

# National University of Singapore

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# Coral reef

- Coral reef is made from corals



<http://aqualog.doorblog.jp/archives/23016729.html>

<http://blog.goo.ne.jp/ryoyu50/e/cdd8a4f85bc2ffee19842b0e39dc3113>

# Corals get energy by the two ways

- Polyps catch plankton
- Zooxanthellae photosynthesize



Algae lives in the tissues  
of corals polyps.

Sun light is important for corals



# Coral reef is so important

- Coral reef provides spawning, nursery and feeding grounds

The Key of “Biodiversity”



# Coral reef is decreasing in Singapore



[http://www.toa-const.co.jp/works/overseas/overseas/2001\\_01.html](http://www.toa-const.co.jp/works/overseas/overseas/2001_01.html)

Because of reclamation,  
sediment is raised in the water



Sediment reduce visibility  
and cover corals



Coral die off

# How to protect coral reef

- Passive way(rely on power of corals)  
To increase protected area etc.
- Active way (add human power)

One of active way is...

**Coral transplantation**

# Coral transplantation

Collect corals from source

Transplant corals to other place



Afiq Rosli



From presentation of NUS (Loke Hai Xin)

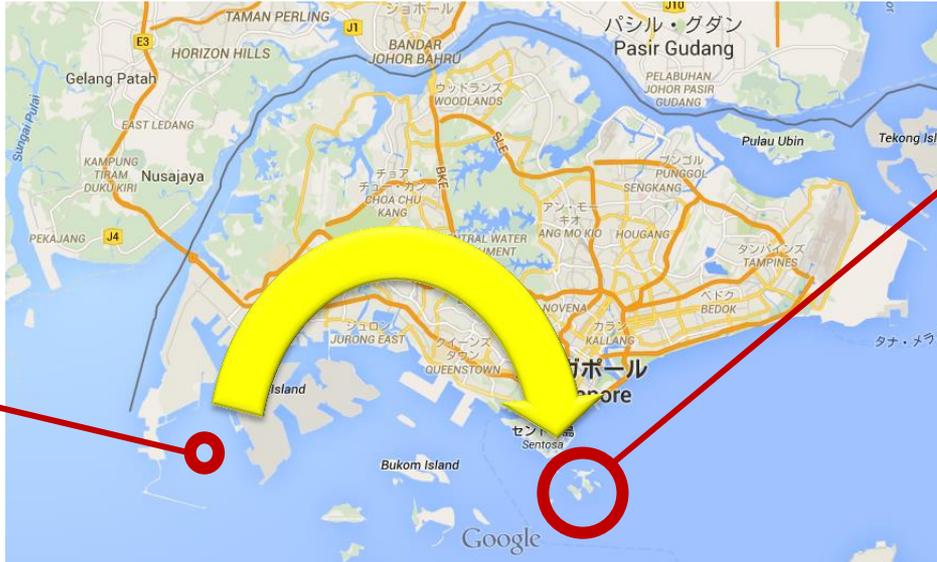
# Which species are more efficient for transplantation?

Find out higher growth and survivorship



Material and method of research

# Selected sites



Donor site  
Sultan  
Shoal

Recipient Sites  
(Coral Nursery Site)  
Lazarus

From Google map

<https://www.google.com.sg/maps/place/Sultan+Shoal+Lighthouse/@1.3510431,103.7958507,11z/data=!4m2!3m1!1s0x31da03ef5f149a49:0x9e79153fb0fab0f0>

# Coral species in research

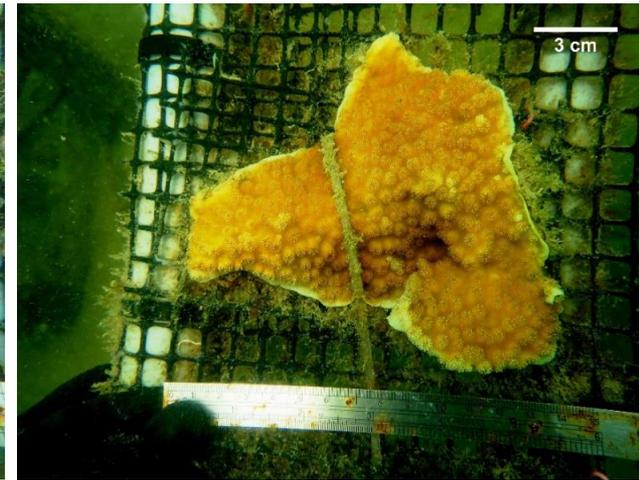
*Podabacia*



*Merulina*



*Echinopora*



From NUS presentation(Toh Tai Chong)

# Monitoring conducted

Coral Species	2014					2015
	August	September	October	November	December	February
<i>Podabacia sp.</i>	○	○	○	○	○	○
<i>Merulina sp.</i>	○	○	○	○	○	○
<i>Echinopora sp.</i>		○	○	○	○	○

\*Pictures of coral fragments are taken by volunteers

# Measurement of coral size



**ImageJ**  
Image Processing & Analysis in Java

Measurements of

1. Maximum length (cm)
2. Maximum width (cm)
3. Surface area (cm<sup>2</sup>)
4. Partial mortality (cm<sup>2</sup>)
5. Live Tissue Cover (%)

Use ImageJ

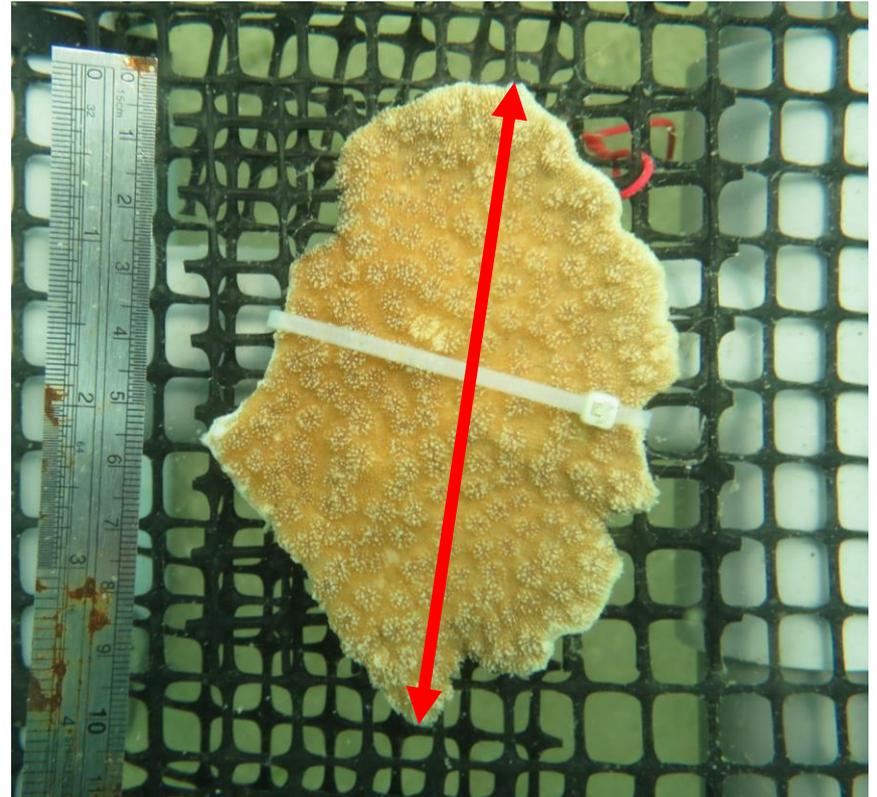
Each species has about 200 pictures(Poda:213 Meru:216 Echin:180)

The total number of pictures is 609



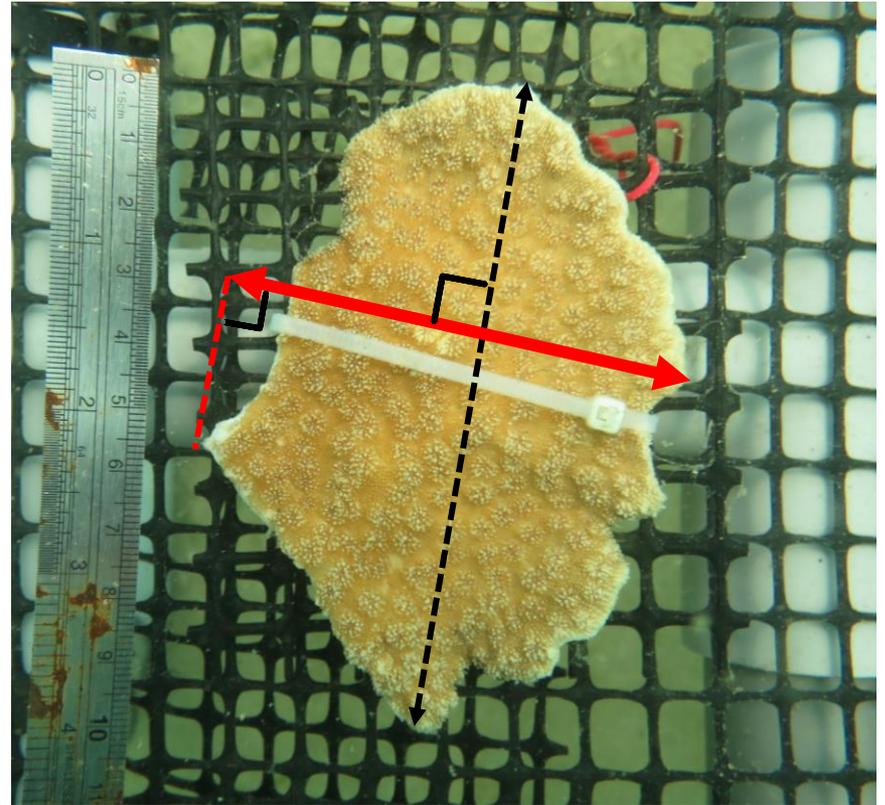
# Maximum length (cm)

- The longest diameter of the coral fragment



# Maximum width (cm)

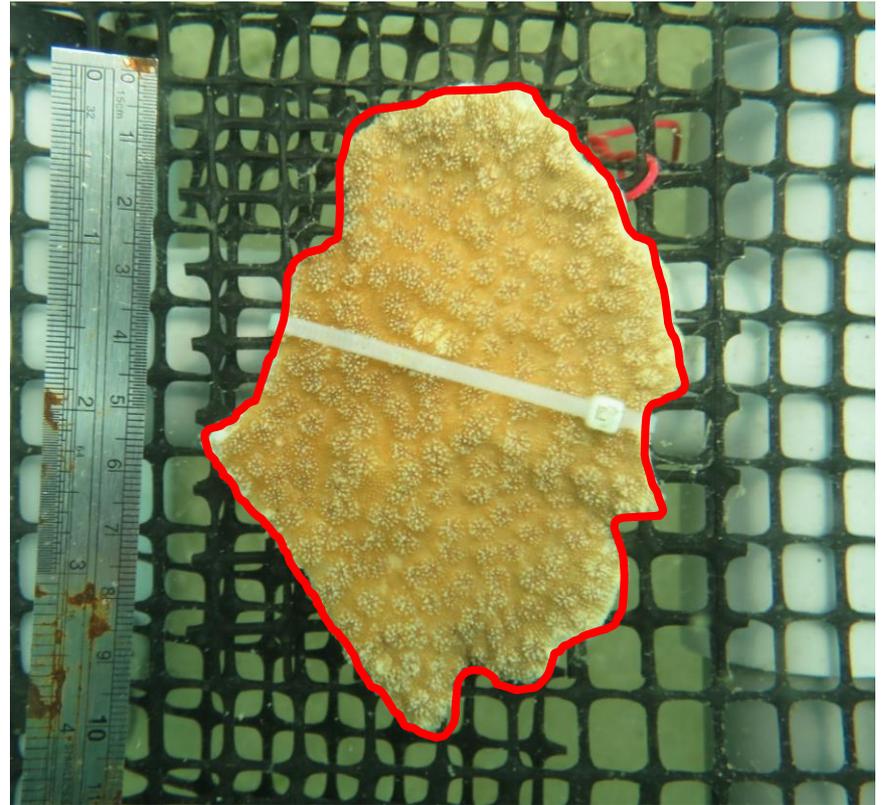
- The longest diameter across ( $90^\circ$ ) the maximum length



From presentation of NUS (Toh Tai Chong)

# Surface area (cm<sup>2</sup>)

- Manually draw a line around the coral fragment, using ImageJ



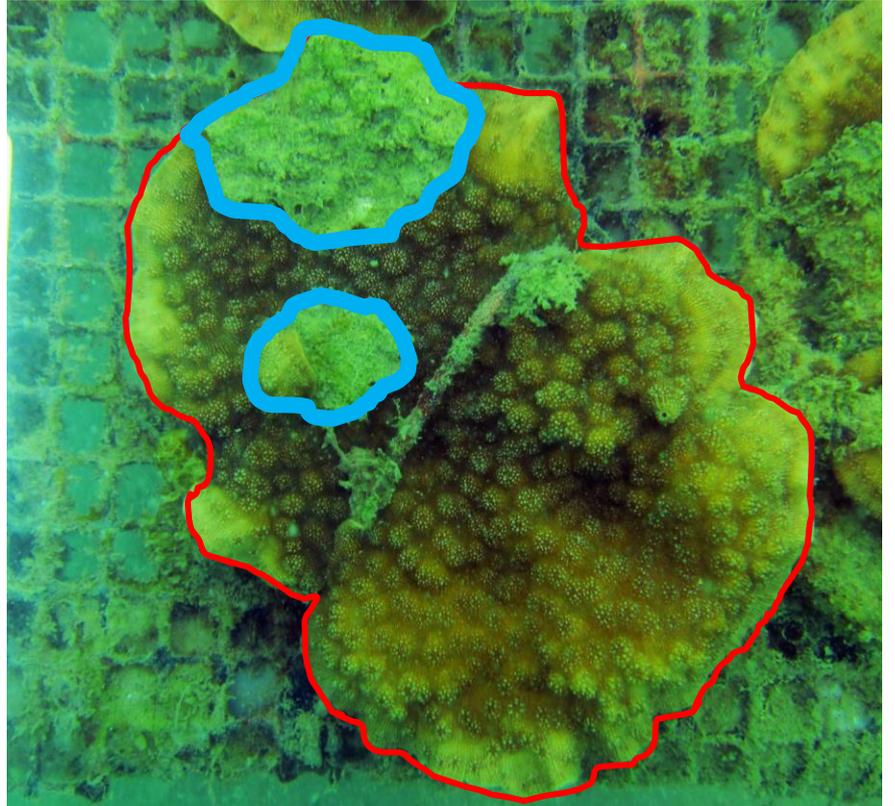
From presentation of NUS (Toh Tai Chong)

# Partial Mortality



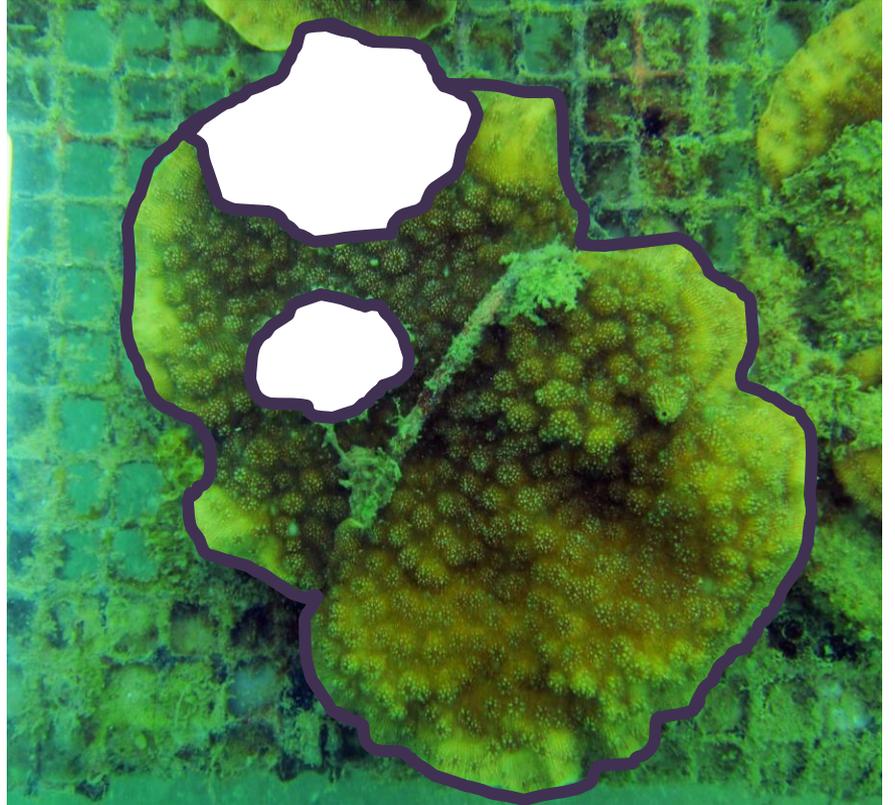
SA: Surface Area (cm<sup>2</sup>)

PM: Partial Mortality  
(cm<sup>2</sup>)



# Live Tissue Cover (%)

- =  $(SA - PM) / SA * 100$



# Methods

- Average length (cm)

Total maximum length/No. of fragments

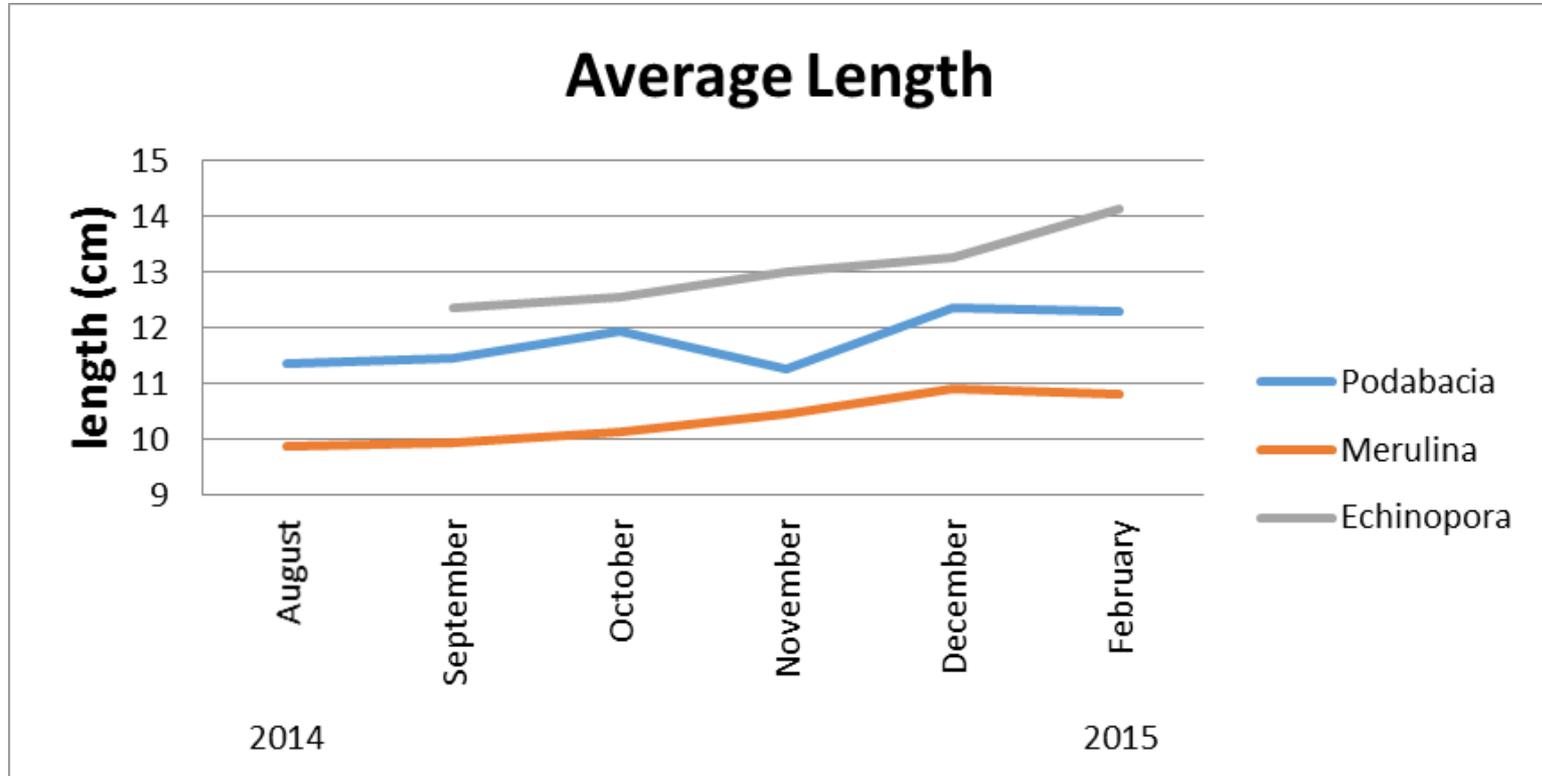
- Live tissue loss (%)

$100 - \text{Live tissue cover (\%)}$

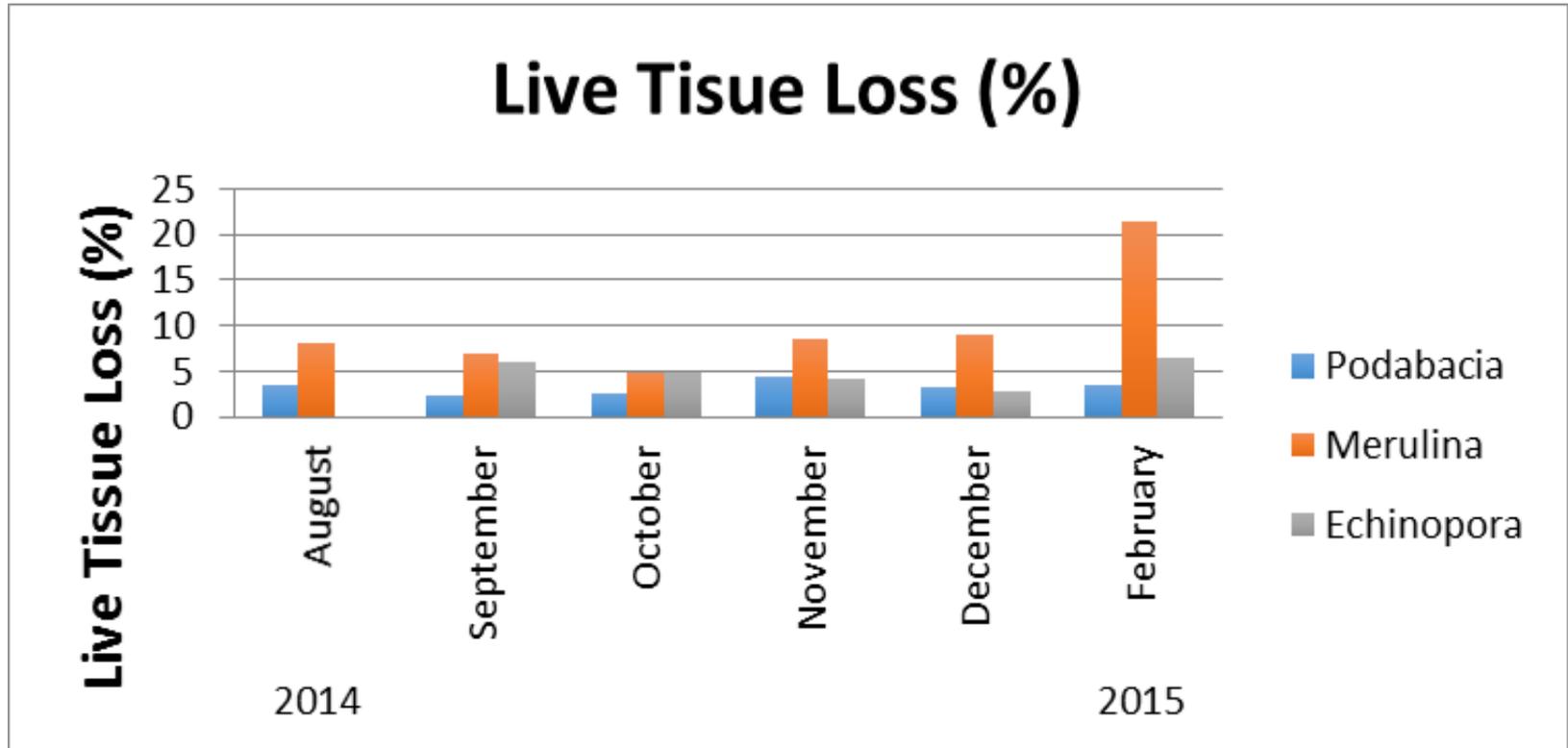
- Growth rate (cm)

$(\text{Average max. length in Last month} - \text{Average max. length in Initial month}) / \text{No. of months between Initial and Last months}$

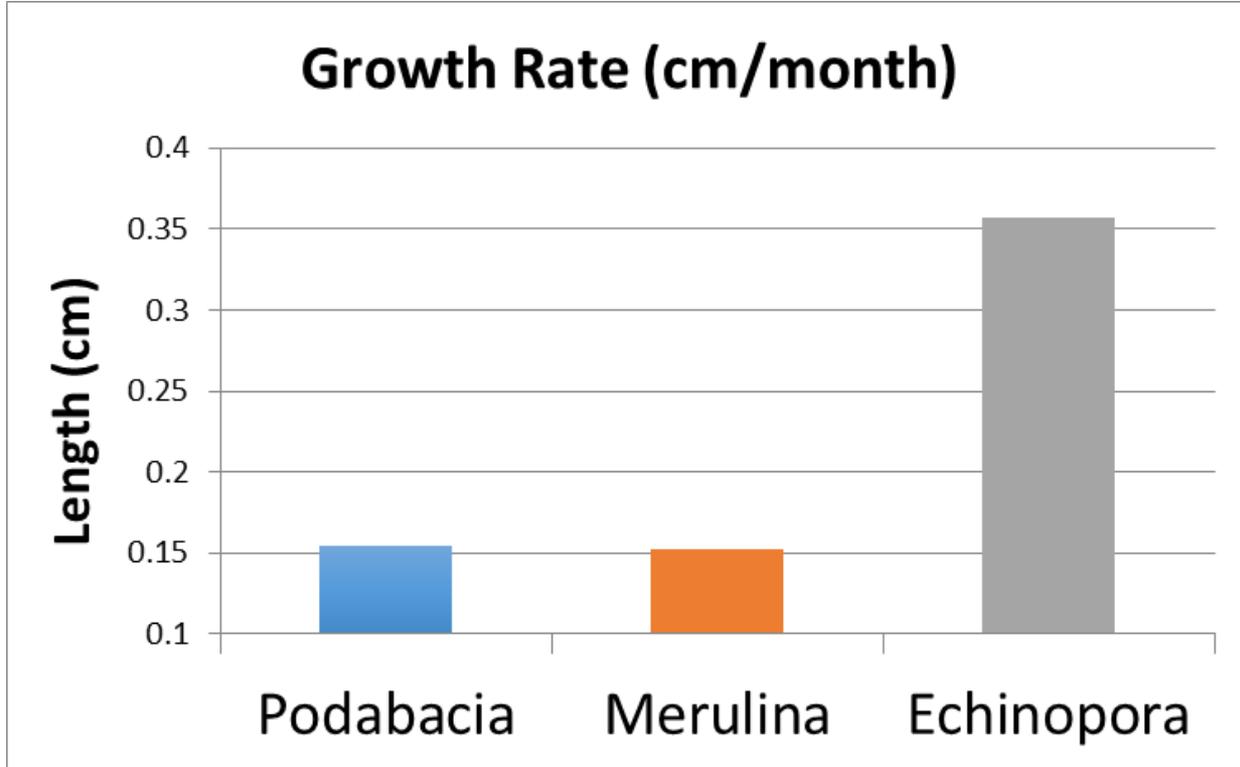
# Results



# Results



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# Results

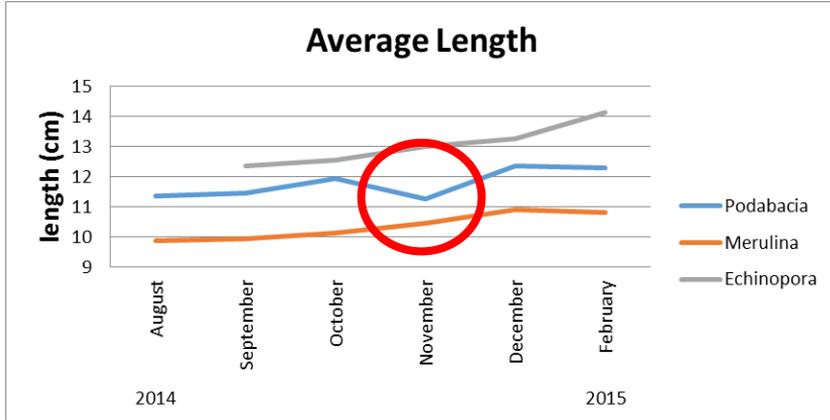
Echinopora suite to environment of Lazarus

Podabacia don't change in environment of Lazarus

Merulina can not suite environment of Lazarus

→Something happened during between  
December and February

# About decreasing of Podabacia



Decreased in really

or

Because of uncleanness of pictures taken by volunteers



# Next challenges

- Teaching volunteers how to take pictures
- Researching more about what happened between December and February

# Conclusion

- Echinopora is most sustainable out of 3 species in our research

High growth and low tissue loss

*Echinopora*



# Thank you for TMSI members



Especially Professor Chou Loke Ming Mr. Daisuke Taira

What we learned in Singapore

Chikako Bannai

Chiori Onoue

Takashi Mizuno

Yumi Kato

Shinji Matsuoka

Thank You