RTA Weipa Pty Ltd

Amrun Project Marine Pest Monitoring Report

August 2018

Rio Tinto

A report prepared in accordance with requirements of the Amrun Project EPBC Act Approval 2010/5642, Construction Marine and Shipping Management Plan and Port Dredge Management Plan.

DOCUMENT CONTROL

Document number: CAL.01-0000-HH-PLN-00028

Version	Purpose	Approval	Submission	Date
1.0	Publication on Amrun Website	Amrun Project Environmental Specialist	Not Applicable	10/08/2018

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1 INTRODUCTION

The Amrun Project (formerly South of Embley Project) involves the construction and operation of a new Port facility (Port of Amrun) located between Boyd Point and Pera Head. The marine works include construction of a jetty, wharf and ship loaders. A detailed description of the Project is provided in the Queensland EIS (RTA 2011), the Queensland SEIS (RTA 2012), and the Commonwealth Environmental Impact Statement (RTA 2013). Construction of the marine aspects of the Port commenced in May 2017.

It has been identified that vessels that may have visited ports of concern have the potential to translocate marine pests. Should a marine pest be introduced to local marine waters, an increase in artificial structure at the Port has the potential to provide suitable habitat for marine pests to become established.

Marine pests are marine biota that are translocated into waters outside their natural geographic range and subsequently settle, survive and spread. Translocation and survival of these species in new areas can cause irreversible impacts to the local ecosystem by competing with and/or predating on native species, as well as introducing disease. The consequences can include a combination of environmental, social and economic impacts.

This report presents the monitoring methods and results of marine pest monitoring conducted in accordance with management plans approved under the South of Embley Bauxite Mine and Port *Environmental Protection and Biodiversity Conservation Act* approval (EPBC2010/5642). This report presents monitoring and analysis conducted during the second annual reporting period (May 2017 and May 2018). The report also presents the monitoring and analysis conducted after the end of the reporting period (to end of July 2018) in response to the identification of an Asian green mussel (AGM) specimen at one of the monitoring locations. The requirement for monitoring is outlined in the Construction Marine Shipping Management Plan and Port Capital and Dredge Management Plans.

1.1. Marine Pests of Concern

Marine pest monitoring at the Port of Amrun targets seven species[1] (Table 1) with two mussels a high priority. These species were chosen based on their abiotic and habitat preferences making them likely to survive and establish in the Port area.

[1] *D Didemnum spp*. (exotic invasive species only) was removed from the project list in mid 2017 after advice that it was not included on the marine pest sectorial committee national significance list and is likely to be found around Australia with no control in place.

Table 1 Marine pests of concern targeted by settlement plate monitoring program

Species	Common Name	Notes
Hydroides dianthus	Tubeworm	
Mytilopsis sallei	Black-striped mussel	High Priority
Perna viridis	Asian green mussel	High Priority
Codium fragile spp. fragile	Green macroalga	
Crassostrea gigas	Pacific oyster	
Crepidula fornicata	American slipper limpet	
Amphibalanus eburneus	Ivory Barnacle	

Of the highest risk to the project is the AGM which is classified as a restricted invasive species in Queensland. AGM are a high risk species with a history of invasiveness when introduced outside its native range. They form dense populations (up to 35,000 individuals per square metre) on a variety of structures including vessels, wharves, buoys and other hard substrates. The species is known to out-compete native species and foul hard surfaces.

1.2. Previous Marine Pest Monitoring (1999 to May 2017)

A historical marine pests study at the Port of Weipa was completed in October 1999 by the CRC Reef Research Centre and James Cook University (Hoedt *et al.,* 2001). No marine pests were detected during this survey. Larval settlement plates have been used to monitor marine pests at the Port of Weipa since 2000. The plates target the black striped mussel since its detection at the Port of Darwin in 1999 and 2000, as well as the AGM since its detection in Cairns in 2006. NQBP currently manages the Port of Weipa and carries out maintenance dredging and spoil disposal at the existing Albatross Bay spoil ground. No incursions of marine pests have been recorded at the Port of Weipa using settlement monitoring plates (NQBP, pers comms).

Prior to capital dredging for development of the Port of Amrun site, a baseline marine pest survey was completed at the Port of Weipa and at the Port of Amrun areas from 16 to 21 December 2015 (Biofouling Solutions, 2016). The objective of the survey was to identify the presence of any established marine pest populations listed on the National Monitoring Strategy Target Species List (NMTSL). No marine pests on the restricted NMTSL were detected in the Weipa Port area or the Port of Amrun area during the 2015 baseline survey.

In February 2016, a marine pest settlement plate monitoring program was implemented in the vicinity of Amrun Port (Biofouling Solutions, 2017). The settlement plates were used to target eight marine pests, including two high priority mussels. Monitoring has been conducted quarterly at four sampling locations situated approximately 150 m north and south of the designated jetty alignment, in Boyd Bay and northwest of Pera Head (**Figure 1**). A summary of the 2016 monitoring activities can be found in the first annual report (RTA 2017).

http://www.riotinto.com/documents/Amrun_marine_pest_settlement_plate_monitoring_program_2016-17.pdf

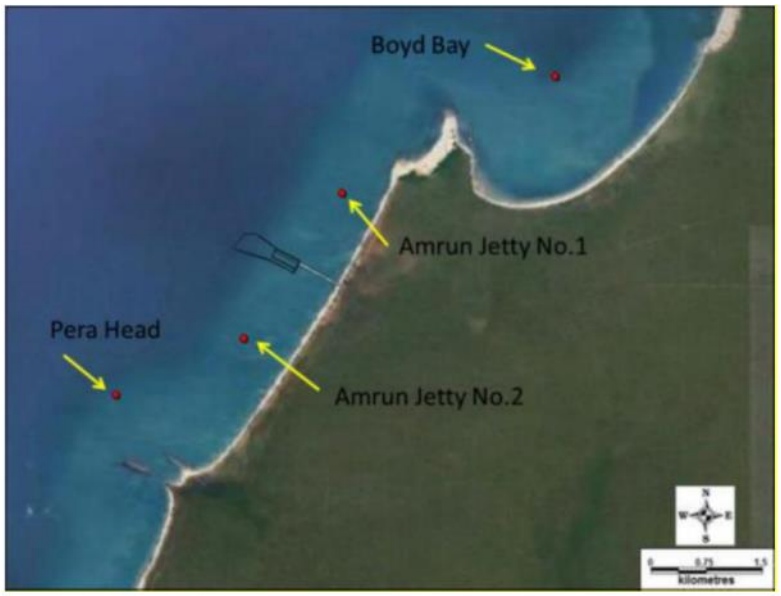


Figure 1 Marine Pest Settlement Plate Monitoring Locations

2 METHOD

2.1. Marine pest settlement plate monitoring

Monitoring was conducted at four sampling locations during the reporting period (**Table 2; Figure 1)** with locations approximately 150m north and south of the designated jetty alignment, a location in Boyd Bay and north-west of Pera Head.

Table 2 Marine pest settlement plate monitoring locations

Location	Coordinates
Pera Head (PH)	S12° 56.577' E141° 35.674'
Amrun Jetty No 1. (AJ1)	S12° 55.129' E141° 37.354'
Amrun Jetty No 2 (AJ2)	S12° 56.173' E141° 36.626'
Boyd Bay (BB)	S12° 54.283' E141° 38.938'

The mooring and settlement array is shown in **Figure 2**. It consists of:

- Mooring consists of a 50kg anchor and heavy base chain section (20mm) connected to a lighter chain (13mm) attached to a large surface buoy.
- Settlement array (**Figure 2**)
    - consists of two stainless steel open frame cubes

- Shackles fix the arrays at water depths of 2 and 5m
- A central ring is mounted at the top and bottom of each cube with the mooring chain running through the central pair of rings so the chain cannot dislodge the plates or rope collectors
- Each frame has four settlement plates (one on each vertical face; 250 x 250mm). Settlement plates are 4.5 mm black acrylic which has been sanded both sides and attached by cable ties
- Each array has two spat ropes, which are frayed ropes cut into 10cm long sections and attached via cable ties

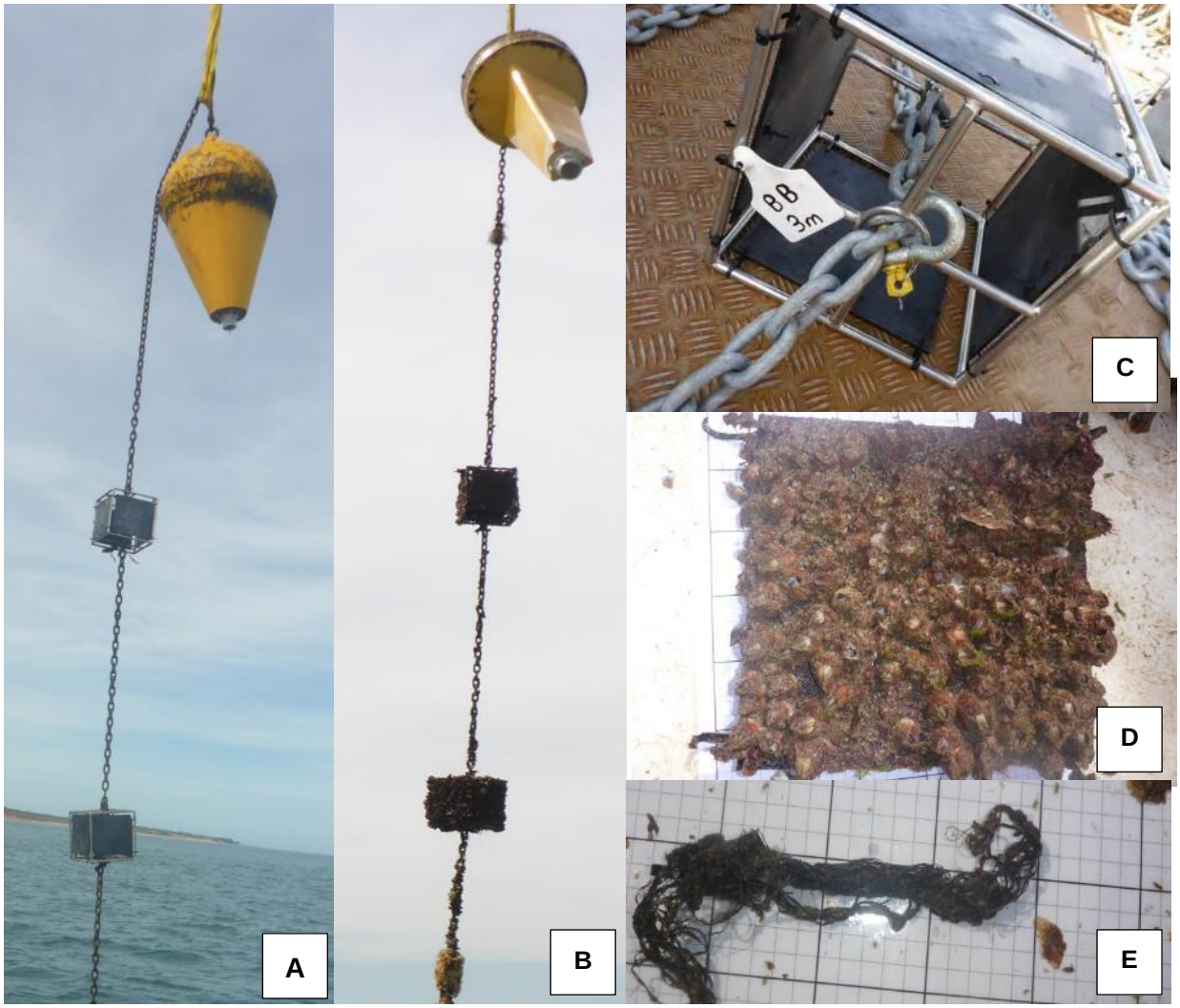


Figure 2 Images of settlement array including mooring arrangement (A and B), settlement array (C), biofouled plates (D) and spat rope (E).

The collection and change out process follows the below procedure:

1. At each location the mooring and arrays (to 5m) are removed from the water and inspected by an experienced and trained person to identify if any marine pests of concern are present

2. Each section of the mooring and arrays are photographed while connected and the composition of biofouling assemblages is recorded.

3. The settlement plates and ropes are disconnected and each are photographed identifying the depth and surface (inside outside of the plate) on a scale bar mat.

4. Any suspected marine pests are carefully removed and photographed to determine species. Samples collected are then preserved and sent for identification.

5. Plates and ropes are replaced using appropriate cable ties and the assemblage is returned to the water.

2.2. Beach wrack surveys

Visual surveys for AGM were made along beach shores and accessible intertidal rocky reef areas. Suspected shells were collected and provided to marine biologist for identification. Areas explored were limited to Boyd Bay to Pera Head.

2.3. Diver visual search and collection

An underwater visual survey was completed bv Bhagwan Marine divers for a random selection of the Amrun wharf jacket pylons. A total of twenty pylons were inspected between 29 May and 06 June 2018.

Prior to completing the pylon inspection divers underwent AGM survey training with a marine biologist which included:

- What are AGM
- Diver technique
- Other local species (horse mussel, pelican oyster (winged oyster), bastard shell (fake pearl clam)
- How to collect sample
- Preservation of sample

A sweeping assessment of the pylons was completed targeting those accessible surfaces on ascent or descent. An assessment of the level of biofouling and composition was recorded with divers targeting bivalves, unusual species or areas of advanced biofouling. Communication between divers and the dive supervisor was maintained with secondary observations for anything unusual.

When divers identified anything of interest the specimen was further investigated which included removal from the pylon or touch and movement under water. When the diver could clearly identify the species as a native, a sample was not collected (eg 'winged' oyster).

Divers also collected a sample of material from each pylon of approximately 20cm x 20cm between 3-5 m depth. Collected samples were frozen and delivered to Boating and Fisheries Weipa for transport to an independent laboratory to undertake molecular analysis.

Videos were recorded on the diver's helmet camera to allow secondary analysis of videos by trained marine pest experts. A summary of the review by the marine biologist and associated images are presented in **Section 3.3**. Videos were also supplied to Biosecurity Queensland for their own analysis

3 RESULTS AND CONCLUSIONS

3.1. Settlement plate monitoring

Settlement plate monitoring has been completed throughout the reporting period (**Table 3**). Biofouling on plates appears to undergo seasonal changes with a reduction in biofouling from August to December. One individual marine pest specimen was recorded during the reporting period.

Table 3 Settlement plate monitoring summary of events

Date	Survey type	Pests identified
23 May 2017	Inspection and change out	1 AGM identified at AJ2 5m
21 August 2017	Inspection and change out	No pests identified
5 December 2017	Inspection and change out	No pests identified. Corrosion of the chain was recorded at each station as part of the maintenance
20 March 2018	Inspection, change out and maintenance of mooring and array equipment at PH	No pests identified, issues with chain erosion and equipment prevented lifting of other locations and monitoring at AJ1, AJ2 and BB was missed for this event
March	Cyclone	NOTE
11 May 2018	Inspection, change out and maintenance of mooring and array equipment at BB, AJ1 and AJ2	No pest identified

28 May 2018	Inspection and change out at PH	No pests identified

One individual specimen of an AGM (*P. viridis*) was found during the May 2017 settlement plate monitoring event at the Amrun Jetty No. 2. As per the *Biosecurity Act 2014*, Act RTA notified the DAF. The specimen was confirmed as AGM by the Curator of Molluscs at the Museum and Art Gallery of the Northern Territory. Information about the specimen includes:

1 Asian green mussel Perna viridis (family Mytilidae), 1 individual measuring 28.08 mm shell length. It is male, and sexually mature to the point of being close to spawning.

RTA have worked closely with DAF to assist with the investigation to potentially identify the causal vessel or and with the investigation and surveillance to delimit the area of the incursion. Since identification of *P. Viridis,* surveillance methods including beach walks, ROV, infrastructure inspections, vessel inspections, plankton tows and continuation of settlement plate monitoring have been implemented, with no additional marine pest specimens identified in the area (as of June 2018). Further information on the results of AGM specific monitoring implemented by RTA are outlined in **Section 3.2** to **Section 3.4**. No other marine pests were identified during any other settlement monitoring event.

Settlement plate monitoring for the March 2018 event also included minor equipment maintenance. When lifting the PH settlement plate mooring and assessing the chain and shackles it was noted the entire system was degraded with the arrays falling to the seabed. All chain and shackles were required to be changed out due to the quick degradation of the system and limited maintenance equipment. A decision was made not to inspect the remaining arrays as further maintenance materials were required and attempts to retrieve the remaining arrays for inspection may have resulted in a loss of one or more arrays to the seabed given the state of corrosion along the chain and shackles.

Tropical Cyclone Nora passed through in late March (23-25 March 2018). This impacted the projects ability to source maintenance materials with barges significantly delayed with priority given to medical and food supplies. On receival and check of maintenance materials monitoring was scheduled for the first available opportunity when personnel where available.

The May settlement plate monitoring event settlement plates from the arrays were unable to be retrieved with these lost in the cyclone. The arrays themselves remained in place with biofouling growth present. This was inspected for marine pests with none recorded. Additionally due to the high loss of plates during poor weather new methods for attachment are being trialled.

Representative images from each sampling event are presented in Appendix A.

3.2. Beach wrack surveys

After identification of a single AGM the RTA Land and Sea Management Team and marine scientist have completed dedicated beach wrack surveys and incorporating these as part of turtle and zone inspections (**Figure 3**). Those surveys which incorporated a marine pest specialist are summarised in **Table 4**.

Beach accumulation

Images of intertidal areas investigated

Figure 3 Images collected from wrack survey (top is accumulation of shells and rubbish), bottom is headlands investigated. No AGM were detected

Table 4 Records of Beach wrack surveys events with marine scientist present

Date	Area	Activity
27/05/2017	Boyd Bay – Pera Head	Turtle and beach wrack survey
28/05/2017	Boyd Bay – Pera Head	Turtle and beach wrack survey
09/06/2017	Boyd Bay – Pera Head	Turtle and beach wrack survey
19/06/2017	Boyd Bay – Pera Head	Turtle and beach wrack survey

Date	Area	Activity
23/06/2017	Boyd Bay – Pera Head	Turtle and beach wrack survey
24/06/2017	Boyd Bay	Wrack survey
25/06/2017	Boyd Bay – Pera Head	Turtle and beach wrack survey
08/07/2017	Pera Head	Beach wrack survey
09/07/2017	Boyd Bay – Pera Head	Beach wrack survey
10/07/2017	Boyd Bay	Beach wrack survey
12/07/2017	Boyd Bay – Pera Head	Beach wrack survey
21/07/2017	Humbug terminal	Low tide pylon inspection
03/08/2017	Boyd Bay – Pera Head	Beach wrack survey
27/04/2018	Boyd Bay – Pera Head	Beach wrack survey
21/05/2018	Humbug and HRT Terminals	Incidental low tide pylon inspection

3.3. Diver inspection

Pylon inspections occurred 29 May to 06 June 2018. No AGM were sighted or recorded during diver or video analysis. Images from the surveys are provided in **Figure 4** and **Figure 5**.

Analysis of videos noted growth at all locations was similar and included:

- Tertiary biofouling was observed on all vertical pylons with coverage at approximately 90% consistent on 10% soft biofouling and 90% hard. Hard cover predominately consisted of barnacles with a few oysters (fake pearl and winged), oysters were mainly sighted in the top 5 metres. Soft cover consisted of ascidians, sponges and algae which often cover the hard cover.

- Horizontal frames generally had lower levels of biofouling (secondary) at approximately 40% mainly consisting of barnacles with a thin sediment layer on top.

- A clear intertidal zone was identified at the top of the pylon, this was restricted to hard cover predominately consisting of barnacles and oysters.

- No areas of dense bivalve assemblages were recorded.

3.4. AGM Monitoring Events Timeline

A timeline of events associated with the AGM specimen recorded associated with the Amrun Port are summarised below.

Timeline of activities

23 May 2017	The scheduled quarterly round of marine pest settlement plate monitoring was completed by Rio Tinto. A potential AGM was identified at Amrun Jetty 2.
24 May 2017	Rio Tinto notified the DAF Customer Service Centre of a suspected AGM collected off a settlement plate array.
26 May 2017	Teleconference with Biosecurity Queensland on the potential AGM detection and process moving forward.
27 - 28 May 2017	Boyd Bay – Pera Head beach wrack survey.
31 May 2017	Positive identification of the mussel as AGM was confirmed by the Curator of Molluscs at the Museum and Art Gallery of the Northern Territory.
07 June 2017	DAF Biosecurity Queensland (BQ) travelled with Rio Tinto for site familiarisation. The trip included visits to monitoring sites and the site where the initial specimen was found (AJ2) and identify potential areas where AGM may establish.
09, 19, 23, 24, 25 June 2017	Boyd Bay – Pera Head beach wrack survey
27 – 30 June 2017 –	BQ and CSIRO personnel conducted ROV survey on river and coastal infrastructure to determine the potential extent of incursion - no AGM detected.
08, 9, 10 12 July 2017	Boyd Bay – Pera Head beach wrack survey
21 July 2017	Low tide pylon inspection at Humbug terminal (incidental)
July 2017	James Cook University (JCU) Plankton tows were completed with no AGM detected
August 2017	JCU plankton tows were completed with no AGM detected
August 2017	Amrun quarterly settlement plate monitoring, samples collected from plates provided to BQ for molecular analysis – no AGM detected

December 2017	Amrun quarterly settlement plate monitoring, samples collected from plates provided to BQ for molecular analysis
March 2018	Amrun quarterly settlement plate monitoring commenced at Pera Head – equipment changed out. The first array to be inspected in March was found to have failed and fallen to the seabed with all plates not able to be retrieved. This array was repaired and re-deployed. A decision was made not to inspect the remaining arrays as further maintenance materials were required. There was a credible risk that attempts to retrieve the remaining arrays for inspection may have resulted in a loss of one or more arrays to the seabed, given the state of corrosion along the chain and shackles.
March 2018	Cyclone Nora passes through region. Cyclone impacted delivery of maintenance materials.
27 April 2018	Boyd Bay – Pera Head beach wrack survey
4 May 2018	Amrun quarterly settlement plate monitoring completed at Boyd Bay, Amrun Jetty 1 (AJ1) and Amrun Jetty 2 (AJ2). All plates were missing, however biofouling was present on the array, buoy and chain. These were inspected in the field by a trained and experienced marine scientist. No AGM were detected. Small local mussels were collected and sent to Darwin curator for confirmation. As part of adaptive management the attachment of plates was modified to include a 'mousing' wire in addition to cable ties to attempt to increase retention rate of plates in unfavourable sea state conditions
28 May 2018	Amrun quarterly inspection at Pera Head, very limited biofouling on array with no AGM detected. As per the previous array approach on 04 May, plates were attached with 'mousing' wire and cable ties to mitigate plate loss.
29 May – 06 June 2018	Diver pylon inspection for AGM – no visible AGM detected. Samples are to be sent for independent analysis.

Examples of splash zone assemblages

Examples of tertiary biofouling with soft overgrowing hard on vertical pylons

Examples of bivalves recoded during survey mainly restricted to winged oyster and

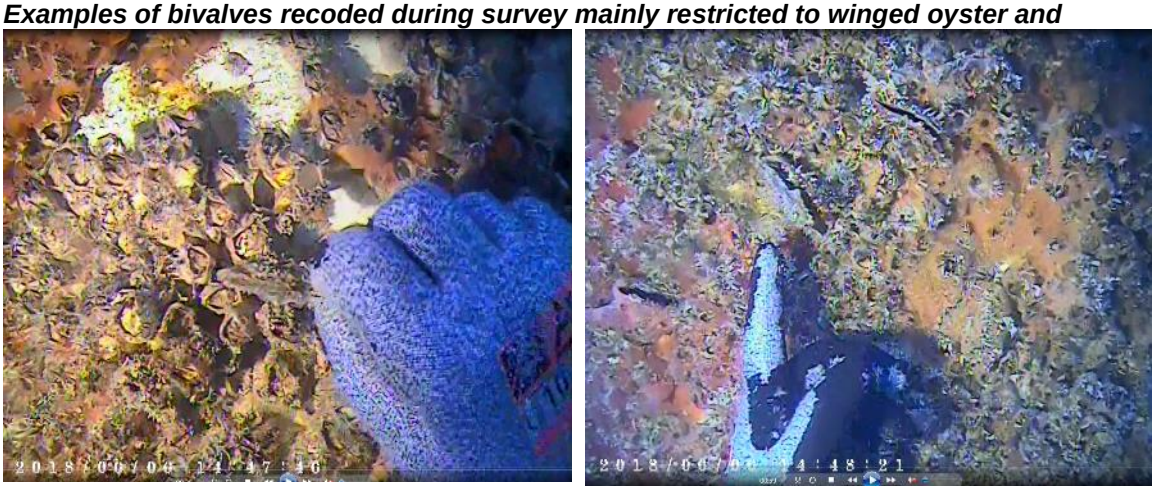
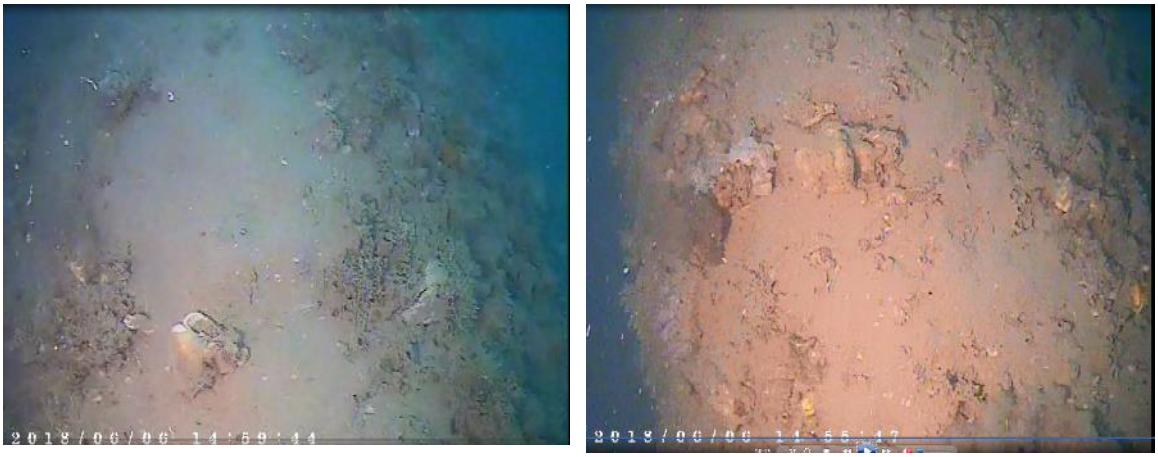


Figure 4 Images collected from diver survey

Examples of primarly bivalve species winged oyster (left) and fake pearl shell (right)

Examples of secondary biofouing on horizontal pylons with thin layer of overlappng sediment



Examples of sample collection using PVC pipe

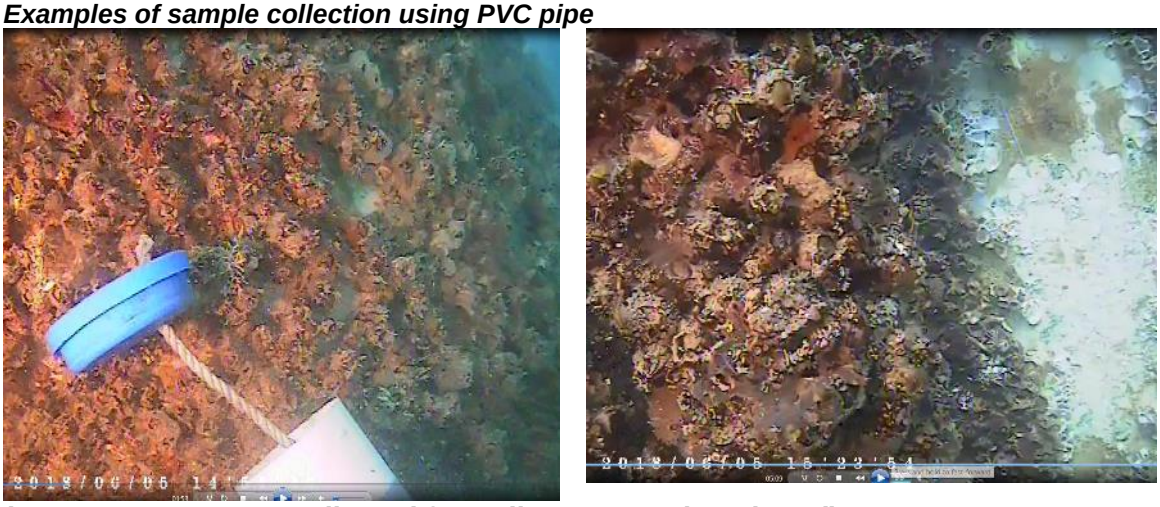


Figure 5 Images collected from diver survey (continued)

3.5. Conclusion

After the identification of a single AGM in May 2017, no further marine pests have been sighted.

4 REFERENCES

Biofouling Solutions (2016). Marine Pest Baseline Survey – Amrun Project . Final Report, 9 May 2016. Prepared for RTA Weipa Pty Ltd.

Biofouling Solutions (2017) Standard Operating Procedures Marine Pests Monitoring: Amrun Project 5 June 2017 Procedure prepared for RTA Weipa Pty Ltd.

Hoedt, F.E., Choat, J.H., Cruz, J.J., Neil, K.M., & Collins, J. (2001). Survey of the Port of Weipa: Port marine baseline surveys and surveys for introduced marine pests. CRC Reef Research Centre and James Cook University School of Marine Biology and Aquaculture. Report to Ports Corporation of Queensland.

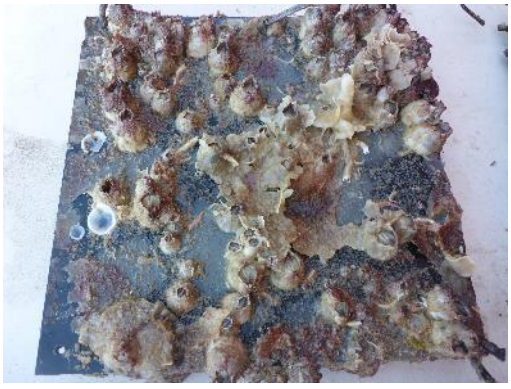
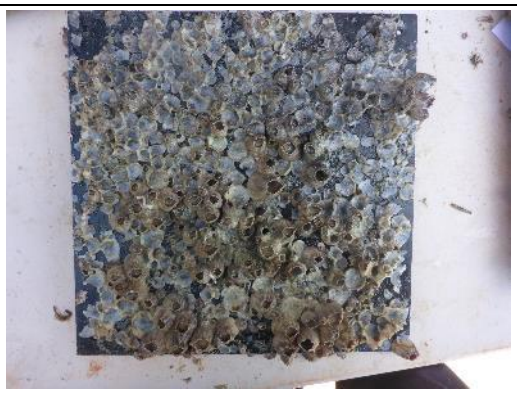
RTA (2016) Amrun Project Marine Pest Settlement Plate Monitoring Program: Amrun Project 20 September 2017.

Appendix A – Representative photos from settlement plate monitoring by Site

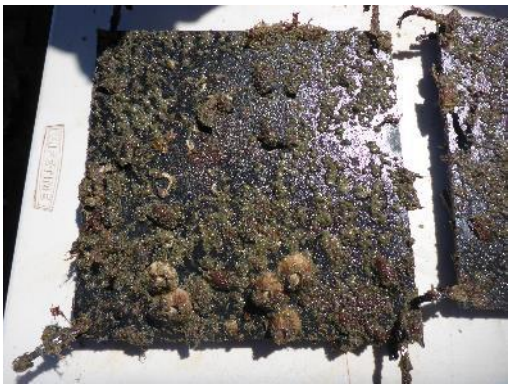
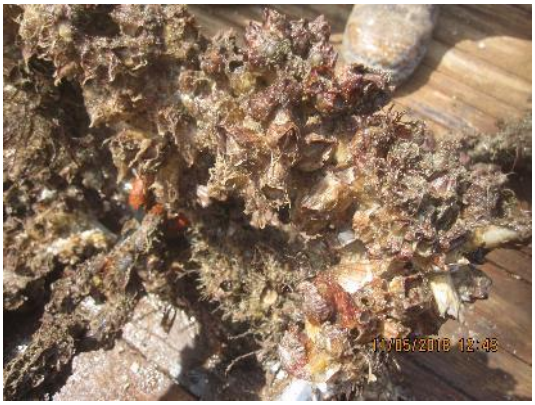
Representative photographs of biofouling communities for each sampling event – Boyd Bay, 3m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	No collection due to equipment issues	
May 2018		

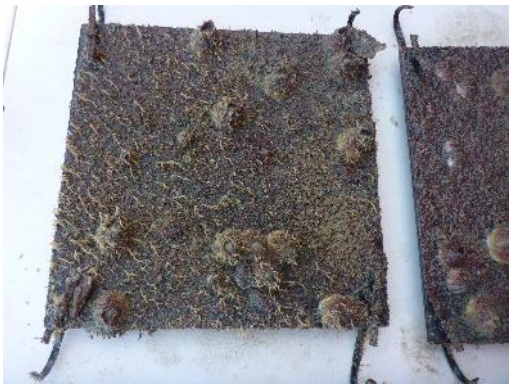
Representative photographs of biofouling communities for each sampling event – Boyd Bay, 5m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	No collection due to equipment issues	
May 2018		

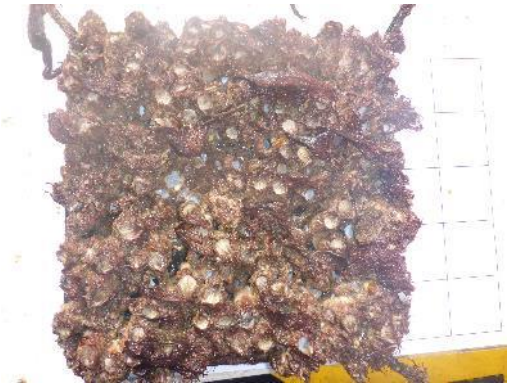
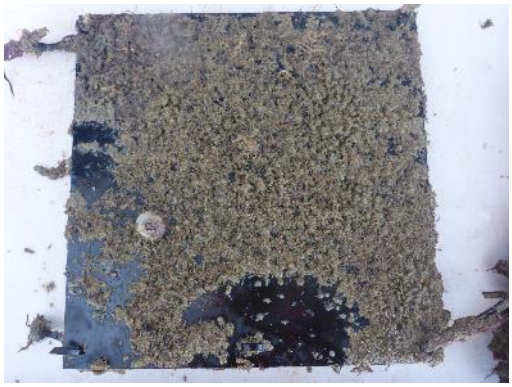
Representative photographs of biofouling communities for each sampling event – Amrun Jetty 1, 3m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	No collection due to equipment issues	
May 2018		

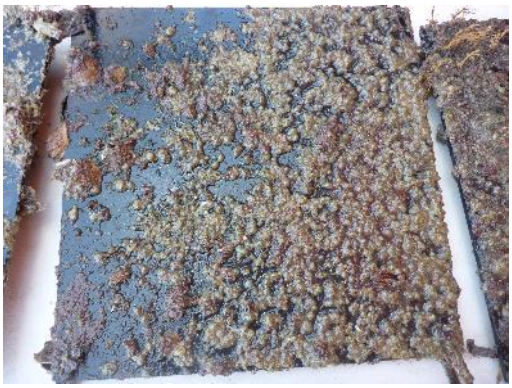
Representative photographs of biofouling communities for each sampling event – Amrun Jetty 1, 5m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	No collection due to equipment issues	
May 2018		

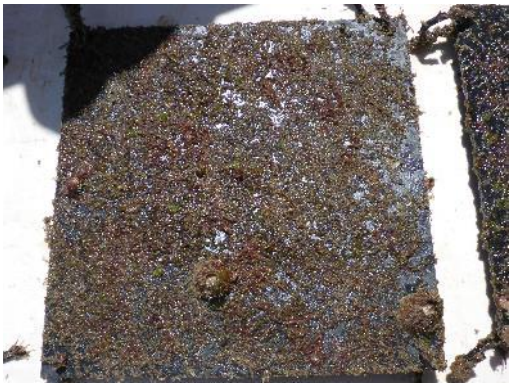
Representative photographs of biofouling communities for each sampling event – Amrun Jetty 2, 3m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	No collection due to equipment issues	
May 2018		

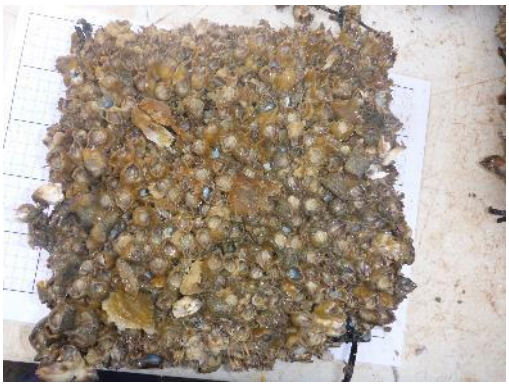
Representative photographs of biofouling communities for each sampling event – Amrun Jetty 2, 5m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	No collection due to equipment issues	
May 2018		

Representative photographs of biofouling communities for each sampling event – Pera Head, 3m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	Arrays fell to ocean floor no biofouling on array only on buoy	
May 2018		

Representative photographs of biofouling communities for each sampling event – Pera Head, 5m

	Inner Surface	*Outer Surface*
May 2017		
August 2017		
December 2017		
March 2018	Arrays fell to ocean floor no biofouling on array only on buoy	
May 2018