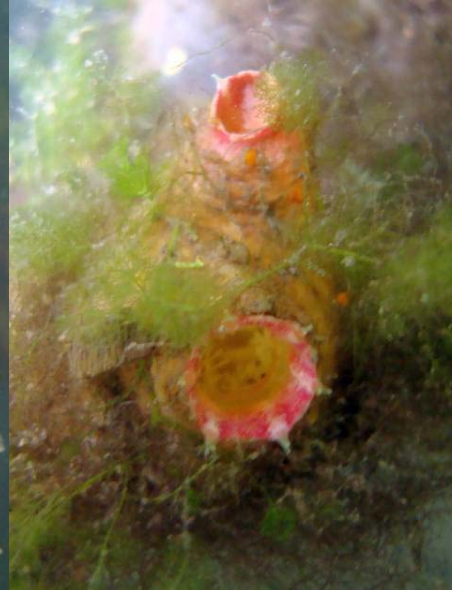


# Tunicates

by Rosana M. Rocha



Tunicates are known as sea squirts ...  
...because they  
circulate water  
inside.



When you take them out of the  
water they contract and squirt you!!



# Tunicates are diverse



There are 2,500 named species of tunicates, 140 of them live in the Caribbean.

There are around 60 species in the Bocas del Toro region.

Four newly discovered species from Bocas are now being described (two of them in these pictures).



# Tunicates are useful



Tunicates are cultivated and eaten in many countries including Japan, Korea, Chile and France.

# Tunicates help fight cancer

Because they do not have any external skeleton, tunicates use chemicals to protect themselves.

Some tunicate chemicals are proven to act against cancer cells. Others can kill bacteria and fungus resistant to antibiotics.



*Ecteinascidia turbinata*  
Photograph courtesy of PharmaMar  
<http://www.pharmamar.com>

The chemical Ecteinascidin ET743 from *Ecteinascidia turbinata*, has been shown to act against sarcomas.



# ... but they also cause trouble!



Some species are invasive and cause problems for aquaculture.



They grow on mussel and oyster shells, compete with them for space and increase the weight of the culture. Billions of dollars are wasted just cleaning the shells!

# Tunicates act like plants

photo by Arjan Gittenberger



Most tunicate species live permanently attached to a substrate.

Many tropical species have single-celled algae living as symbionts inside their tissues.



photo by Arjan Gittenberger

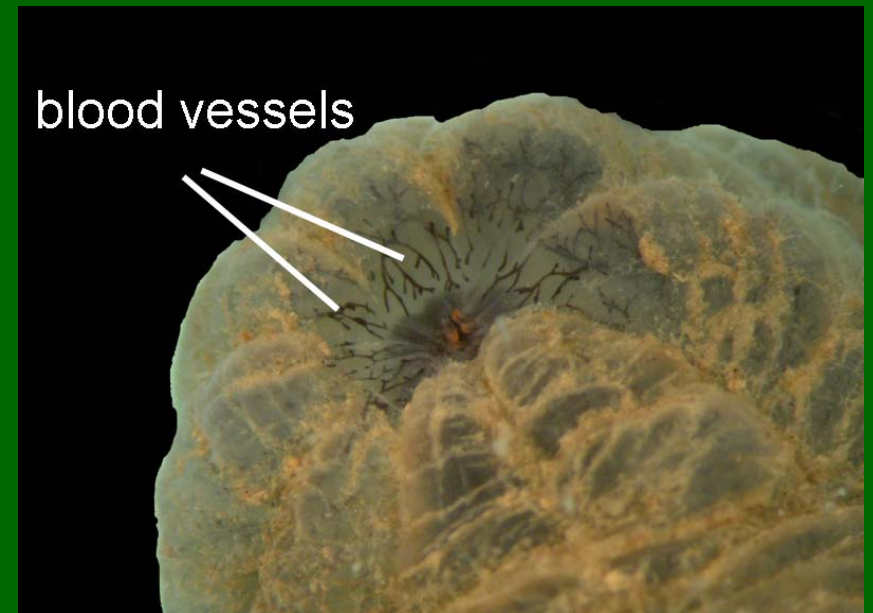
They are also like plants because they have cellulose fibers in the tunic tissue that covers their body.

# Other tunicate facts



heart

Tunicates are the only animals that reverse their blood circulation. Their heart is tubular and they have two pace-makers which take turns.



blood vessels

The tunic that cover their body is a living tissue with blood vessels. It is equivalent to our connective tissue underneath the skin. But they have it outside the skin!!





# We need more biologists studying tunicates...



Photos by Charles and Gretchen Lambert of the Tunicate course in 2006

... we are training them at the Bocas del Toro Research Station