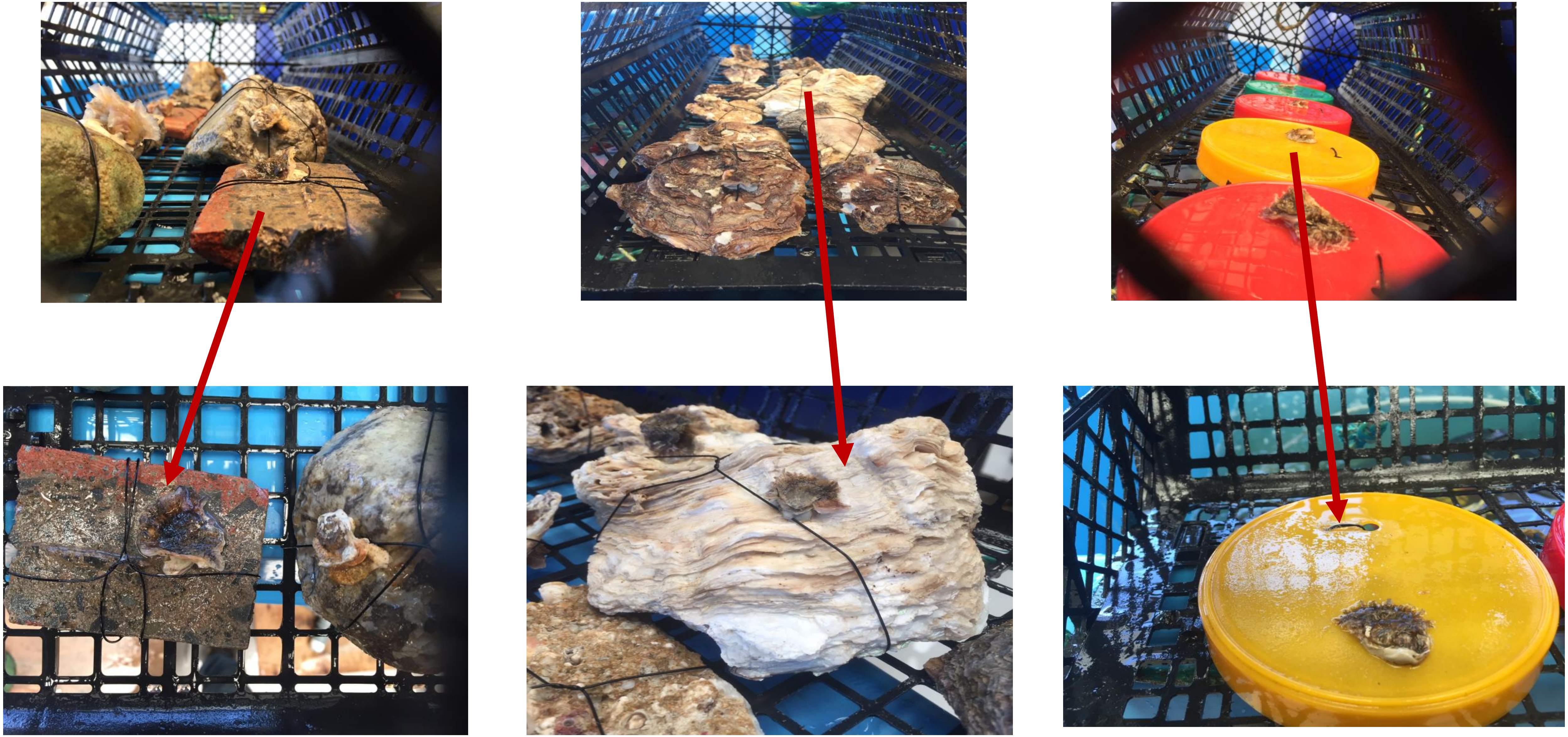
Ensayos actuales con la especie….

“Influencia de los parámetros ambientales sobre el crecimiento y supervivencia de *S. prismatica (Gray, 1825)* en cultivos suspendidos de varias localidades en la costa Pacífico (Ecuador)”





"¿Acelera la textura superficial del sustrato el crecimiento de juveniles de *S. prismatica (Gray, 1825)* ?"



Crassostrea gigas o *Striostrea prismatica*????

Length AP= 15 mm

Crassostrea gigas o *Striostrea prismatica*????

Length AP= 15 mm

Crassostrea gigas

Striostrea prismatica

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Crassostrea gigas o *Striostrea prismatica*????

Striostrea prismatica

Crassostrea gigas

5 mm → 25 mm

Journal of Shellfish Research, Vol. 36, No. 3, 1–7, 2017.

SPAT PRODUCTION OF THE ROCK OYSTER *STRIOSTREA PRISMATICA* (GRAY, 1825)

CÉSAR LODEIROS,[1,2]* ADRIÁN MARQUEZ,[1] JORMIL REVILLA,[1] DANIEL RODRÍGUEZ[1] AND STANISLAUS SONNENHOLZNER[1]

[1]*Escuela Superior Politécnica del Litoral, ESPOL, Centro Nacional de Acuicultura e, Investigaciones Marinas, CENAIM, Campus Gustavo Galindo Km 30.5 Vía Perimetral, Guayaquil 090903, Ecuador;* [2]*Instituto Oceanográfico de Venezuela, Universidad de Oriente, Av. Universidad, Cumaná 6101, Venezuela*

ABSTRACT The rock oyster *Striostrea prismatica* is one of the most abundant species in the rocky coastal ecosystems of the tropical and subtropical eastern Pacific; however, natural banks are overexploited or depleted, so production by culture is recommended. Adult *S. prismatica* obtained from natural banks were conditioned for gonad maturation and spawning. Fertilization, embryogenic, and larval development were performed under laboratory conditions, then settlement of pediveliger larvae and nursing of postlarvae were performed using downwelling methods to produce spat. The early life cycle (embryonic, larval, and postlarval development up to 5 mm in length) is described. The larval development was completed in 22 days, with survival >25%. The larval and postlarval growths were exponential reaching spat size (5 mm) after 28 days of settlement. The methods used in this study supported successful larval and postlarval culture of *S. prismatica* and provide a basis for large-scale propagation of this species.

KEY WORDS: rock oyster, embryogenic stage, larval growth, hatchery rearing, *Striostrea prismatica*

Ostra nativa

Influencia de dietas microalgales sobre la tasa de ingestión y crecimiento en juveniles de la ostra de roca

Alfredo Loor

Centro Nacional de Acuicultura e Investigaciones Marinas (CENAIM), Escuela Superior Politécnica del Litoral, San Pedro de Manglaralto - **Ecuador**

alfgloor@espol.edu.ec

como la fase larvaria o posterior a la metamorfosis (semillas).

Con la finalidad de proveer información para su cultivo, el presente estudio tuvo como objetivos: 1) comparar el desempeño de la ostra nativa alimentada con cultivos mono-específicos de tres microalgas e individuos cultivados en ambientes naturales (long-lines en mar abierto y reservorio de una cama

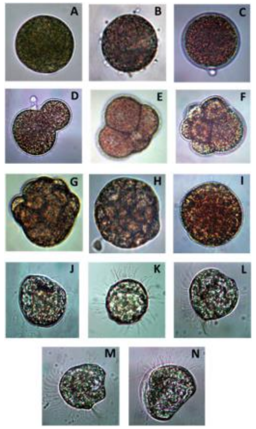

Figure 1. Embryonic development of *Striostrea prismatica* until trochophore and D-larvae. (A) Unfertilized oocyte (46.3 ± 0.90 μm), (B) oocyte with surrounding spermatozoids, (C) first polar body indicating oocyte fertilization (15–20 min), (D) first cell cleavage (1 h 30 min), (E) second cell cleavage (2 h), (F) third cell cleavage (2 h 30 min) (G) fourth cell cleavage (3 h 30 min), (H) immobile morula (4 h 00 min), (I) blastula (5 h 00 min), (J) early gastrula (6 h 3 min), (K) late gastrula (7 h 30 min), (L) early trochophore larvae (52.4 ± 1.17 μm; 10 h), (M) late trochophore larvae with noticeable D form (58.1 ± 0.53 μm; 19 h), and (N) calcified early D-shaped larvae with prodissoconch I (64.3 ± 0.34 μm; 20 h). The images have different magnification scale to better observation.

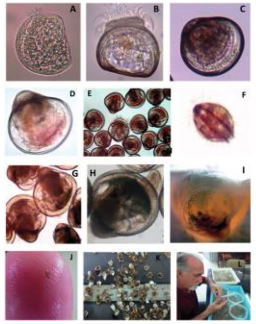

Figure 2. Larval and postlarval development of *Striostrea prismatica* until spat stage. (A) Larvae D with prodissoconch II (66.9 ± 1.27 μm; 24 h postfertilization), (B) veliger larvae, (71.1 ± 0.52 μm; 2 days), (C) early umboned veliger larvae (125.7 ± 2.00 μm; 7 days), (D) umboned larvae with a distal reddish-orange toward the ventral zone (142.6 ± 8.22 μm; 9 days), (E and F) umboned larvae with a more marked distal reddish-orange toward the ventral zone (178.3 ± 3.91 μm; 12 days), (G) large umboned larvae showed spot eye (289.6 ± 13.76 μm; 18 days), (H) pediveliger larvae (341.6 ± 4.58 μm; 22 days), (I) early postlarvae (3 days postfertilization), (J) visually observable postlarvae (764.8 ± 37.23 μm; 9 days), (K and L) spat sizing 5 mm anteroposterior length (28 days postmetamorphosis; 50 days postfertilization). The images have different magnification scale to better observation.

Fig. 2B). A provinculum was highly noticeable in 7-day-old larvae, measuring 125.7 ± 2.00 μm in shell length (early umboned veliger larvae; Fig. 2C). On day 9, 69.4% ± 12.35% of veliger larvae turned markedly umboned when the shell length was 142.6 ± 8.22 μm, and a distal reddish-orange color toward the ventral zone was observed in all these larvae (Fig. 2D). On day 12, the reddish pigmentation was more marked in all larvae measuring 178.3 ± 3.91 μm (Fig. 2E, F) then the distal red spot became diffuse and disappeared toward day 18. On day 20, the 1.1% ± 3.81% advanced umboned larvae showed a spot eye (289.6 ± 13.76 μm), on day 21 100% of larvae had spot eye (329.3 ± 3.89 μm; Fig. 2G), and on day 22, 100% developed a ciliated foot (pediveliger; 341.6 ± 4.58 μm; Fig. 2H). In this moment, the pediveliger larvae had a crawling behavior, indicating to be in the competent stage for metamorphosis, and were transferred to circular downwelling systems with shell fragments for settlement, metamorphosis, and postlarval development. No double ring in pediveliger larvae on the shell was evident.

The first cemented postlarvae observed with dissoconch formation had 482.2 ± 19.72 μm, at 3 days postmetamorphosis (25 postfertilization; Fig. 2I). The cemented postlarvae continued their growth, and visual evident postlarvae reached a mean shell length of 764.8 ± 37.23 μm after 9 days (Fig. 2J). Oysters could be easily handled circa 5 mm (4.9 ± 0.32 mm) at 28 days (50 days postfecundation; Fig. 2K, L) and could be transferred to the grow-out systems at sea.

Growth and Survival

The larval growth curve (Fig. 3) shows similar growth rates (7–10 μm/day) between the onset of larval development until F3

Journal of Shellfish Research, Vol. 32, No. 3, 665–670, 2013.

BROODSTOCK CONDITIONING, SPAWNING INDUCTION, AND EARLY LARVAL DEVELOPMENT OF THE TROPICAL ROCK OYSTER *STRIOSTREA PRISMATICA* (GRAY 1825)

WILFRIDO ARGÜELLO–GUEVARA,* ALFREDO LOOR AND STANISLAUS SONNENHOLZNER

CENAIM-ESPOL, Escuela Superior Politécnica del Litoral (ESPOL), Campus Gustavo Galindo, Km. 30.5 Vía perimetral, PO Box 09-01-5863, Guayaquil, Ecuador

ABSTRACT The tropical rock oyster *Striostrea prismatica* is a commercially valuable bivalve mollusc found along the Pacific tropical coast. A laboratory study was conducted to investigate broodstock acclimation at two temperatures (28.3 ± 0.9°C and 22.2 ± 0.9°C) fed a combined microalgae diet (*Chaetoceros gracilis* and *Isochrysis galbana* at 150 cells/μL/day and 100 cells/μL/day, respectively) for 7 wk, and to investigate seven treatments to stimulate spawning of individuals acclimated at both temperatures. Treatments to induce spawning consisted of a 10°C temperature decrease for 60 min (HS1), a temperature increase to 30°C for 30 min (HS2), a 5°C temperature increase for 60 min followed by 30 min of desiccation (HSD), a decrease in salinity to 15 psu for 30 min (SS1), an increase in salinity to 96 psu for 30 min (SS2), overfeeding with *C. gracilis* microalgae (OF), and the addition of oyster sperm (SPM). All treatments were treated with oyster sperm after 1 h of the last stimulus. Spawning success was evaluated by measuring egg production, fertilization percentage, and response time of spawning. Only broodstock held at 28°C spawned (51.8%). All organisms in the HSD treatment spawned after 1.40 ± 1.01 h. Oocytes released per individual and fertilization rate averaged 34.88 ± 23.81 $\times 10^6$ and 89.82 ± 5.90%, respectively. Addition of sperm enhanced spawning success in the HS1, HS2, and SS1 treatments.

KEY WORDS: rock oyster, *Striostrea prismatica*, gonad and embryonic development, broodstock acclimation, spawning stimulation

Aquaculture Research

Aquaculture Research, 2014, 1–11 doi:10.1111/are.12601

Reproductive cycle of the rock oyster, *Striostrea prismatica* (Gray, 1825) from two locations on the southern coast of Ecuador

Alfredo Loor & Stanislaus Sonnenholzner

Escuela Superior Politécnica del Litoral (ESPOL), Centro Nacional de Acuicultura e Investigaciones Marinas (CENAIM), Guayaquil, Ecuador

Correspondence: A. Loor, Escuela Superior Politécnica del Litoral, Centro Nacional de Acuicultura e Investigaciones Marinas, Km 30.5 Vía Perimetral, P.O. Box 09-01-5863, Guayaquil, Ecuador. E-mail: alfgloor@espol.edu.ec

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G R A C I A S

dfrodrig@espol.edu.ec