HATCHERY EXPERIENCE & USEFUL LESSONS FROM *ISOSTICHOPUS FUSCUS* IN ECUADOR & MEXICO

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Introduction

The sea cucumber *Isostichopus fuscus* has been intensively fished along the coasts of Mexico, mainland Ecuador and the Galapagos Islands, where efforts at management have typically met strong opposition from local communities. Wild populations of *I. fuscus* have thus been severely depleted over the past decades.

Until recently, aquaculture in Latin America has been largely focused on shrimp, but the emergence of viral diseases has harmed the industry and forced numerous farms to close down. Ecuador and Mexico now have a lot of facilities that could be used to cultivate other species, such as sea cucumbers…

Main questions

1. Can *I. fuscus* be cultivated in land-based systems (using shrimp-farming installations).
2. What are the optimal conditions to grow juveniles to the exportable size (in tanks, shrimp ponds or cages at sea).

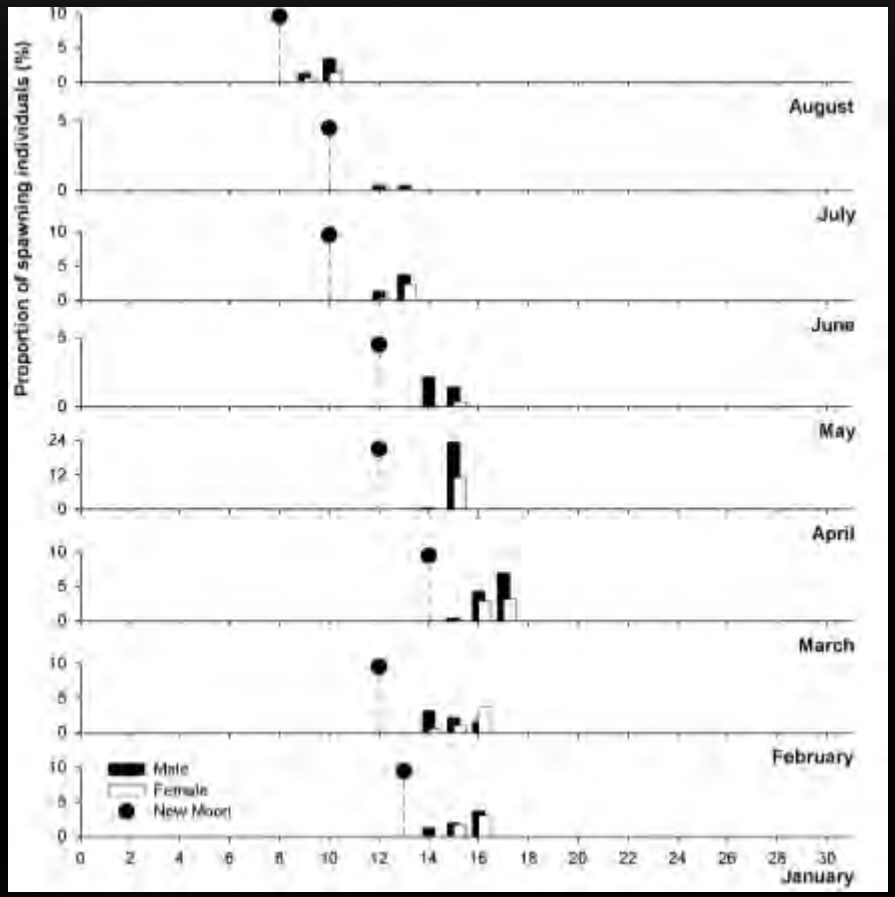
Isostichopus fuscus

Brood stock

Spawning

Spawning periodicity of *I. fuscus* follows a lunar cycle.

From Mercier et al. 2007



Micro-algae

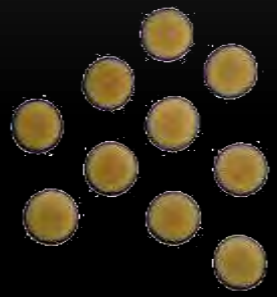
Quality of feed for larvae is of primary importance.

Hatchery

Larval rearing tanks (cones).

Experimental tanks (aquariums).

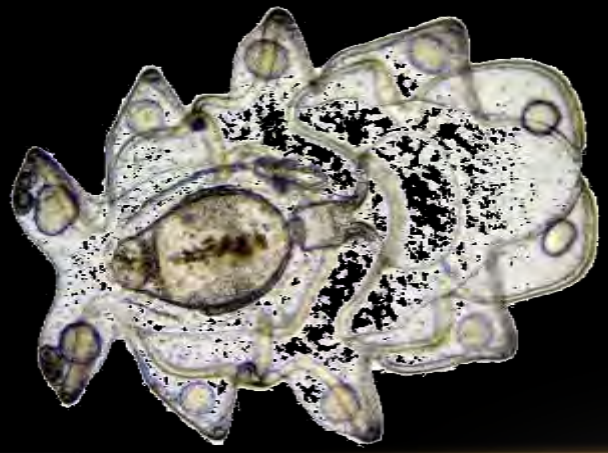
Development



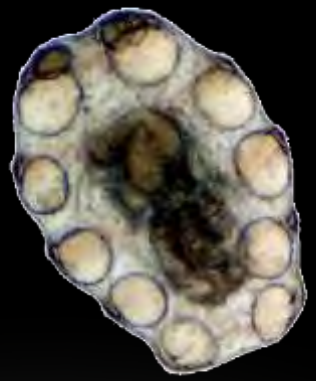
Newly fertilized eggs

2-cell (~50 min)

Gastrula (~6-10 h)



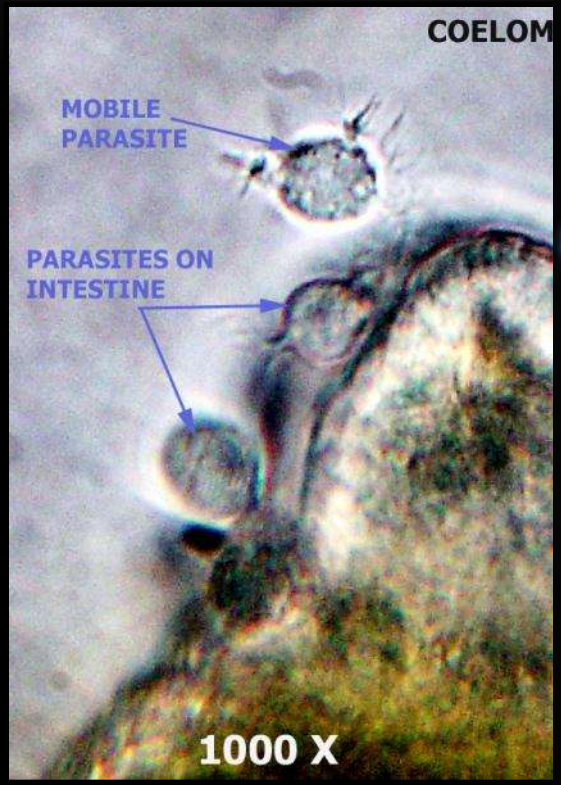
Auricularia (~3-15 d)

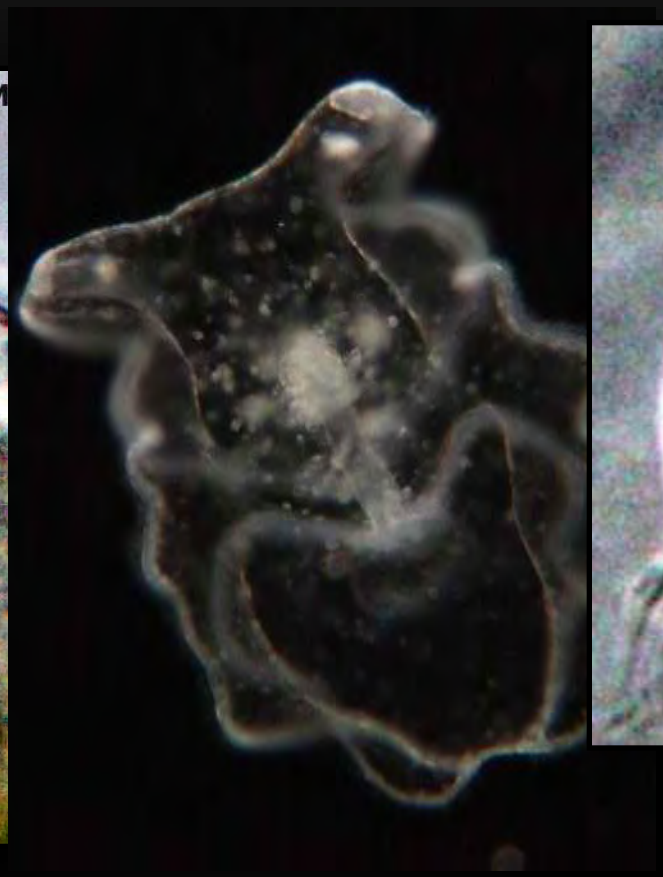


Doliolaria (~19-24 d)

Early pentactula (~21-26 d)

Diseases





From Becker et al. 2009

Diseases

Solution: decrease temperature of seawater and increase air bubbling.

Settlement

Sheets of fabric mesh 500-1000 µm conditioned for ~3 weeks.

Settlement

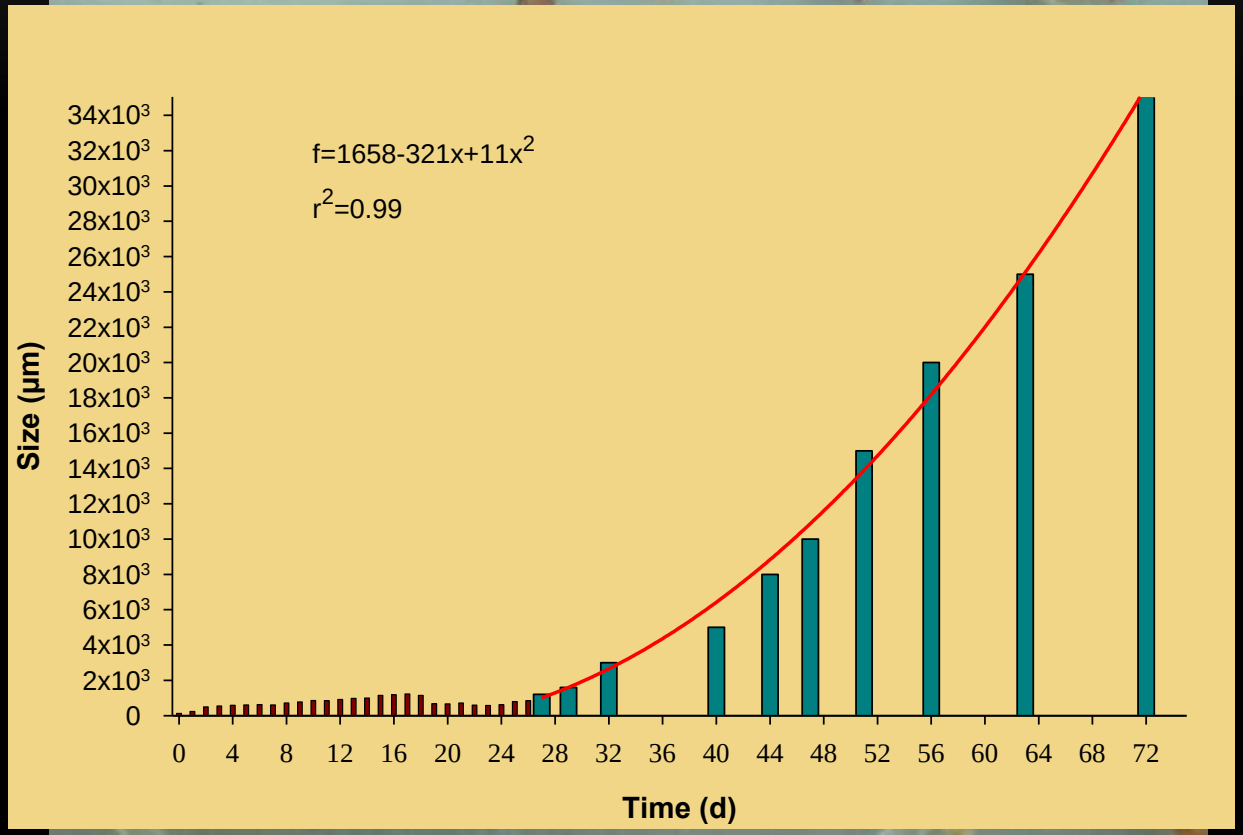
Settlement (~22-27 d)

1.5-mm juvenile (~28 d)

15-mm juvenile (~50 d)

Juveniles

Growth rates



Grow-out

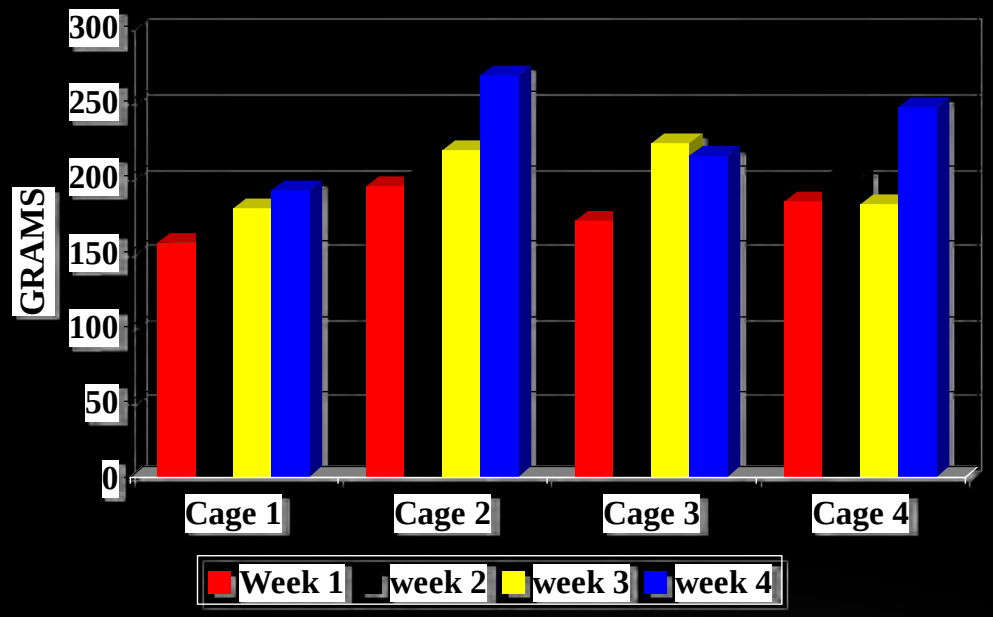
In Ecuador & Mexico:
Hatchery-reared sea cucumbers were placed in shrimp ponds.

Grow-out

In Ecuador: The animals were placed in cages of 1 m² to facilitate recapture for weekly controls.

Grow-out

In Ecuador: The sea cucumbers in the farm grew an average of 17 g/week.



Grow-out

Survival rate was high (to 98%) in the absence of skin disease

Grow-out

In Mexico: The animals were placed directly in the ponds and assessed every 15 d.

Grow-out

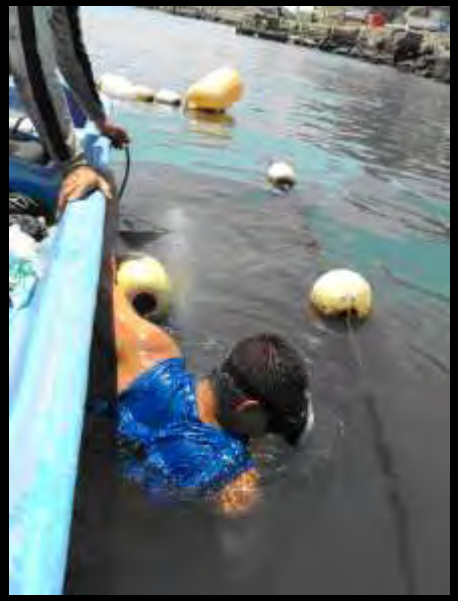
In Mexico:

Growth in ponds was fast (1 g/day) but survival was often low mainly due to skin disease.

Skin can repair with antibiotics in tanks (but long and costly)

Grow-out

Growth was slower but survival much better in cages at sea



- Individuals initially affected by skin disease recovered
- When juveniles were transferred at size of 3-5 mm, survival was between 30-50%
- Weight increment from 2.66 g to 26.92 g in 3 months
- Main problems: crabs and fouling

Grow-out

24-cm long sea cucumbers were obtained randomly

Summary

1. A good portion of the effort has been placed on adapting shrimp farm equipment and larval rearing conditions to fit the needs of *I. fuscus*.
2. The species has been found to follow a predictable lunar spawning cycle which facilitates the collection of mature gametes (oocytes and spermatozoa).
3. A larval rearing protocol has been developed using flow-through systems, an optimal micro-algal diet as well as water quality management and disease control.
4. Maximum survival rates of juveniles were typically 30-50%.
5. Based on the best growth rates, juveniles can reach 8 cm (~25 g) in 110 days in shrimp ponds in Ecuador and 90 days in cages in Mexico.
6. While grow-out of sea cucumbers in tanks and shrimp ponds appears to be promising under optimal conditions, sea farming might be a more reliable and simple option (disease-free).

Some lessons

Cultivating a reef species in a sandy environment is challenging

Some lessons

More R&D needed to optimize use of shrimp installations

Future goals

1. Research on diets and on conditioning adults to spawn when maintained in tanks to avoid having to continuously collect from wild populations (to become independent of wild stocks).
2. Fine-tune hatchery and larval rearing protocols to maximize commercial mass-production.
3. Experiment with grow-out techniques to determine the best diet, substrates and location to grow the juveniles.
4. Determine the commercial and ecological prospects for hatchery-produced *I. fuscus*.
5. Optimize the control of larval and juvenile parasitic infestations and infections.
6. Compare with culture away from shrimp habitat / installations.

THANKS

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