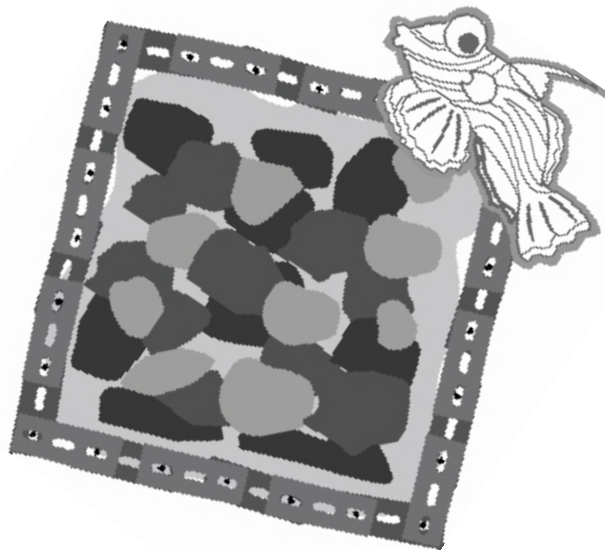




critters@lembah

HOUSE REEF LAVA ROCK HABITAT

HOBATA PROJECT



Lembah Resort Environmental Volunteer Program

Lembah . North Sulawesi . Indonesia

04 Dec 2011 – 05 Jan 2012

SuSan Stephanie

ACKNOWLEDGMENT



My sincere thank you for everyone in Critters@Lembah and Lembah Resort, whom without them this project would not have been possible.

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Nonetheless, I would like to thank you also to Guillermo 'Gizmo' and Helen Gomez and also all Lembah Resort staff for the warm welcome during my stay here. *Haturnuhun pisan ka sadayana jo* for being my new family and for giving me one of the best 4 weeks I have in the end of year 2011.

BACKGROUND

Lembah Resort, located on Lembah Island side, adjacent to Bitung city which also known as one of Indonesia's future international port hub¹.

In this very busy boat traffic condition, many of the areas along the 12 km Straits of Lembah suffered from human actions such as anchoring and fishing. Not mentioning the natural impact like storm, coral bleaching and heavy garbage run off from area surrounding².

Initiated first in 2003 and under the new management of Critters@Lembah (C@L) since 2007, Lembah Resort keep continue on doing a restoration project to rehabilitate and adding aesthetic value to the House Reef in front of the resort.

A total of 10 different methods of habitat (adding structures to the house reef area) has been installed in the House Reef. The last habitat installed was between the periods of August – September 2011 when 3 volunteers working at C@L initiated Lava Rock Project and installed 5 new artificial reef habitats named Volcano Alleys³.

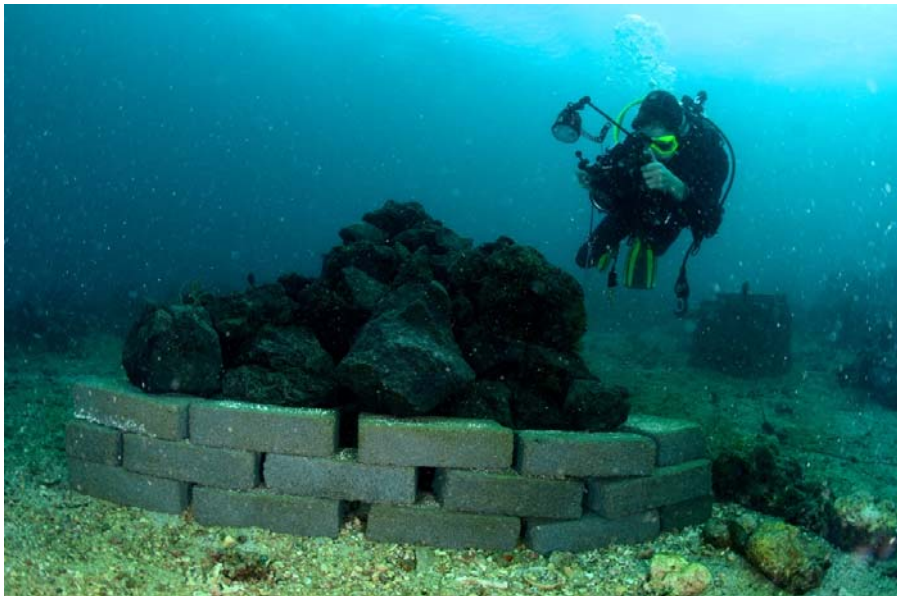


figure1
Volcano Alley habitat

¹ Kuala Tanjung and Bitung to Become International Hub Ports.
http://emu.co.id/news_daily_detail.php?id=2042, 27 October 2011.

² Catherine 'Dimpy' Jacobs

³ Smith, Hugh, Lisa and Parker. Lembah House Reef Lava Rock Project – Volcano Alley, August-September 2011.

ACTIVITY PROJECT

Inspired from the success of Volcano Alley project, 6 new habitats planned to be installed in 2 different dive site areas:

1. Pintu Colada 2

Dive site located only 3 minutes boat ride from Lembeh Resort and currently become very famous for dawn dive to see mating Mandarin Fish. The increasing number of divers come every day to this dive site has given some impact to the site condition itself.

To reduce the stress burden of the marine life here, especially the mandarin fish, 5 new habitats installed in spread location near the main mandarin dive site. In the future, these habitats will hopefully attract corals, marine life, and eventually can be an alternative home for the mandarin fish.

2. House Reef

Located exactly in front of Lembeh Resort area, this site definitely has a lot to offer. The entire previous artificial habitats, with the exception of Reef Builder Block habitats¹, were installed here spread in various location, but relatively close to one another.

In 2006, some of the left over batako (precast concrete bricks) from Fish House project has been collected and put together in one of the area here. Looking at the positive result of this 'unexpected' habitat after a period of time, which has attract marine life such as branching coral, bubble coral, crinoid, damsel fish, scorpion fish and many others, gave an idea to actually add a frame structure surround this pile of batako bricks habitat.



figure 2
sponge, brain and folioid coral on lava rock at House Reef

¹ Between May – June 2011, several reef builder block habitats were installed at Pintu Colada 2 dive site.

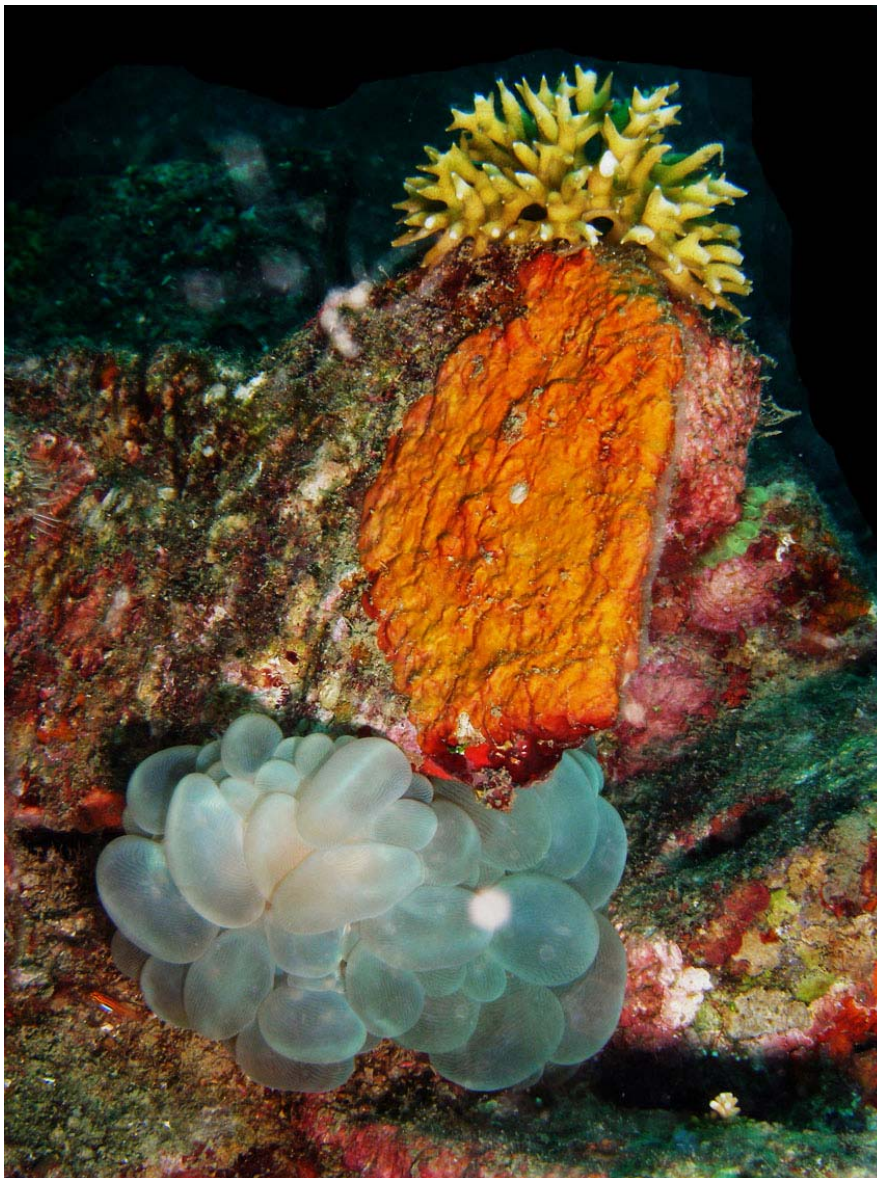


figure 3

branching coral and bubble coral on lava rock at House Reef

HABITAT DESIGN

As this was the second attempt to install artificial habitat outside House Reef, which relatively difficult to maintain or observe periodically, a modified structure of Volcano Alley created for this project, named Hobata (Hollow Batako Habitat).

Instead of creating rectangular frames using normal batako pieces sized cm x cm x cm stacked together, an alternative hollow batako bricks sized 40cm L x 10cm W x 20cm H used for this project. An additional 8mm rebar, with 60cm length per unit, anchored to the sea floor in between some of the hollow batako, making the structure more stable.

A total of 24 pieces of batako and 24 pieces of rebar unit needed to build 1 complete structure of Hobata, with approximately total size of 1.65m x 1.65m.

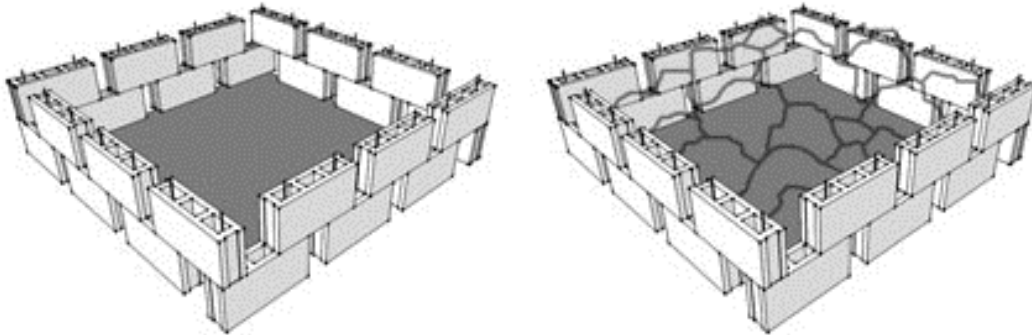


figure 4

schematic drawing of modified-Volcano Alley structure, which later to be filled with lava rock inside

Drilling works need to be done creating 2 holes on every hollow batako brick. Later on construction phase, the rebar will be anchor to the sea floor through the hole.



figure 5

image on the left showing the front & back view of original condition of hollow batako brick
image on the right showing a hollow batako brick which has been drilled



figure 6

drilling works process

CONSTRUCTION

Adapted from previous Volcano Alley construction methods¹, Hobata construction divided into 4 phases of works:

1. preparation of rebar and hollow batako materials
2. site selection and markings
3. delivery of lava rock substrate and batako to site
4. habitat assembly.

Daily Work Schedule

No.	Wednesday 14 Dec 2011	Thursday 15 Dec 2011	Friday 16 Dec 2011	Tuesday 20 Dec 2011	Wednesday 21 Dec 2011
1	rebar cutting works at Lembeh Resort (Yance)	130 pieces of batako delivered to Tanduk Rusa (P. Ronny)	buoys installations at Pintu Colada 2 (Dimpy and Susan)	25 pieces of batako picked up from Tanduk Rusa to Lembeh Resort (Andri)	rebar cutting works at Lembeh Resort (Yance)
2		drilling works for batako holes at Tanduk Rusa (Ronald and Yance)	deploying batako at every marker buoy location at Pintu Colada 2 (Abner, Ramly, Opo, Dimpy and Susan)	drilling works for batako holes at Lembeh Resort (Yance)	buoys installations at House Reef (Dimpy and Susan)
3		lava rocks transported from Kasowari to Pintu Colada 2 and House Reef (P.Yoko, Abner and Ramly)	underwater construction works of 5 Lava Rock Habitats at Pintu Colada 2 (Abner, Ramly, Opo, Dimpy and Susan)		deploying batako at marker buoy location at House Reef (Abner, Ramly, Opo, Dimpy and Susan)
4		buoys installations at Pintu Colada 2 and House Reef (Dimpy and Susan)			underwater construction works of 1 Lava Rock Habitat at House Reef (Ramly, Dimpy and Susan)
5		deploying lava rocks at every marker buoy location (Abner, Ramly, Dimpy and Susan)			
6		batako pick up from Tanduk Rusa to Lembeh Resort (P.Yoko, Abner, Ramly)			

¹ Smith, Hugh, Lisa and Parker. Lembeh House Reef Lava Rock Project – Volcano Alley, August-September 2011.

Material Cost

No.	Item	Amount	Price Per Item (IDR)	Total Price (IDR)
1	Batako (Tanduk Rusa)	150	3,500	525,000
2	Batako transport (Tanduk Rusa to Pintu Colada 2)	1	200,000	200,000
3	1 boat of Lava Rock	1	450,000	450,000
4	Lava Rock transport (Kasowari to Pintu Colada 2)	1	500,000	500,000
5	12mm Rebar	9	37,000	333,000
6	Marking Buoy	1	25,000	25,000
7	Gloves	4	4,000	16,000
8	Gloves	5	5,000	25,000
9	Gloves	1	6,000	6,000
10	Rope	1	37,000	37,000
11	Miscellaneous	1	50,000	50,000
TOTAL (IDR)				2,167,000

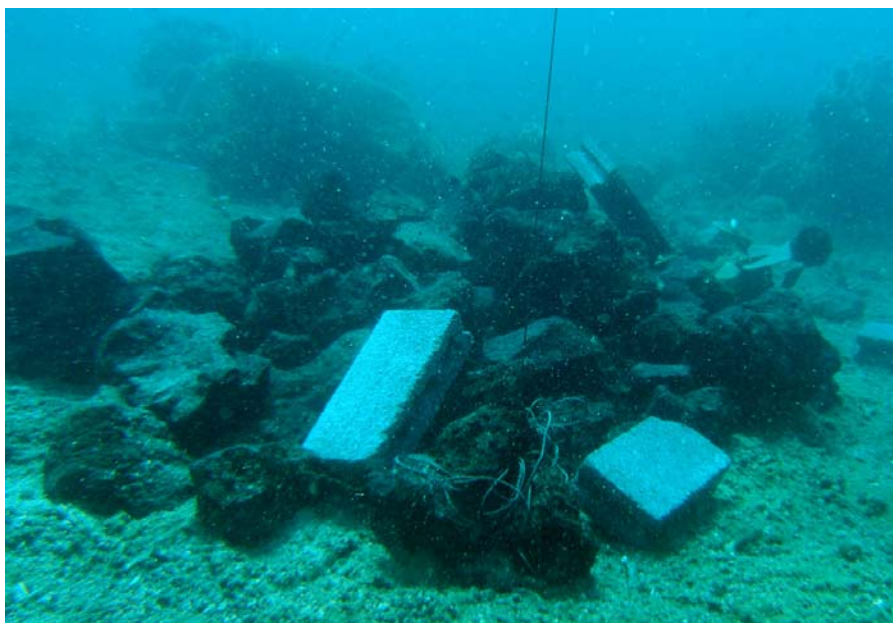


figure 7

lava rock and hollow batako materials, after being deployed on a certain buoy location



figure 8

installation work of Hobata frame structure

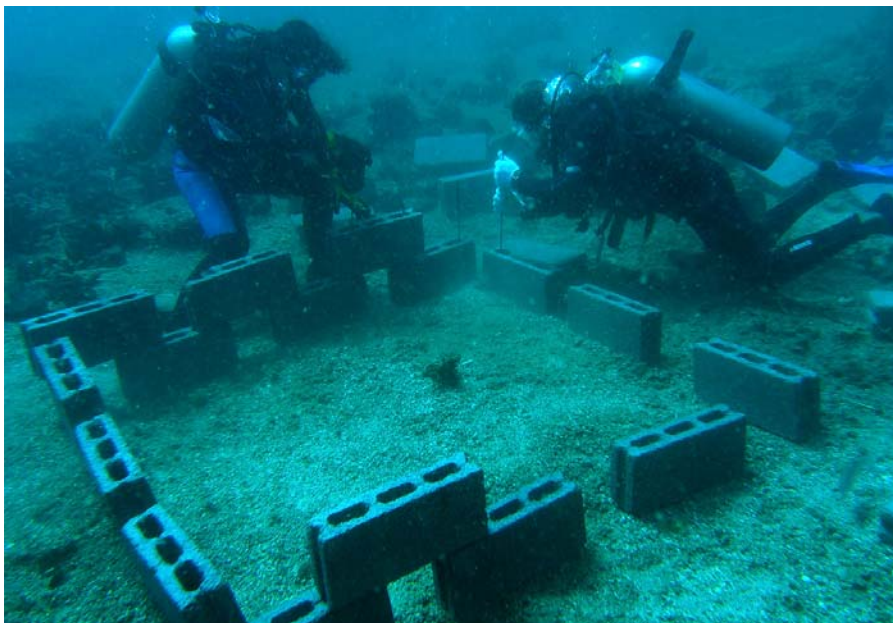


figure 9
process of completing Hobata frame structure

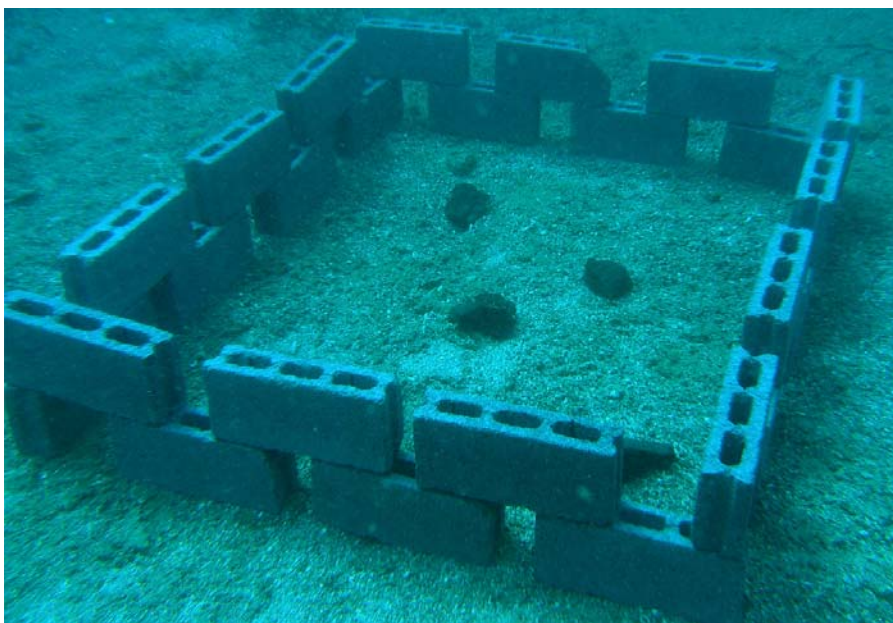


figure 10
a complete Hobata frame structure, ready to fill in with lava rocks

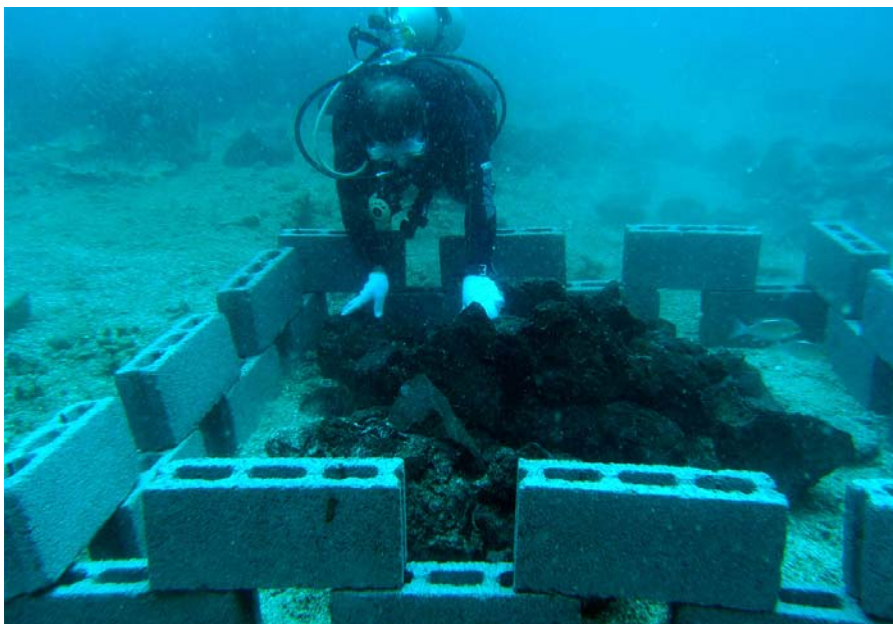


figure 11

process of filling-in Hobata frame structure with lava rock

OBSERVATION

1st week after installation



figure 13

lava rock covered by detritus



figure 14
coral polyp attached to lava rock material

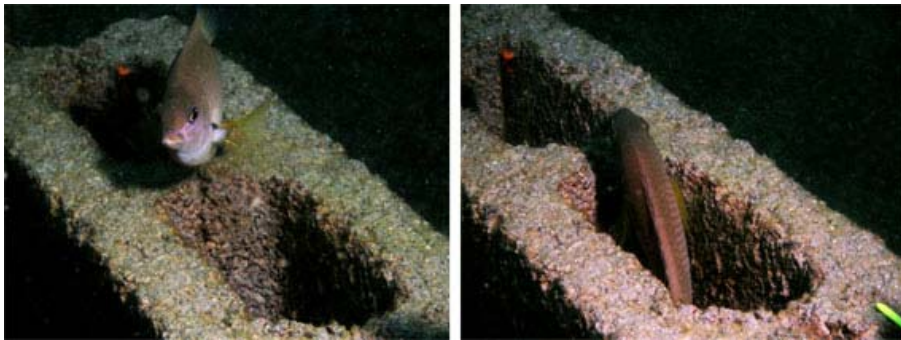


figure 14
damselfish hiding on some of the hollow area of batako bricks

2nd week after installation



figure 14
a survey dive to install numbering tag for each habitats at Pintu Colada 2
number 1 marked the closest habitat to mandarin fish dive site area

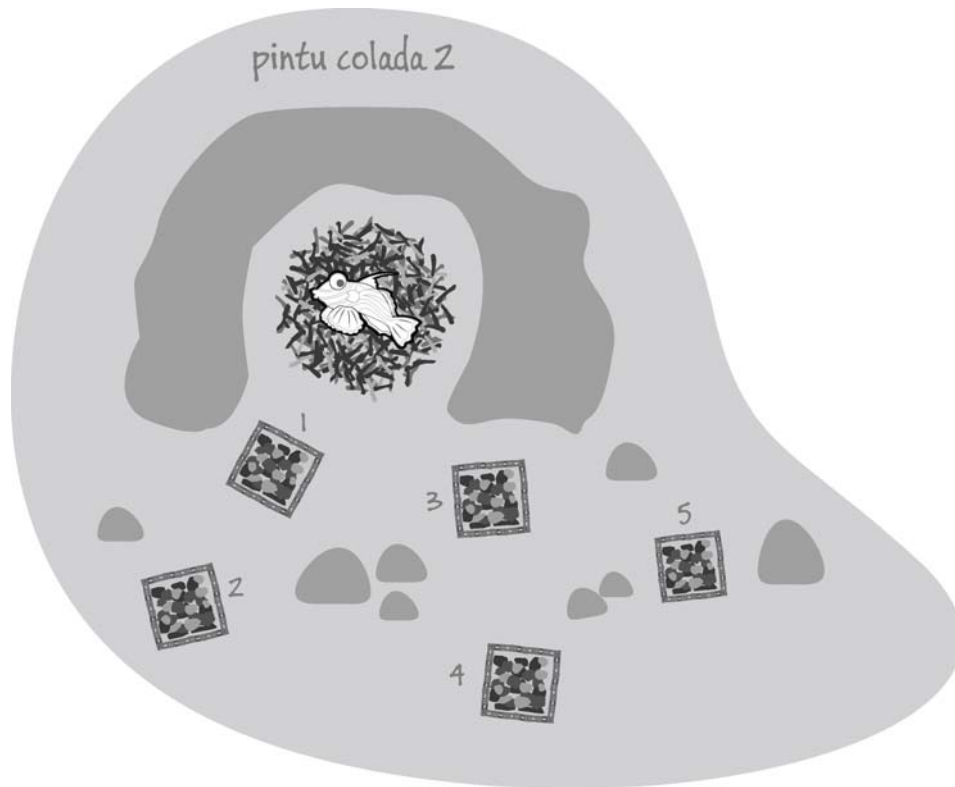


figure 15

schematic map of 5 numbers of Hobata in Pintu Colada 2

ARTIFICIAL REEF HABITAT UPDATES

Below listed 11 different types of artificial reef habitats installed between periods of 2003 – 2011:

Structure	Date of Installations	Primary Goal
Reef Balls	May 2003	Biodiversity habitat
Fish Houses	April – June 2003	Biodiversity habitat
Biorock	December 2007	Coral/Sponge re-colonization
Fish Houses	January 2006 – June 2007	Biodiversity habitat
Wreck	December 2007	Biodiversity habitat
Fish Net	July 2009	Biodiversity habitat
Concrete Blocks	October 2009	Biodiversity habitat
Drum Ladder	July 2010	Biodiversity habitat
Reef Building Blocks	May – June 2011	Marine research habitat
Bottle City	July 2011	Cephalopod habitat
Volcano Alley	August – September 2011	Biodiversity habitat
Hobata	December 2011	Mandarin fish / Biodiversity habitat

FUTURE RECOMMENDATION

A measured underwater map will be good to marked the habitats in Pintu Colada 2 dive site, also a routine observation to monitor these habitats and give input to improve the systems, increasing the possibilities to replicate the systems in other different area.