Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes

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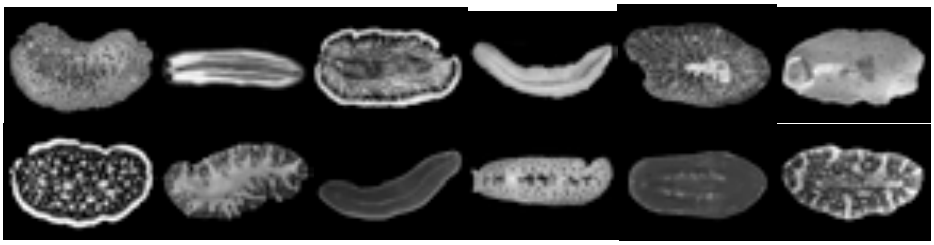
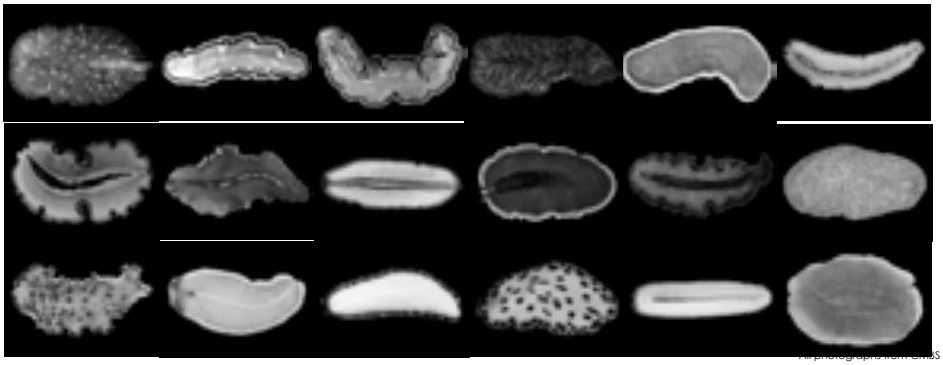


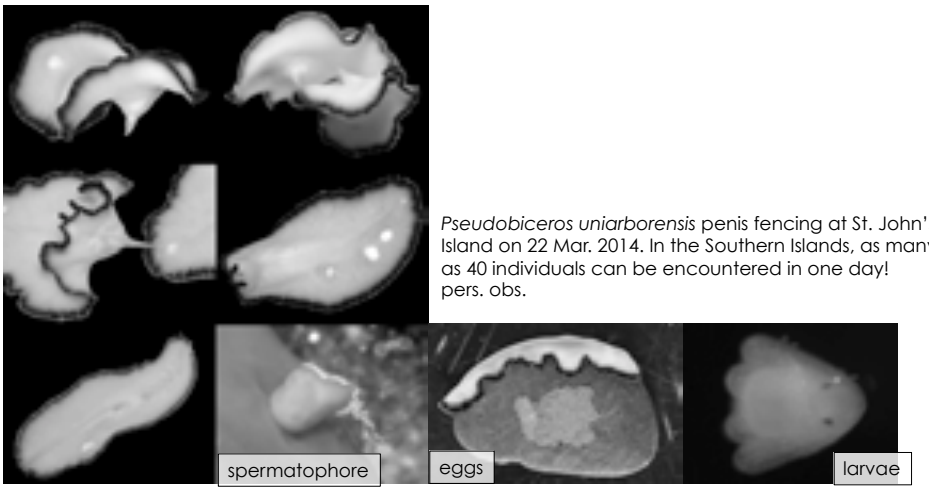
As many as 100 species were discovered in Singapore during the recently completed Comprehensive Marine Biodiversity Survey (Gan Bin Qi, Rene Ong & Marcela Bolanos, pers. comms.).



All photographs from CMBS

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes

Kinky sex lives!



Pseudobiceros uniarborensis penis fencing at St. John's Island on 22 Mar. 2014. In the Southern Islands, as many as 40 individuals can be encountered in one day! pers. obs.

Pseudoceros indicus penis fencing, spawning, parental care and larval development (Chim Chee Kong, Rene Ong & Gan Bin Qi, in press).
One of the most common species in Singapore, it can be found in most intertidal habitats .

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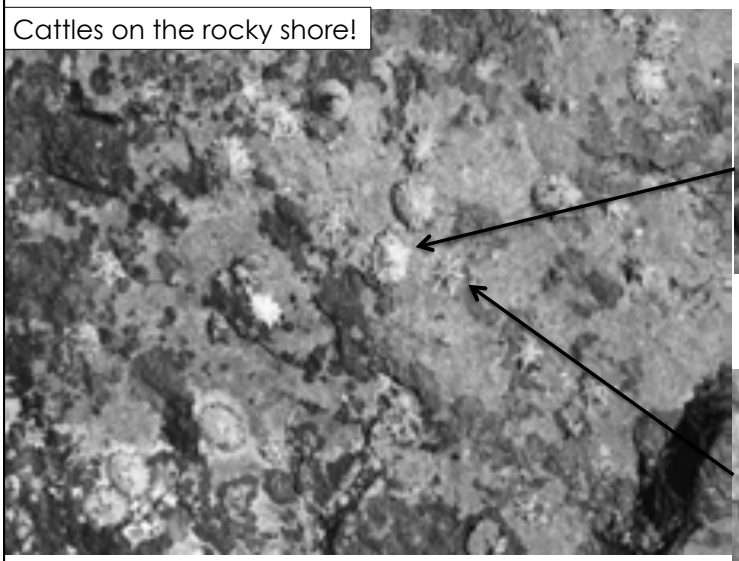
Cattles on the rocky shore!



Density of false limpets can reach hundreds per square metre on the intertidal shores of St. John's Island and other Southern Islands of Singapore.

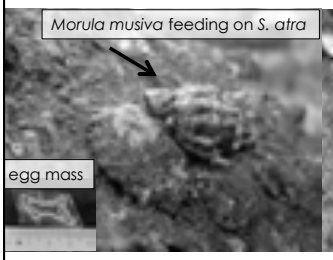
Right side of shell is lightly larger

False limpet

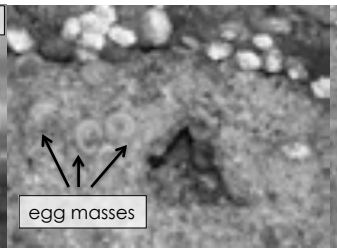
Shell is symmetrical

True limpet

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes

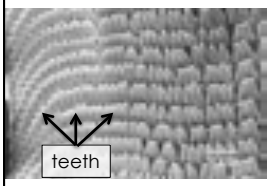


Siphonaria atra
(low-mid shore)



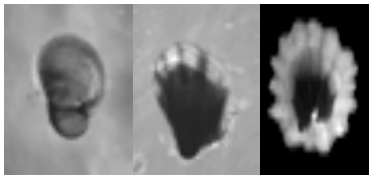
Siphonaria guamensis
(mid-high shore)

Siphonaria javanica
(mid-high shore)



S. atra radula

S. guamensis veliger



19 days 49 days 21 weeks

S. javanica juveniles

References: Chim & Tan, 2009; Chim & Ong, 2012; pers obs.

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes

Tetraclita singaporensis/squamosa

Morula sp. feeding on a *Tetraclita* sp.

Helen Wong collecting the occupants inside empty barnacle tests at Pulau Tekukor.

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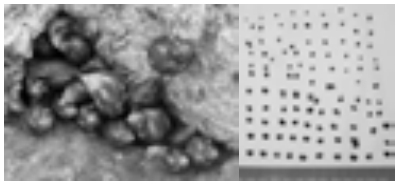
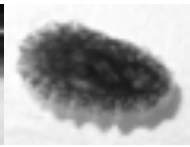


Littoraria articulata/strigata
As many as 110 periwinkles living inside one empty barnacle test!

Other associated animals:

- Bivalves (*Brachidontes* sp., *Isognomon legumen*)
- Mites
- Pseudoscorpion (*Parahya submersa*)
- Crustaceans (e.g. crabs, tanaids, leptostracans)
- Springtails (*Pseudanurida* cf. *billitonensis*)

Acotylean flatworm

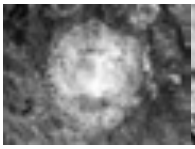


Onchidiidae

Smaragdinella sp. *

Sipuncula

Nereididae



Spider web

Diplocanthopoda marina
Rediscovered after 84 years!

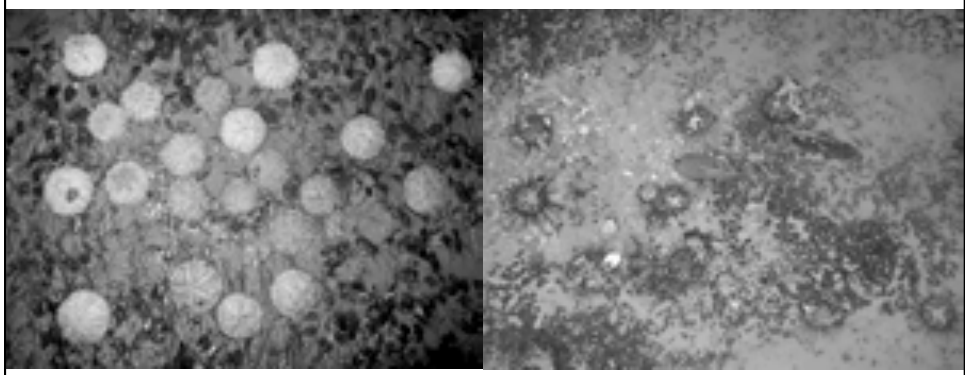
Salduncula murphyi
Rare (Polhemus, 1991), previously recorded only from Labrador Park

Insect larva

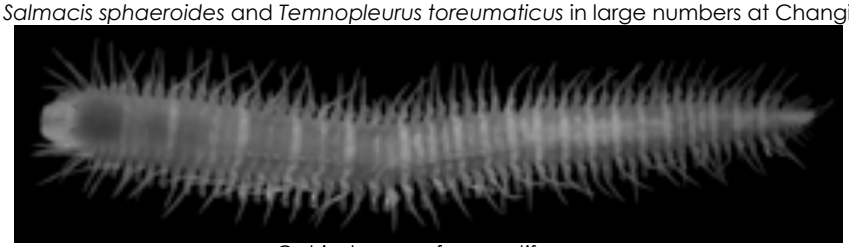
Dynamenella ptychura *

* = New records

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes



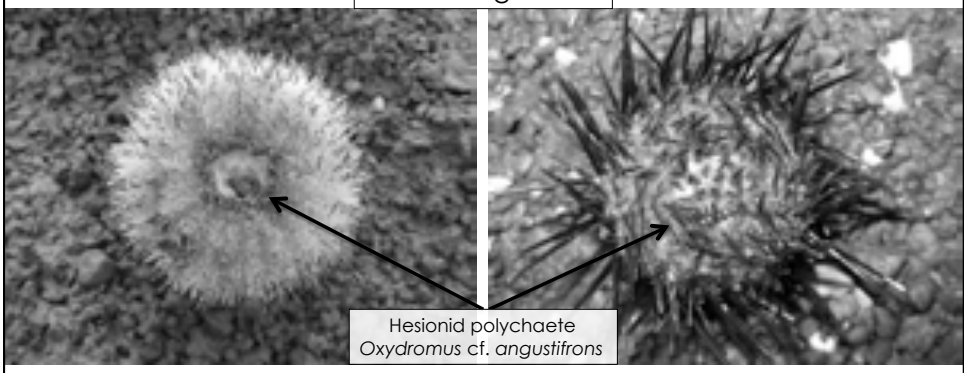
Salmacis sphaeroides and *Temnopleurus toreumaticus* in large numbers at Changi.



Ophiodromus cf. *angustifrons*

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes

hitch-hiking worm!



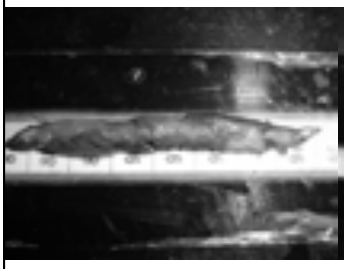
- Commensal relationship between sea urchins and polychaetes.
- Large sea urchins may carry multiple polychaetes.
- Largest polychaete always on the membrane surrounding the mouth.
- Smaller polychaetes hide among the spines.
- Polychaetes fight over territory using proboscis.

Reference: Chim et al., 2013

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes

The dog-faced water snake *Cerberus schneiderii* can be commonly found in local mangroves such as Pasir Ris and Sungei Buloh. More than 100 snakes can be caught per night.

Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes



Regurgitated food items

Snakes can swallow prey much wider than their head.

Voracious feeders!

- Opportunistic feeders.
- Feeds on a wide variety of fishes, small and large ones.
- Eats as many as 50 fishes a night.

Copulating snakes.

Mother snake and her newborn.

= Prolific baby snakes-making machines!

- Produces only 4 neonates, low reproductive effort, long gestation period (~ 4 mths).
- Early sexual marurity, feeds while gravid, aseasonal reproduction, reproduces multiple times a year.

References: Chim, 2009; Chim & Diong, 2013.

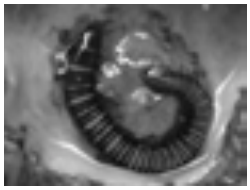
Of flatworms, false limpets, barnacles, sea urchins and mangrove snakes: the natural history of common but poorly understood marine fauna

Filling gaps of knowledge in the web of life

Effects of environmental disturbances e.g. water pollution, climate change

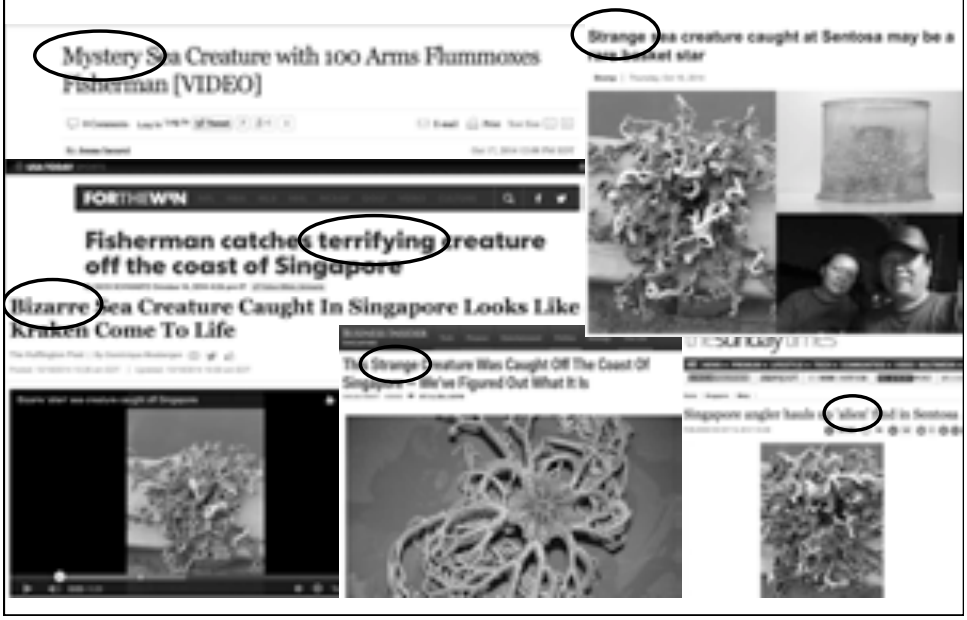
Habitat restoration, bioengineering etc.

Managing populations for conservation, aquaculture, anti-fouling etc.



Relationships between animals

What about the future?



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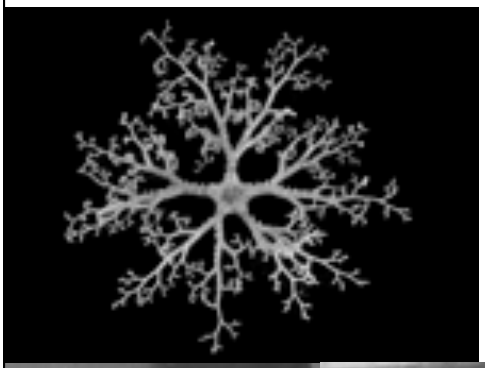
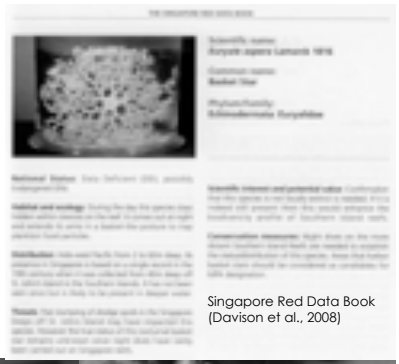
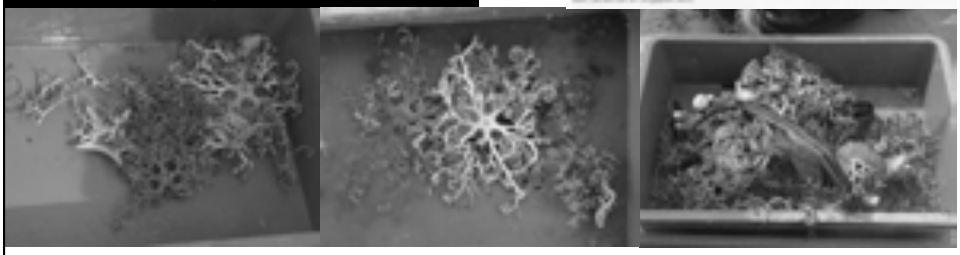




Singapore Red Data Book (Davison et al., 2008)



More than a hundred specimens found on rocky seabeds off Kusu Island at depths of more than 40 m.

Thank you