Final Report January 2021

Censusing the Aliens

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Summary

- A total of 21 student volunteers from across four of the region's universities undertook training and then surveyed 9 rocky shores within Moreton Bay.
- The surveys sought to identify new records for taxa 'invading' the Bay either as long-range non-native colonists or as range shifting Australian taxa.
- The project also sought to upskill the students and to facilitate their building of professional networks.
- While the limited survey work did not identify any alien invaders, it was clear that the volunteers increased their confidence in field work and survey skills, learnt taxonomic procedures and built new relationships across institutions.

Introduction

The *Censusing the Aliens* project utilised volunteers from amongst the tertiary student community of the Moreton Bay region to investigate species invasions into rocky shore and other hard substratum ecosystems.

The project was organised under the auspices of the Moreton Bay Foundation and funded by the Goodman Foundation, whose support and assistance we gratefully acknowledge.

Aims

- Record the distribution of large invertebrates (snails, clams, crabs, anemones) and 'seaweed' on rocky shores and artificial hard substrata around Moreton Bay
- Seek to identify the occurrence of species invading by range extension from the north (as part of a 'poleward migration') and species introduced from more remote locations by shipping or aquaculture.
- Upskill members of the local marine student community by the provision of training in ID and survey techniques and through field survey experience.
- Promote the development of collegiate and supportive networks amongst the next generation of marine professionals.

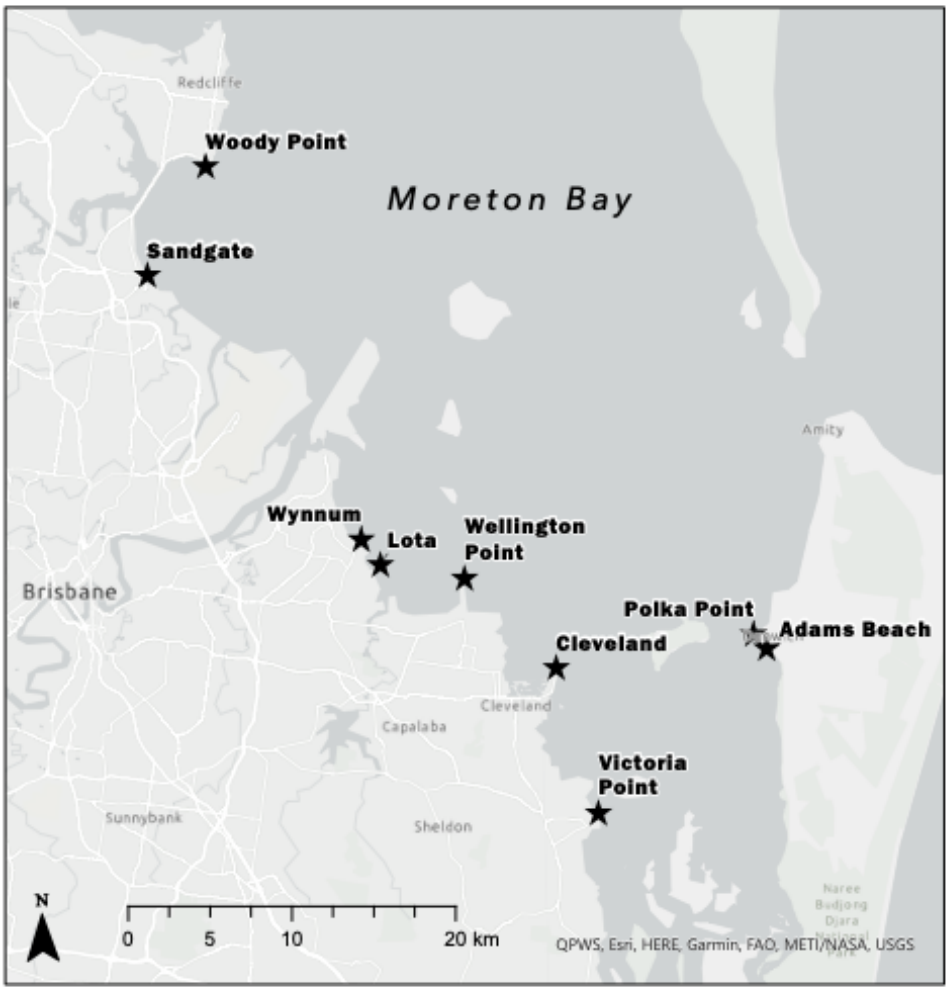


Figure 1. Survey site locations in Moreton Bay.

Site selection and timing

Potential sites were initially identified using Google Earth. Nine sites were ultimately chosen after verifying their suitability (Figure 1). To be suitable, a site needed to contain sufficient hard substrate along the shoreline, represent a different part of the Bay, be easily accessible and safe for students. These sites were grouped by location to create four separate field survey events (Table 1).

The four surveys were undertaken between the end of September and the end of November 2019 (Table 1). All surveys occurred on dates when there was a spring low tide in mid-afternoon. The field surveys were scheduled so that they commenced early afternoon, 1 to 2 hours prior to the low tide. Conducting the surveys on an outgoing, near-to-low tide ensured the full length of the intertidal zone could be surveyed and students were not at risk of being cut-off by an incoming tide.

Table 1. Details of CoA surveys in Moreton Bay in 2019.

Survey	Date	Sites visited	Number of student volunteers
1	28 Sept	Victoria Point, Cleveland Point	10
2	28 Oct	Sandgate, Woody Point	12
3	11 Nov	Wellington Point, Manly, Lota	14
4	25 Nov	Adams Beach, Polka Point , Minjerribah	7

A total of 21 student volunteers took part in the surveys along with 'volunteer' academics including the Chair of the TMBF Research Advisory Committee. Survey teams included individuals from Griffith University, University of Queensland, Queensland University of Technology and the University of the Sunshine Coast. While some volunteers were from the local region, there were also volunteers from interstate, New Zealand, Brazil, France, UK, China and USA.

On every survey, teams comprised members from multiple universities. Facebook® and Messenger® traffic shows that these students engaged with each other throughout the project.

Survey Methods

Student recruitment and training
Using flyers and targeted email strategies, university students from Griffith University, University of Queensland, Queensland University of Technology and the University of the Sunshine Coast, studying marine science or ecology related degrees, were invited to sign up for one or more of the field survey events.

The first three field survey events followed the same format:

- 2 to 3 hours of training in the morning (at a function venue relatively close to the survey sites) to provide: a project briefing, training on survey techniques, field identification and Occupational Health and Safety (OHS) aspects of the work 2 to 3 hours of training in the morning (at a function venue relatively close to the survey sites) to provide: a project briefing, and training on survey techniques, field identification and Occupational Health and Safety (OHS) aspects of the work
- lunch for students to network with other attending students and academics;
- 3 hours of field surveys and debriefing.

The final field survey event on Minjerribah (at Dunwich) only involved lunch with a briefing comprised of local OH&S afternoon field surveys as only experienced volunteers trained from earlier surveys were used.

Copies of the prepared training materials are included in Appendix 1.

Field surveys
Students were divided into groups, allocated to sites and provided with a set of equipment consisting of a bucket, first aid pack, an edition of the Queensland Museum's *Wild Guide to*

Moreton Bay and Adjacent Coasts, training handouts with clipboard/pencil, trowel and rake, small blunt knife, magnifying glass, and plastic sampling containers and bags.

Surveys were conducted using random meander surveys. Participants took photos of invertebrate specimens, and if those specimens could not be identified in the field, they were collected for later examination in Griffith's ecology lab. Upon completion of each field survey (during debriefing), specimens were preserved in 70% ethanol and given a unique identification tag which included the date, location, possible genus/species name and collector.

Specimen photos were shared by the students through a Messenger group established for the project. These photos were then incorporated into specimen catalogues – one for each field survey event.

Laboratory identification
Students that participated in the field surveys were invited to assist with identifying specimens in Griffith's laboratory using the provided training materials, field guides and available online identification tools.

Those specimens that were easily identifiable and considered 'native' were retained in cold storage with details of the specimen being recorded in the relevant catalogue of specimens. The remaining specimens were identified to the lowest level possible and then set aside in cold storage to provide to the Qld Museum for better identification.

Photo identifications
To minimise the number of specimens requiring physical examination by the Queensland Museum, unidentified and potentially non-native specimens were arranged into catalogues by major taxonomic groups (by rearranging the field survey catalogues and removing already identified specimens). These catalogues with photos were then emailed to relevant Australian taxonomists and academics to determine if further identifications could be made from the photos. Any feedback from those specialists was incorporated into the major taxonomic group catalogues (see Appendices 3-10).

Results

The aim of upskilling students and helping them form networks is deemed to have been completed successfully (Appendix 2 for examples).

In total, around 70 specimens and 100 photographs were collected by the project teams. Post-collection laboratory analysis of samples was impacted by COVID-19 laboratory closures.

High level taxonomy showed that individuals from a total of 226 practical taxonomic units were identified (Table 2) with 'sponges and ascidians', molluscs and crustaceans being the most frequently recorded groups.

Table 2. The number of Practical Taxonomic Units recorded as 'new records' in Censusing the Aliens surveys in Spring 2019.

	28 September 2019		28 October 2019		11 November 2019			27 November 2019		Survey total
	Victoria Pt	Cleveland Pt	Sandgate	Woody Point	Wynnum	Lota	Wellington Point	Polka Point	Adams Beach	
Algae	0	1	2	7	1	3	3	0	2	19
Anthozoans	0	3	3	3	2	1	4	0	1	17
Bryozoans	1	1	5						2	9
Crustaceans	2	6	8	10	4	9	5	1	0	45
Echinoderms	0	0	1	0	0	0	1	0	0	2
Molluscs	4	4	4	4	8	7	11	0	9	51
Sponges and Ascidians	7	4	11	12	5	4	14	0	10	67
Worms	1	1	3	1	2	4	3	1	0	16
ALL SPECIES	15	20	37	37	22	28	41	2	24	226

Summary tables derived from the species recording databases are presented in Appendices 3 to 10. Identifications are based on the work of the Censusing the Aliens team, Griffith in house experts, and identifications made from the photographic records by Queensland Museum staff and colleagues during COVID-19 lockdown in 2020.

Discussion

The student survey teams did not positively identify any new records of invasive species at any of the 9 sites they surveyed in Moreton Bay. Moreton Bay lies at the transition between the Temperate Australasian to Central Indo-Pacific biogeographic realms at 25^{o}S (Spalding et al., 2007). Biogeographic shifts in this area have previously been reported for fish (Fowler et al., 2017; Sunday et al., 2015), rocky shore organisms (Poloczanska et al., 2011) and mudflat species (Caswell et al. 2020) and further climatic warming is likely to cause the biogeographic boundaries to move further and for more taxa.

Caswell et al. (2020) using new data on the mudflat macrofaunal communities of Moreton Bay, together with historic biogeographic datasets, demonstrated poleward biogeographic range expansions for up to eight typically tropical species, representing 14% of the 50 taxa recorded from the mudflats. However, their dataset covered 24 sites and 2 years of sampling with considerable taxonomic expertise applied to the samples in the laboratory. The field identifications and photographic approach applied here will have constrained the survey's ability to find new records.

So while the survey reports no new 'alien' sightings the project achieved a number of its goals and provided a series of learning points for further surveys of this nature. The volunteer, multi-institutional, teams worked well together, achieving a sense of common purpose from which on-going interactions were developed. However, our attempts to preserve specimens in the field using alcohol, due to the much lower health and safety concerns compared to formaldehyde, were at best only partially successful and much of the material was not suitable for review by experts. Similarly, the use of mobile phone cameras and ambient light to capture images of small and wet (and hence reflective) organisms also resulted in frequent fails. Future surveys should consider some dedicated team members, who with appropriate training and PPE, can take responsibility for photographing and preserving specimens.

Future activities

Further discussions with the RAC over continuation/extension of the approach took place in Q2 2020 but no funding was allocated. There remains scope for repeating the survey in future years and expanding the coverage.

Acknowledgements

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References

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Appendix 1

CENSUSING THE ALIENS – FIELD SURVEY DATA SHEET

Student name(s):_____

Date:_____ Location :_____

Weather/Conditions:_____

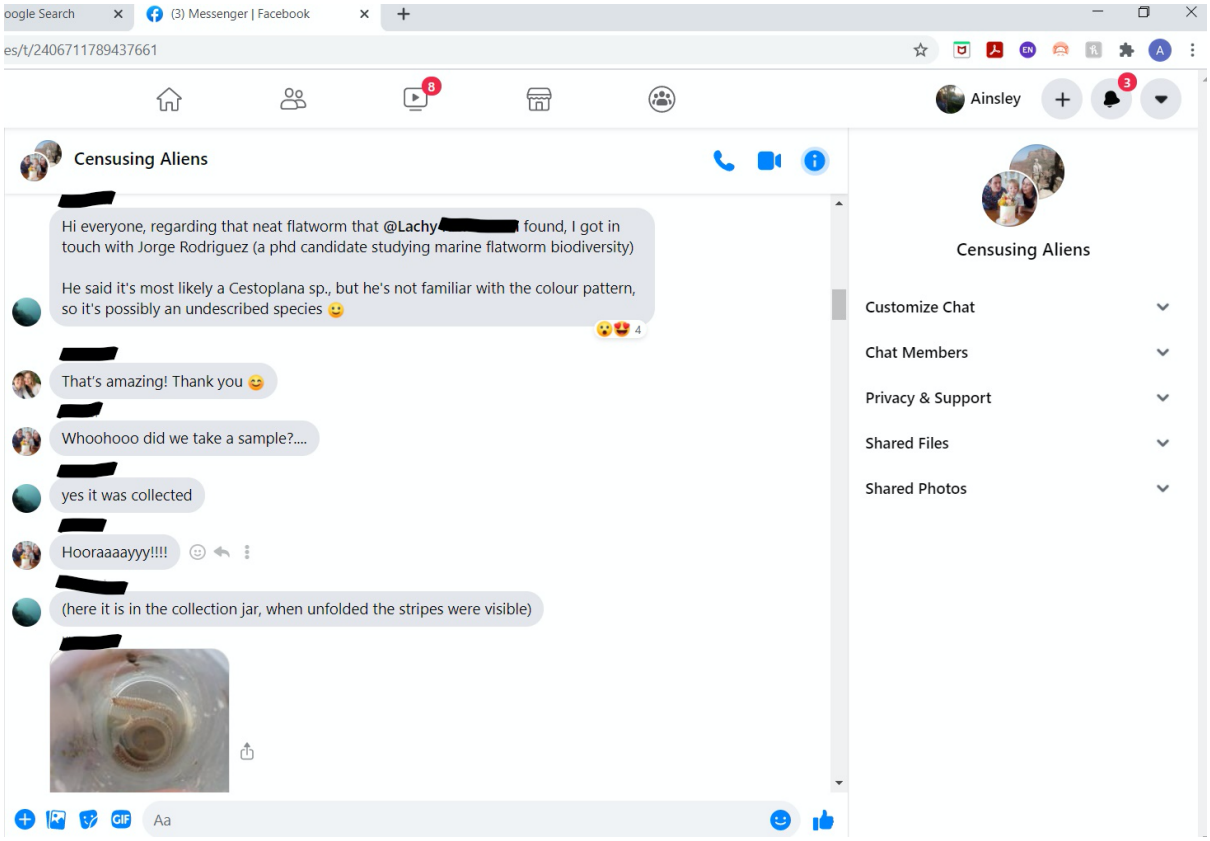
Low tide:_____ Survey start time:_____ Survey end time:_____

Id no **	Species name (or lowest classification can go to)	Description	Count++

****if associate with collection container or photo ++count if less than 20 otherwise just put '>20')**

Appendix 2.

Examples of student exchanges crossing the institutional divide (names removed to comply with privacy and confidentiality requirements).




Censusing Aliens
Fouling serpulid soon. 2810SAN
Spp not soon
Keeled tube worm (note ridge down back like the keel of an upturned boat) Pomatocerus triqueter
11/19/19, 6:25 PM
Looks like a Amphipod of the Corophium type.. but can see the end of the antenna
can NOT see the end...
11/25/19, 8:14 PM
Aa

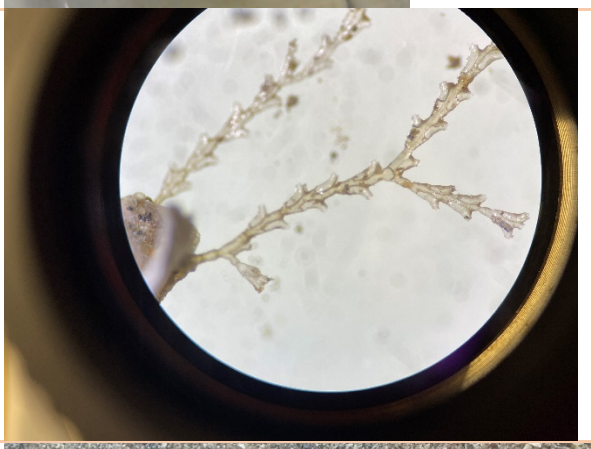
Appendix 3

ALGAE – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location	Finder or Photograp
	2809Cle05	*Gracilaria* spp	Cleveland	Joshua and Kelly

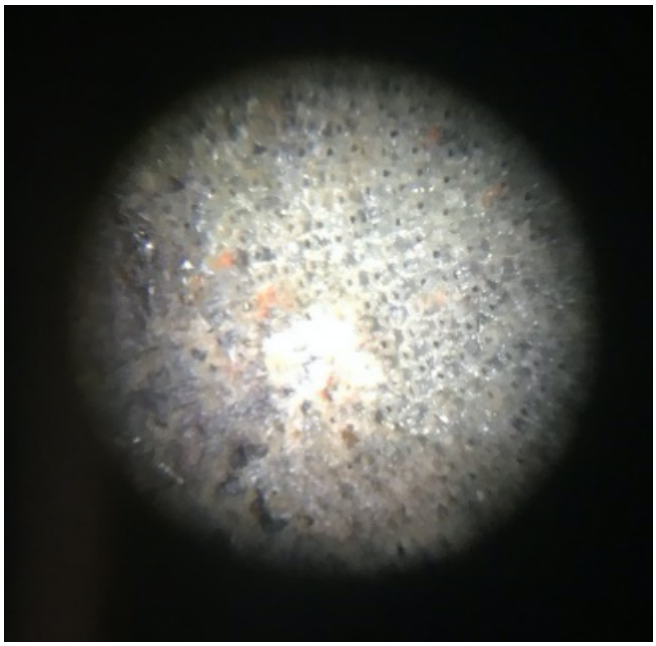
Appendix 4

ANTHOZOANS AND HYDROZOANS – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location	Finder or Photograp
	2810San26	*Anthpleura handi?* *TO BE CONFIRMED*		
	2810San16	*Halecium delicatum ??* TO BE IDENTIFIED		
		*Arachnanthus nocturnus* CONFIRM Not in Moreton Bay on ALA	Well Pt	Jonathan
		*Anthopleura handi* Others suggestion *Boloceroides mcmurrichi* - Swimming anemone	Woody Pt	Henri

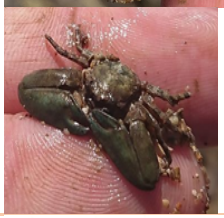
Appendix 5

BRYOZOANS – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location	Finder or Photographe
	2810San09	Bryozoan TO BE IDENTIFIED	Sandgate	
	2809Vic05	Encrusting bryozoan on mussel Radiates outwards from middle. Circular colony *Membranipora sp.* *TO BE IDENTIFIED*	Vic Pt	Eleanor

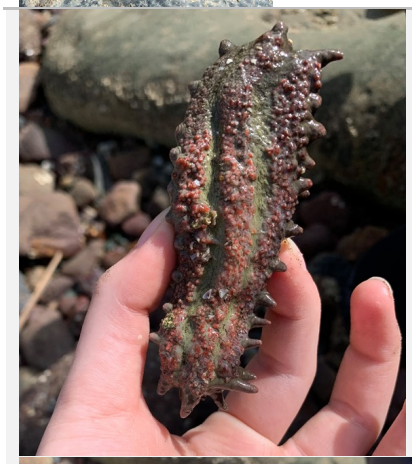
Appendix 6

CRUSTACEANS – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location	Finder or Photograp
	1111WP11	*Zaopis Ostaeum* Pea crab Inhabiting *Pinctada margaritifera* (black lip pearl oyster)	Well Pt	Paul I
 	2809Cle01	Twisted-claw porcelain crab *Ancylocheles gravelei*	Cleveland point	Paul iacuzzo
	2809Cle02	Spines all over carapace – from side edges and dorsal side Spines on back legs triangular in shape similar to shark fin Similar to *Pilumnus vespertilio* *TO BE IDENTIFIED*	Cleveland	Paul I

Appendix 7

ECHINODERMS – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location	F F
	1111WP05	*Ophiactis savignyi*	Wellington Point	
 		*Ophiactis savignyi*	Polka Pt	L
 		Quadrangluar Sea Cucumber *Colochirus quadrangularis*	Sandgate	E

Appendix 8

Brown mussel

Perna perna



Similar species
Hairy mussel (*Trichomya hirsuta*)

Description

- Smooth, dark brown shell with concentric growth lines.
- Thin at the edges, thicker towards the narrow end.
- Straight with proportionally long hinge line.
- Shell is up to 12cm long.
- Accumulates toxins and heavy metals, which can cause shellfish poisoning if eaten by humans.

Habitat

- Hard and soft substrates (dead shells, rocks, piers, stones, buoys)
- Intertidal and subtidal
- Prefers areas rich in organic matter and plankton carrying low loads of suspended sediments

Hairy Mussel

Trichomya hirsuta



- Shells of living animals are covered in short bristles (modifications of the organic 'skin' portion of the intact shell).
- The shell is up to 6cm in length,
- is sculptured with numerous radial ribs externally, and internally is smooth and highly iridescent ('mother of pearl' nacre).
- Byssal threads attach these mussels to each other or to rocks on the sea bottom, thereby forming clumps or even extensive beds in intertidal to shallow subtidal areas.

Occurs abundantly along the eastern and southern coasts of Australia as far south as Tasmania, particularly in estuarine localities.

Winged Horse Mussel

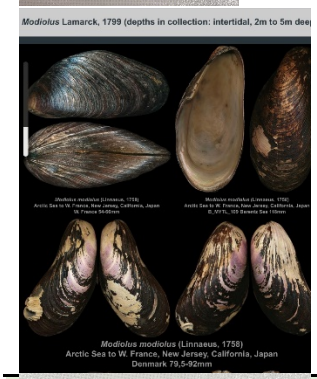
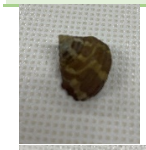
Modiolus micropterus



By Georges Jansoone (JoJan) - Own work - photo made at an sea aquarium, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=10576799

- to 22 cm long though 10 cm is a more typica size.
- shell is purpleish or dark blue and robust, with horny protuberances when young.
- two valves are roughly triangular or bluntly oblong with rounded umbones near the anterior end.
- annual growth lines are clear and there is a fine sculpturing of concentric grooves and ridges.
- interior of the shell is white with a broad pallial line
- body is deep orange and the mantle is unfrilled.
- shell is firmly attached to the substrate by byssus threads.

MOLLUSCS – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location
 	1111Lot06	*Modiolus modiolus*? (if so non-native) TO BE IDENTIFIED possibly a Modiolus but can't tell what species (Mytilidae)	Lota
	1111Lot07	*Callista planatella* Found in WA – not shown on ALA as in Moreton Bay TO BE IDENTIFIED *Venerupis aspera* (Veneridae)	Lota
  	1111Wyn06	*Turbo spp.* TO BE IDENTIFIED Austrocochlea porcata (Trochidae)	Wynnu
	1111Wyn07	*Musculista* spp TO BE IDENTIFIED Wyn07 Neotrapezium sublaevigatum (Trapezidae)	Wynnu

Appendix 9

SPONGES/ASCIDIANS

Specimen photo	ID	Species name	Location	Finder / Photographer
 	2511AB01	Sponge Hexagonal backbone with star shaped spicules 2511AB01, was this rough to the touch? Were the star shaped spicules like mercedes symbol? If so then it is a calcarea sponge	Adams Beach	Ainsley

Appendix 10

WORMS – CENSUSING THE ALIENS

Specimen photo	ID	Species name	Location	Finder / Photographer
	1111Lot01	*Terebellida sp* TO BE IDENTIFIED	Lota	Ainsley
	1111Lot02	*Cestoplana sp ??* new species as unfamiliar pattern ? TO BE IDENTIFIED	Lota	Lachy R
	2810San04	Sabellilda sp or Terebellida sp TO BE IDENTIFIED	Sandgate	
	1111WP02	*Marphysa mullawa* *CONFIRM*	Well Pt	Jonathan
	1111WP06	*Polynoidae – overlapping scales* TO BE IDENTIFIED	Well Pt	