Appendix 11 West of Wedge Zone Assessment

INITIAL ENVIRONMENTAL ASSESSMENT FOR THE ESTABLISHMENT OF A NEW MARINE FARMING ZONE: "WEST OF WEDGE", SOUTHERN TASMANIA

Report to

Tassal

November 2016

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AQUATIC ENVIRONMENT ANALYSTS
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EXECUTIVE SUMMARY

An environmental assessment of a proposed marine farming zone extension west of Wedge Island was conducted during August and September 2016. The assessment area covered 11.27 km^2 (1127 ha), with depths ranging from 35 – 47 m. The seabed was gently sloping, with deepest depths measured towards the southwest and shallower depths measured towards the northeast section of the assessment area. Based on the survey outputs, benthic habitats within the 1127 ha zone assessment area were determined to comprise entirely of ridged sand.

Environmental data on substrate type, habitat distribution, bathymetry, and benthic flora and fauna were assessed. Video and bathymetry surveys showed the seabed to be relatively featureless and characterised by dark orange brown sand with shell grit throughout the survey area. Diverse assemblages of invertebrates were recorded from 35 sediment grabs spread across the survey area, with no strong patterns in community assemblage composition across the area assessed. A range of faunal groups were observed in the sediment samples including anthozoans, crustaceans (e.g. amphipods, cumaceans, decapods, ostracods, tanaids), molluscs, echinoderms and polychaete worms. One of the most common taxa recorded was the bivalve *Glycymeris striatularis* which was recorded from 15 of the 40 grab samples collected. Other prominent taxa included an anthozoan (Family Edwardsiidae), brittles stars (*Ophiura kinbergi*) and trumpet worms (Family Pectinariidae). All of the sediment samples were odourless.

One dead shell of the threatened screw shell *Gazameda gunnii* shell was detected from the 35 samples that were used to characterise sediment condition and fauna communities. A further 120 grab samples were collected as part of targeted sampling effort for *Gazameda gunnii*. Five *Gazameda gunnii* were detected across the 120 sites, including a single live specimen and four dead shells. Some old and eroded *Gazameda* sp. shells were also recorded during the survey, these shells could not be reliably identified as they also resembled the closely related *G. tasmanica*.

1 INTRODUCTION

The *Marine Farming Planning Act* (1995) requires the preparation of an environmental impact statement in order to assess the suitability of proposed sites for marine farming activities in Tasmania. This report details the extent, depth and details of the substrate, including dominant flora and fauna, comprising the habitat west of Wedge Island in Storm Bay, south eastern Tasmania.

The environmental assessment was conducted during August and September 2016. Environmental data on substrate type, habitat distribution, bathymetry, benthic flora and fauna were collected. Targeted surveys for the threatened screw shell *Gazameda gunnii* were also conducted. The survey area covered 11.27 km2 (1127 ha) (Figure 1).

The zone assessment area is indicated in Figure 1 below. It should be noted that a previous zone assessment for West of Wedge was conducted by IMAS in 2014. The zone area has since been moved to the north. Although there was some overlap between the previous and new zone proposals, a complete zone assessment was conducted, providing an up to date assessment of the proposed zone area.

Note that all methodologies and sampling activities were in accordance with the zone assessment guidelines (DPIPWE 2016).

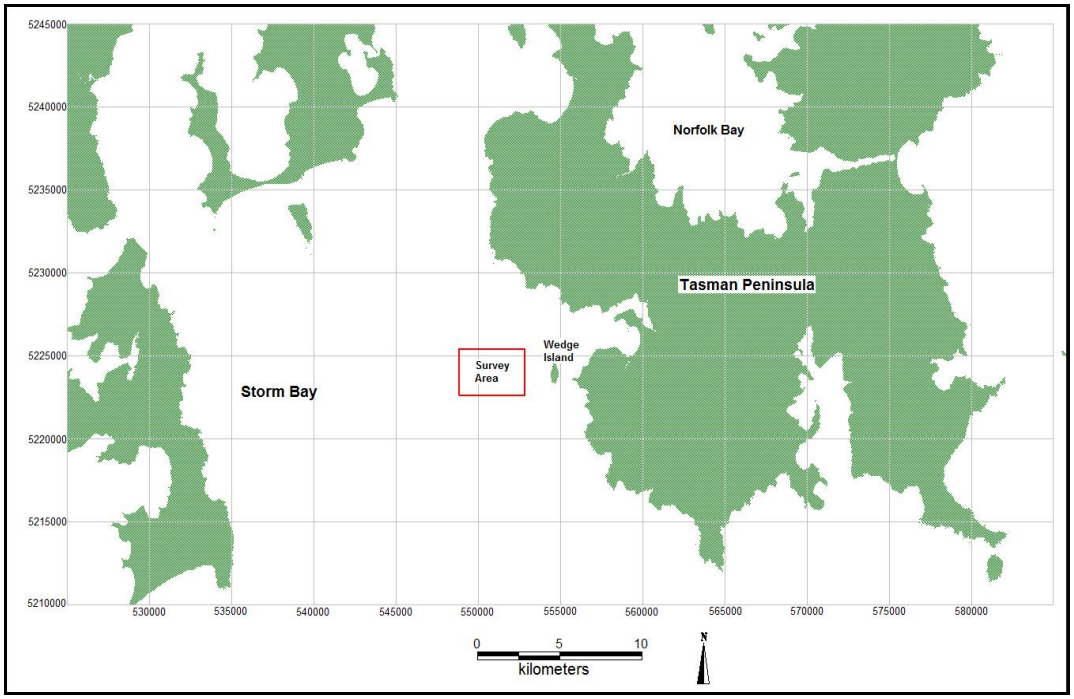


Figure 1 Location of zone assessment area, as indicated in red.

2 METHODS

2.1 BATHYMETRIC MAPPING

Bathymetric mapping was conducted along 50 m-spaced transects using single beam. A total of 56 transects at approximately 2 km length were travelled at an average speed of approximately 6 knots.

The proposed zone was mapped using a vessel mounted Garmin GPS Map 551s running a dual frequency 50/200 transducer. The DGPS signal was from FUGRO, logged through a Trimble TSC1 DGPS station mounted directly above the logging transducer. DGPS positions and water depth were logged every two seconds to *Seabed Mapper* run on a laptop computer. The depths were tidally and barometrically corrected for Chart Datum using appropriate tide charts and observations from the Bureau of Meteorology station of Hobart.

Bathymetric data was mapped with contour lines at intervals of 0.5 m. Note that the data is available in a format suitable for input to *DEPOMOD* depositional modelling software, and in a format to comply with the DPIPWE zone assessment guidelines.

2.2 SEDIMENT SAMPLING

A total of 35 sites were sampled, as per DPIPWE's (2016) specifications for a survey area < 1500 Ha. (Figure 2).

Sediment samples were collected using a Van-Veen grab. Once on board the vessel, sediment samples were emptied into a tote box before being photographed and characterised based on colour, texture, layering and odour.

Sediment samples were then sieved through a 4 mm sieve and assessed for the presence of large biota, with particular attention paid to examination of sediments for the presence of the threatened screw shell, *Gazameda gunnii*. All samples were photographed for future reference.

2.3 VIDEO DATA COLLECTION - REMOTELY OPERATED VEHICLE (ROV)

Video footage was captured to obtain detailed information on habitat attributes and to verify benthic habitat classification. A total of 30 spot dives were conducted, as per DPIPWE's (2016) specifications for a

survey area < 1500 Ha. The appearance of the seabed was recorded by filming spot dives of the sea floor using a Seabotix LBV150SE Remote Operated Vehicle (ROV). High definition footage was also recorded using a GoPro Hero4 camera mounted to the ROV.

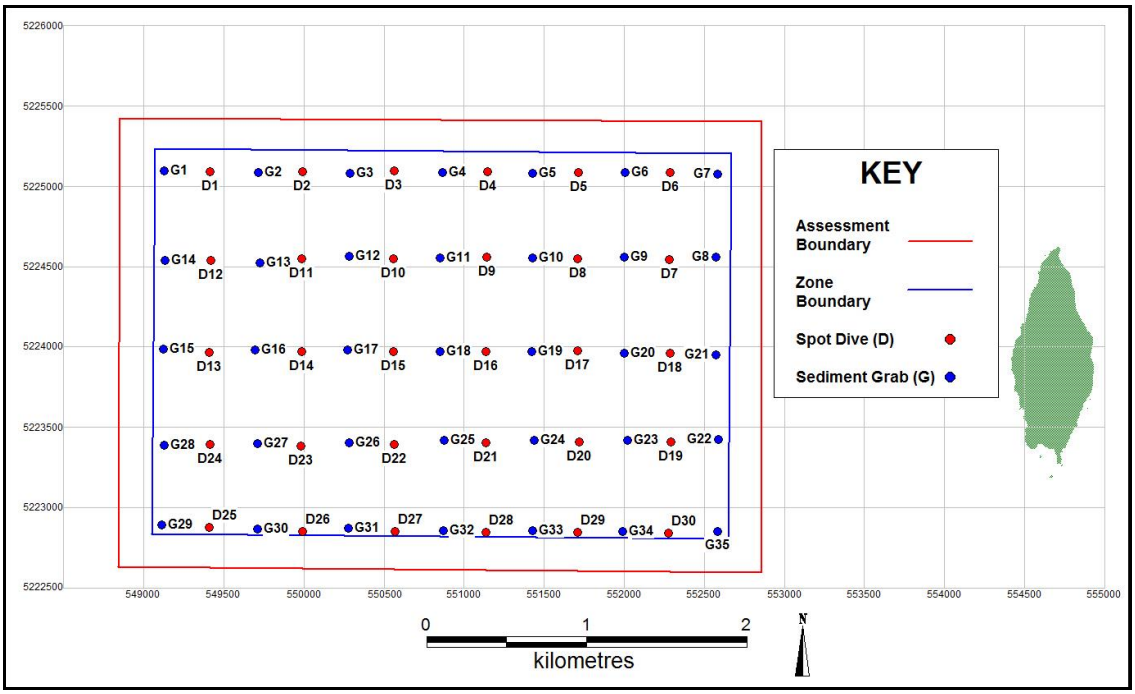


Figure 2. Location of ROV dives and sediment grabs within the zone assessment area.

2.4 BENTHIC HABITAT MAPPING

Benthic habitat mapping was conducted in conjunction with the bathymetry, video and sediment surveys. Bottom discrimination was undertaken using a Raymarine E120 system running a DSM300 1kW focussed beam, dual frequency transducer. Substrate types were identified based on acoustic roughness and hardness, and were confirmed against video and sediment samples.

2.5 TARGETED *GAZAMEDA GUNNII* SURVEY

DPIPWE's zone assessment specifications state that a targeted *Gazameda gunnii* survey is required if live specimens are detected in the sediment samples. Although the sediment sampling did not reveal any live

G. gunnii, a conservative approach was adopted and targeted *G. gunnii* surveys were carried out. This approach was taken because live shells have been recorded during recent sampling of nearby areas (IMAS 2014).

A total of 120 grab samples were taken using a van-veen grab across the zone area. This incorporated 30 samples across each of the four proposed lease blocks (i.e. lease blocks 1-4).

Samples were sorted through a 4 mm sieve. Dead shells were retained and examined by a taxonomic expert (J. Lane). In accordance with DPIPWE protocols, any live individuals of *G. Gunnii* were relocated to a location nearby in a similar habitat (i.e. depth and substrate composition) that is outside of the proposed area identified for impact.

3 RESULTS

3.1 BATHYMETRIC MAPPING

Results of bathymetric mapping at 0.5 m resolution are shown in Figure 3 and Figure 4. Depth across the assessment area ranged from 35 – 47 m. The seabed was gently sloping, with deepest depths measured towards the southwest and shallower depths measured towards the northeast section of the assessment area. No reef features were identified across the assessment area.

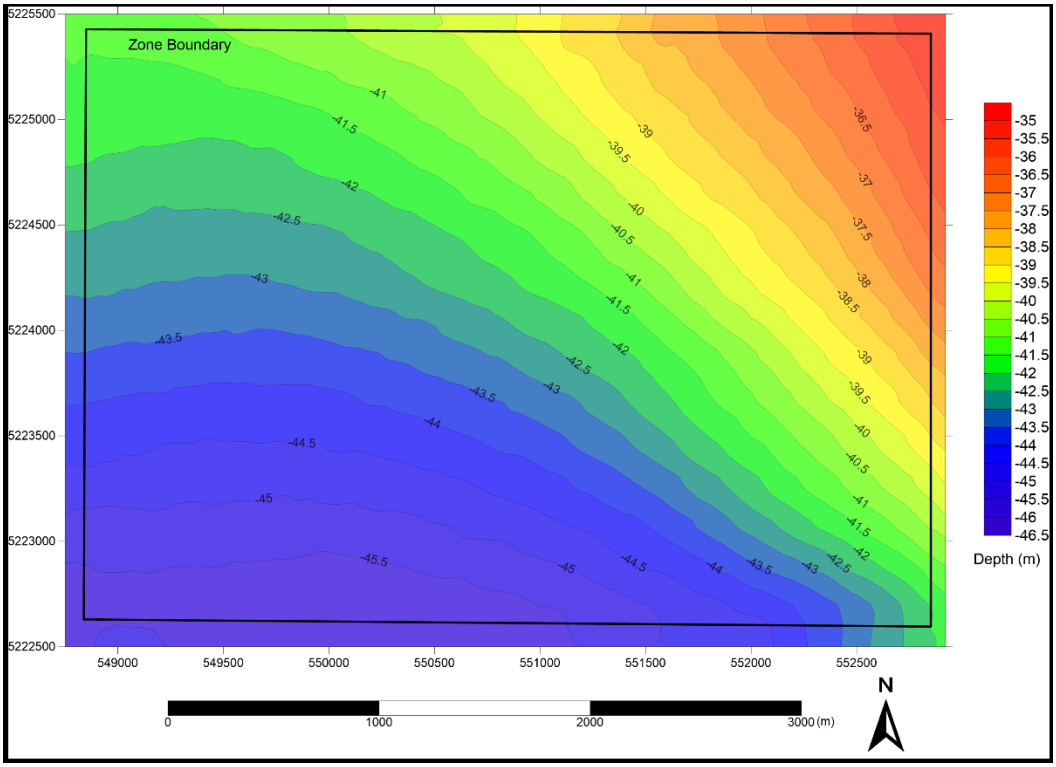


Figure 3 Bathymetric map of the proposed West of Wedge zone area

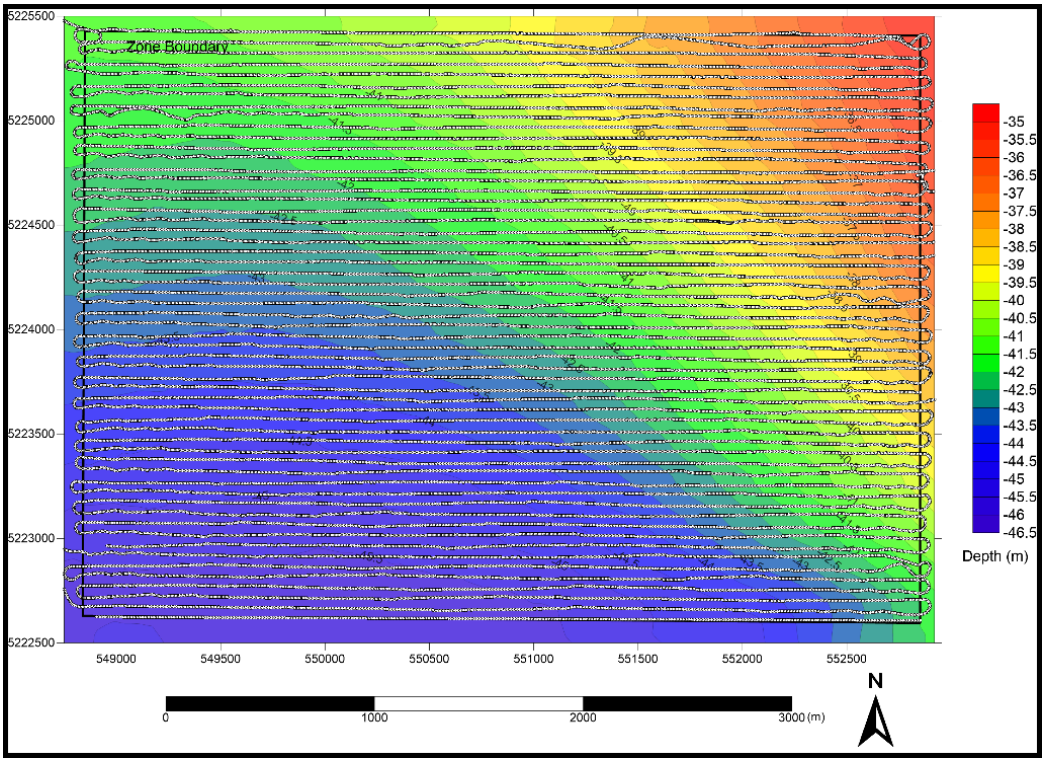


Figure 4 Bathymetric map of the proposed West of Wedge zone area with track log overlaid.

3.2 SEDIMENT SAMPLING

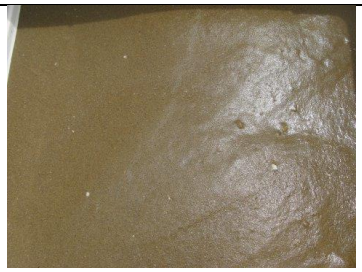
Sediments consisted of dark orange brown sand with shell grit throughout the survey area (Table 1). Diverse assemblages of invertebrates were recorded, with no strong patterns in community assemblage composition across the extent of the survey area. A range of faunal groups were observed in the sediment samples including anthozoans, crustaceans (e.g. amphipods, cumaceans, decapods, ostracods, tanaids), molluscs, echinoderms and polychaete worms. One of the most common taxa recorded was the bivalve *Glycymeris striatularis* which was recorded from 15 of the 40 grab samples collected. Other prominent taxa included anthozoans (Family Edwardsiidae), brittles stars (*Ophiura kinbergi*) and trumpet worms (Family Pectinariidae).

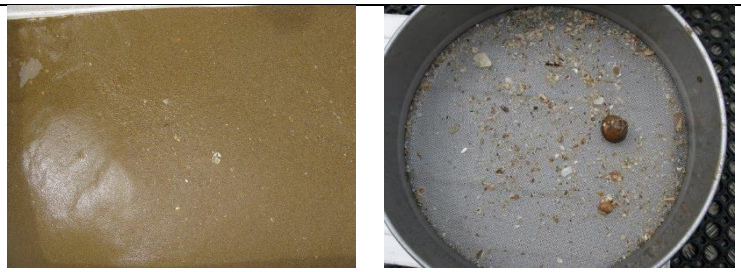
A single dead shell of the native screw shell *Gazameda gunnii* was recorded from grab sample 16. Additional, more intensive survey effort for *G. gunnii* sampling was undertaken and is described in section 3.5 below.

All of the sediment samples were odourless.

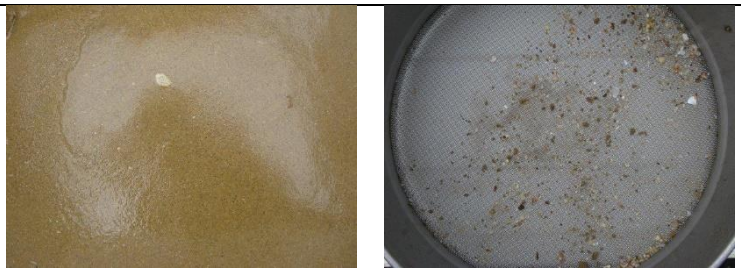
Table 1. Sediment sample descriptions for the thirty five samples taken within the proposed marine farming zone. Sampling coordinates are included in Appendix 5.1.

Grab #	Imagery	Description
1		Orange-brown sand with shell grit. Amphipods, anthozoan (Edwardsiidae), bivalve, ostracod, polychaete, tanaids. No odour.
2		Orange-brown sand with shell grit. Amphipod, anthozoan (Edwardsiidae), bivalves (*Glycymeris striatularis*), tanaid. No odour.
3		Orange-brown sand with shell grit. Amphipod, anthozoan (Edwardsiidae), bivalve, gastropods, ostracod, polychaete, tanaids. No odour.
4		Orange-brown sand with shell grit. Bivalves (*Glycymeris striatularis*), brittle star (*Ophiura kinbergi*). No odour.
5		Orange-brown sand with shell grit. Gastropod, ostracod, polychaetes, trumpet worm (Pectinariidae). No odour.

Grab #	Imagery	Description
6		Orange-brown sand with shell grit. Amphipods. No odour.
7		Orange-brown sand with shell grit. Amphipods, brittle stars (*Ophiura kinbergi*), gastropods, trumpet worms (Pectinariidae). No odour.
8		Orange-brown sand with shell grit. Amphipod, cumacean, gastropods, polychaetes, tanaid. No odour.
9		Orange-brown sand with shell grit. Amphipods, bivalve, brittle star (*Ophiura kinbergi*), gastropod. No odour.
10		Orange-brown sand with shell grit. Amphipods, brittle star (*Ophiura kinbergi*), dead *Gazameda gunnii* shell, decapod shrimp, ostracod, polychaete, tanaid, trumpet worms (Pectinariidae). No odour.

Grab #	Imagery	Description
11		Orange-brown sand with shell grit. Bivalves (*Glycymeris striatularis*), cumacean, trumpet worms (Pectinariidae). No odour.
12		Orange-brown sand with shell grit. Amphipods, anthozoan (Edwardsiidae), bivalve (*Glycymeris striatularis*), decapod shrimp, gastropod, polychaete. No odour.
13		Orange-brown sand with shell grit. Anthozoan (Edwardsiidae), bivalves (*Glycymeris striatularis*), hermit crab, ostracod, polychaete, tanaid. No odour.
14		Orange-brown sand with shell grit. Amphipods, anthozoan (Edwardsiidae), bivalve (*Glycymeris striatularis*), cumacean, isopod, polychaete. No odour.
15		Orange-brown sand with shell grit. Amphipods, anthozoan (Edwardsiidae), bivalve (*Glycymeris striatularis*). No odour.

Grab #	Imagery	Description
16		Orange-brown sand with shell grit. Amphipods, bivalve, brittle star (*Ophiura kinbergi*), dead *Gazameda gunnii* shell, gastropod. No odour.
17		Orange-brown sand with shell grit. Amphipods, bivalve (*Glycymeris striatularis*), polychaetes, trumpet worms (Pectinariidae). No odour.
18		Orange-brown sand with shell grit. Bivalves (*Glycymeris striatularis*), other bivalves. No odour.
19		Orange-brown sand with shell grit. Amphipods, anthozoans (Edwardsiidae), bivalves (*Glycymeris striatularis*), other bivalves. No odour.
20		Orange-brown sand with shell grit. Brittle star (*Ophiura kinbergi*), cumacean, gastropod, tanaid. No odour.

Grab #	Imagery	Description
21		Orange-brown sand with shell grit. Amphipods, decapod shrimp, isopod, polychaete, tanaid, trumpet worm (Pectinariidae). No odour.
22		Orange-brown sand with shell grit. Brittle stars (*Ophiura kinbergi*), gastropod, polychaete. No odour.
23		Orange-brown sand with shell grit. Amphipod, bivalve, decapod shrimp, gastropod, trumpet worm (Pectinariidae). No odour.
24		Orange-brown sand with shell grit. Bivalve (*Glycymeris striatularis*), large errant polychaete. No odour.
25		Orange-brown sand with shell grit. Bivalve, gastropod, polychaetes. No odour.

Grab #	Imagery	Description
26		Orange-brown sand with shell grit. Amphipod, anthozoan (Edwardsiidae), bivalve (*Glycymeris striatularis*), polychaetes, tanaid. No odour.
27		Orange-brown sand with shell grit. Amphipod, bivalve, polychaete. No odour.
28		Orange-brown sand with shell grit. Amphipod, bivalve, gastropod. No odour.
29		Orange-brown sand with shell grit. Amphipod, bivalves (*Glycymeris striatularis*), polychaetes. No odour.
30		Orange-brown sand with shell grit. Bivalves (*Glycymeris striatularis*), gastropod, hermit crab, tanaid. No odour.

Grab #	Imagery	Description
31		Orange-brown sand with shell grit. Amphipods, cumacean, gastropod, heart urchin (*Echinocardium*), polychaete, tanaid. No odour.
32		Orange-brown sand with shell grit. Polychaetes. No odour.
33		Orange-brown sand with shell grit. Amphipods, anthozoan (Edwardsiidae), bivalve, cumacean, polychaetes, tanaid. No odour.
34		Orange-brown sand with shell grit. Bivalves (*Glycymeris striatularis*), gastropod, ostracod, polychaetes, tanaid. No odour.
35		Orange-brown sand with shell grit. Amphipods, bivalve, brittle star (*Ophiura kinbergi* sp), ostracod, polychaetes, trumpet worm (Pectinariidae). No odour.

VIDEO DATA COLLECTION

The seabed showed little variation across the survey area and was characterized by ridged sand with shell grit (Table 2). Invertebrates were observed in low numbers in most spot dives, with bivalves (*Glycymeris striatularis*), screw shells (*Maoricolpus roseus* and *Gazameda* sp.), ribbon worms (nemerteans) and polychaetes the most commonly recorded taxa. Fish were observed in low densities across the survey area, with sand flathead (*Platycephalus bassensis*) and sea moth (*Pegasus lancifer*) the only species recorded from the spot dives. A pale octopus (*Octopus pallidus*) was also observed at spot dive 7.

Table 2. Video descriptions for the thirty ROV dives taken within the proposed marine farming zone.

Spot Dive	Description
1	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Pebble crab (*Dittosa undecimspinosa*). Ribbon worms, small translucent fish.
2	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Unknown polychaete, dislodged algae, ribbon worms, a hermit crab, screw shell (suspected *Maoricolpus roseus*).
3	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Ribbon worms, drift algae and a screw shell (suspected *M. roseus*).
4	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Polychaete worm tube (empty), screw shell (suspected *M. roseus*)
5	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. *M. roseus*, flat polychaete.
6	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. Screw shells (suspected *M. roseus*), faunal burrow, bivalve (suspected *Glycymeris striatularis*), sculptured seamoth (*Pegasus lancifer*), ribbon worm, drift algae.
7	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. Brittle star, hermit crab, dead *Gazameda* sp., heart urchin tests, drift algae, pale octopus (*Octopus pallidus*), faunal burrow.
8	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Dense marine snow. Bivalve (suspected *G. striatularis*), hermit crab, screw shells (unknown sp.), drift algae.
9	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Ribbon worms, hermit crab, bivalve (suspected *G. striatularis)*.
10	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Bivalve (suspected *G. striatularis*), screw shell (suspected *Gazameda* sp.)
11	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Drift algae, bivalve (suspected *G. striatularis*), heart urchin tests, ribbon worms, screw shells (unknown sp.).

Spot Dive	Description
12	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Ribbon worms (some in burrows), screw shells (suspected *Gazameda* sp.), drift algae, heart urchin test, bivalve (suspected *G. striatularis*), screw shell (unknown sp.).
13	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. A ribbon worm, a hermit crab, a gastropod shell (suspected volute), a screw shell (unknown sp.).
14	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. A heart urchin test, screw shells (unknown sp.), sediment tracks, polychaete tube (suspected Pectinariidae).
15	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Dead gastropod shell, ribbon worm, polychaete tube extending from the sediment (empty).
16	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Algae, ribbon worms, hermit crab.
17	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Screw shells (unknown sp.), bivalve (suspected *G. striatularis*), drift algae.
18	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Ribbon worms, drift algae, screw shell (suspected *M. roseus*), hermit crab, bivalve (suspected *G. striatularis*).
19	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Screw shell (unknown sp.), sand flathead (*Platycephalus bassensis*), drift algae, ribbon worms (some protruding from burrows).
20	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Faunal burrow, screw shells (unknown sp.), polychaete tube extending from the sea floor.
21	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. Drift algae, ribbon worm, sculptured sea moth (*Pegasus lancifer*).
22	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Swarming crustaceans, screw shell (suspected *M. roseus*).
23	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Heart urchin tests, screw shell (unknown sp.)
24	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. Heart urchin test, hermit crab inside screw shell, bivalve (suspected *G. striatularis*), drift algae.
25	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Ribbon worms, heart urchin tests, screw shell (suspected *M. roseus*), bivalve (suspected *G. striatularis*).
26	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Bivalves (suspected *G. striatularis*), ribbon worms (in burrows), urchin test, screw shells (unknown sp.).
27	Ridged sand with shell grit. Pieces of consolidated sediment. Light marine snow. Ribbon worms (some in burrows), hermit crab, screw shells (suspected *Gazameda* sp.), drift algae, trumpet worm (Pectinariidae).
28	Ridged sand with shell grit. Pieces of consolidated sediment. Marine snow. Small swimming crustacean, crab (unknown sp.), hermit crab, drift algae.
29	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Small swarming crustaceans, polynoid scale worms, hermit crab inside screw shell.
30	Ridged sand with shell grit. Darker patches of fine silt/detritus in ridge troughs. Pieces of consolidated sediment. Marine snow. Ribbon worms, decapod shrimp, urchin test, drift sponge.

3.3 BENTHIC HABITAT MAPPING

Only one habitat category could be identified during the survey area, with ridged sand observed across the entire 1127 ha survey area (Figure 5). Representative images of this habitat, taken from frame grabs of video footage, are shown in Figure 6.

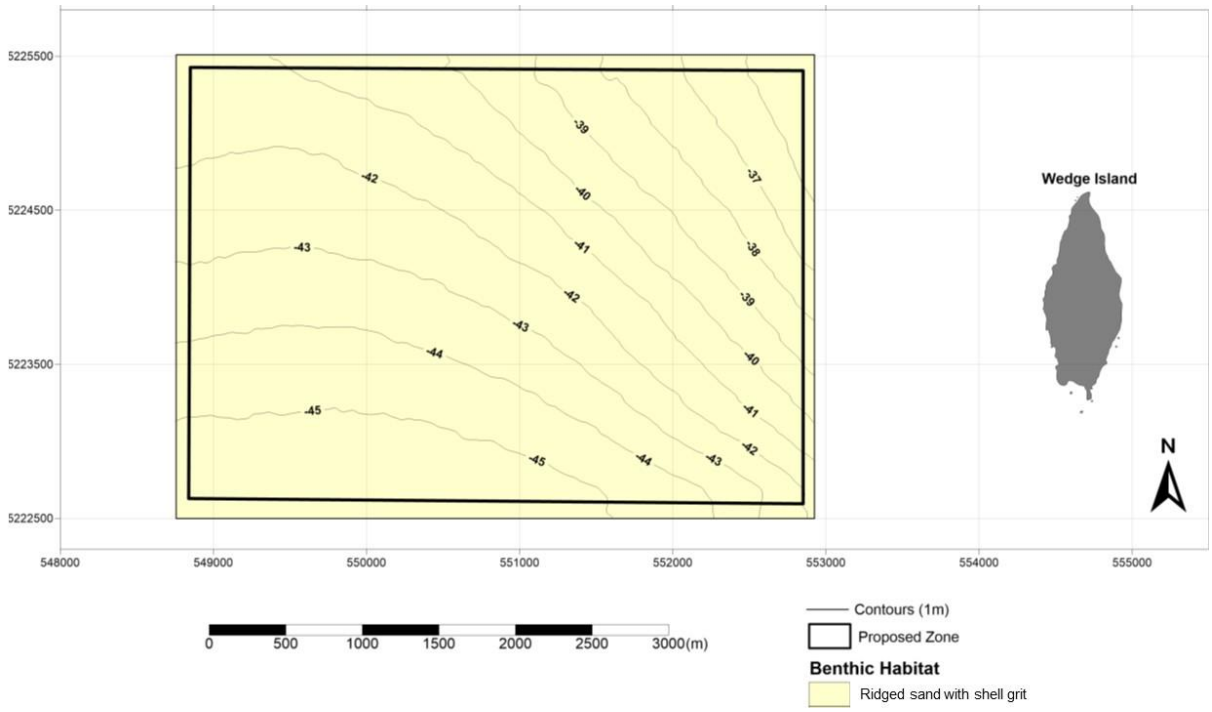


Figure 5. Benthic habitats within the proposed West of Wedge Island assessment area.

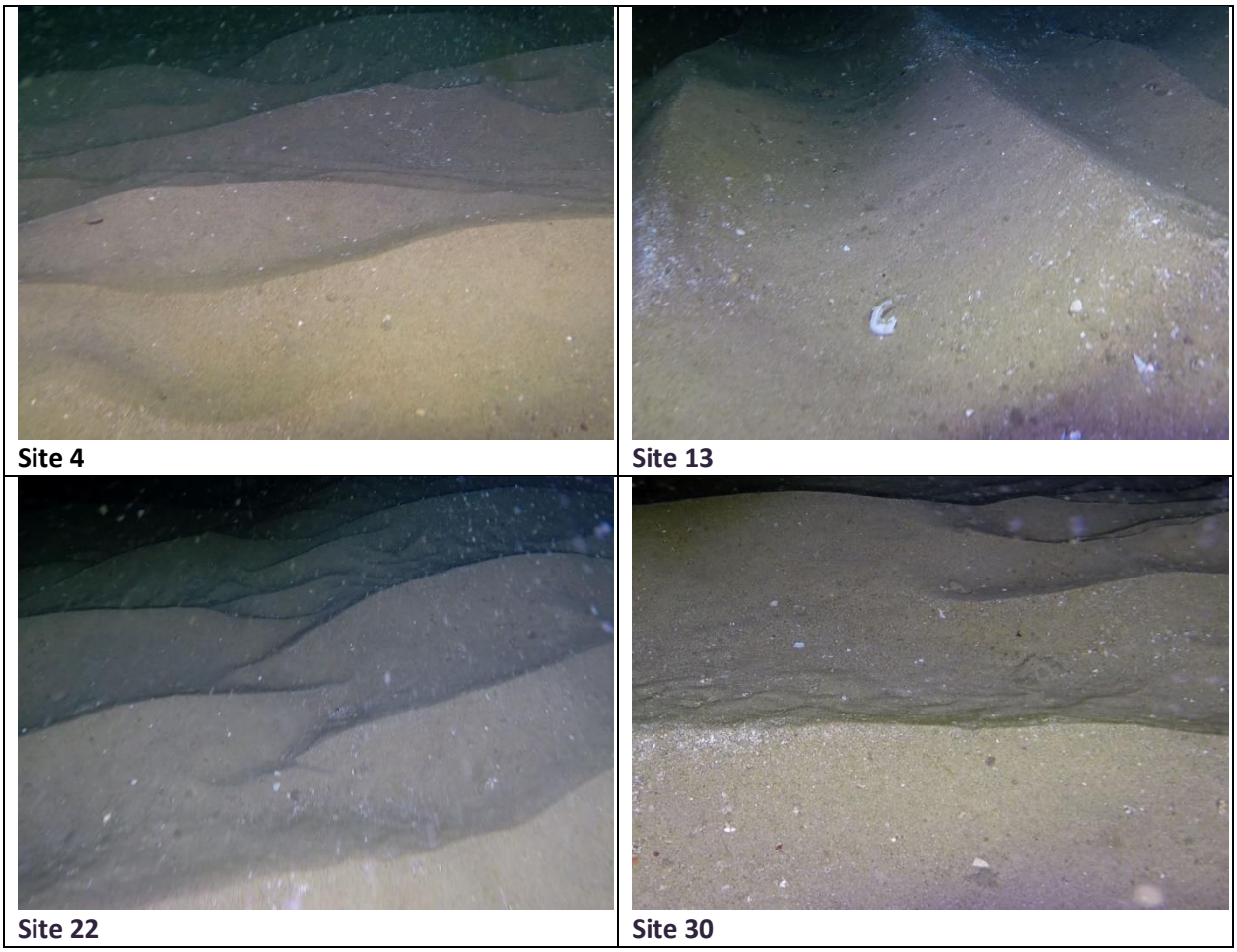


Figure 6. Frame grabs from ROV survey showing representative image of ridged sand habitat.

3.4 TARGETED *GAZAMEDA GUNNII* SURVEY

Results from the survey are presented in Figures 7-11 below. Five *Gazameda gunnii* shells were detected across the 120 sites, including a single live specimen at site 1.12 (Figure 12) and four dead shells at sites 1.17, 1.27, 3.11 and 4.20 (see Figures 8-11). A number of old and eroded *Gazameda* sp. shells were also recorded during the survey, these shells could not be reliably identified as they also resembled the closely related *G. tasmanica*.

As per DPIPWE requirements the live *G. gunnii* was relocated outside the zone area in a similar habitat and depth. Coordinates of the relocated *G. gunnii* individual is provided in Table 3 below.

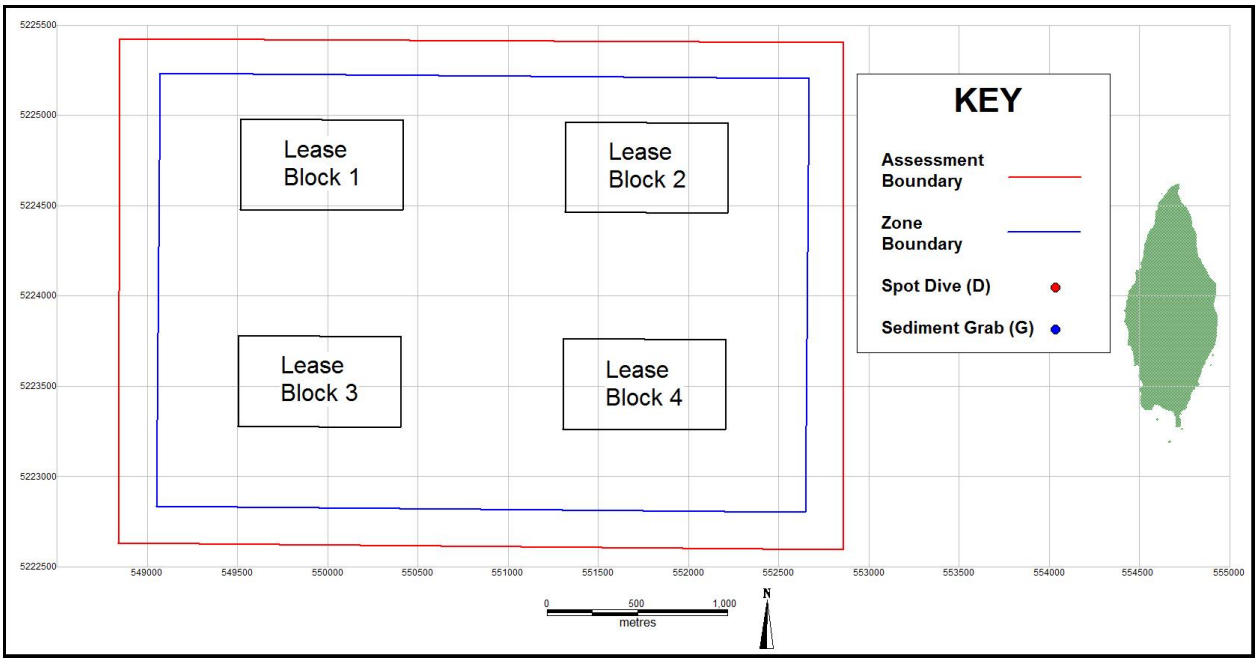


Figure 7. Map showing lease block areas where targeted *Gazameda gunnii* sampling was undertaken.

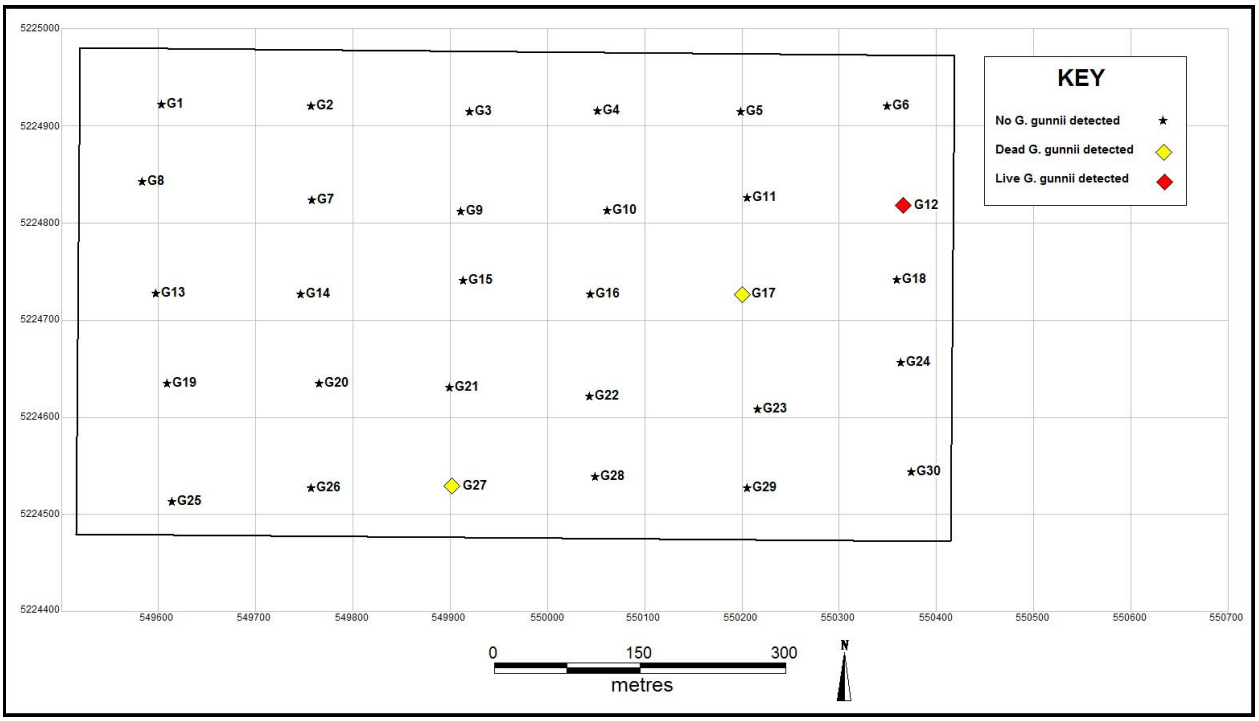


Figure 8. Results of targeted *Gazameda gunnii* survey within the proposed West of Wedge zone (Lease block 1).

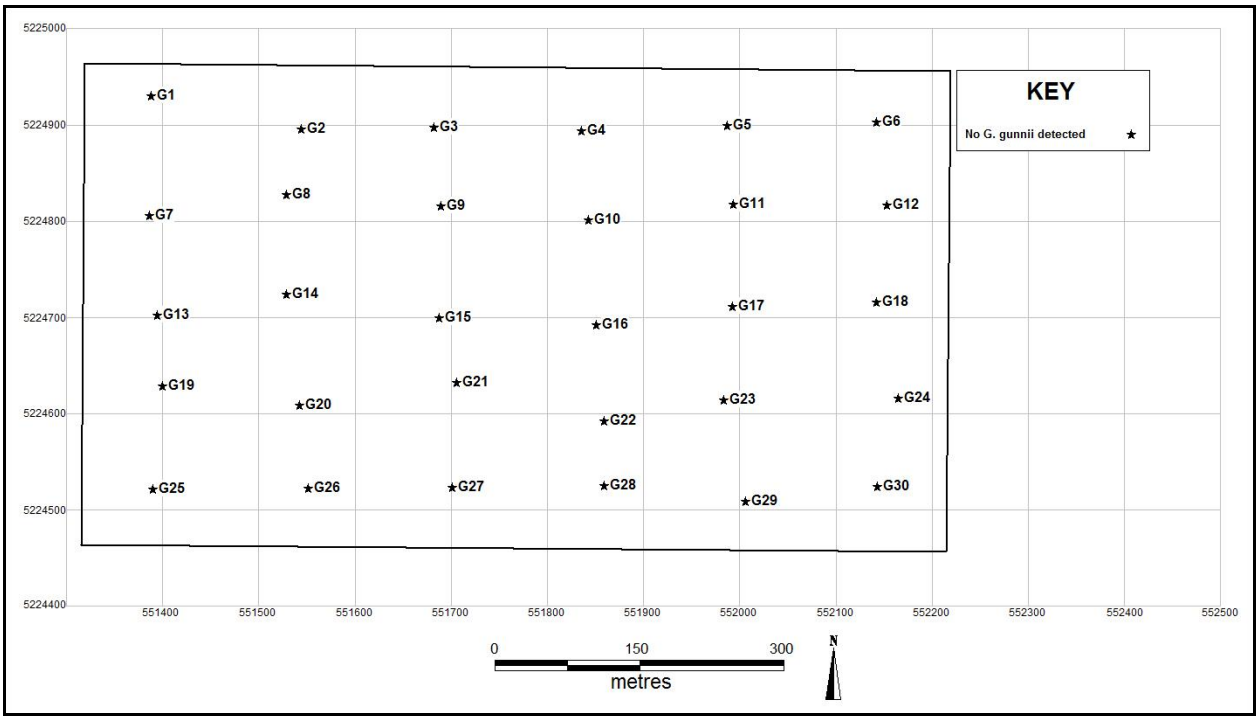


Figure 9. Results of targeted *Gazameda gunnii* survey within the proposed West of Wedge zone (Lease block 2).

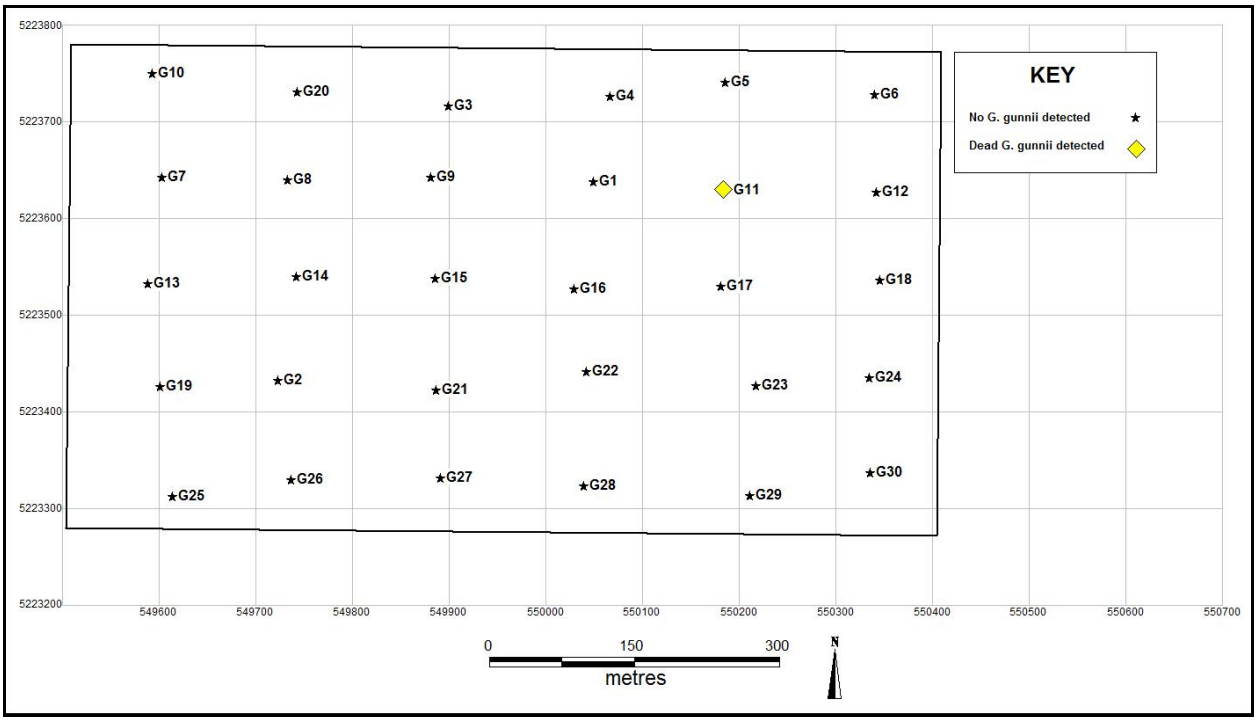


Figure 10. Results of targeted *Gazameda gunnii* survey within the proposed West of Wedge zone (Lease block 3).

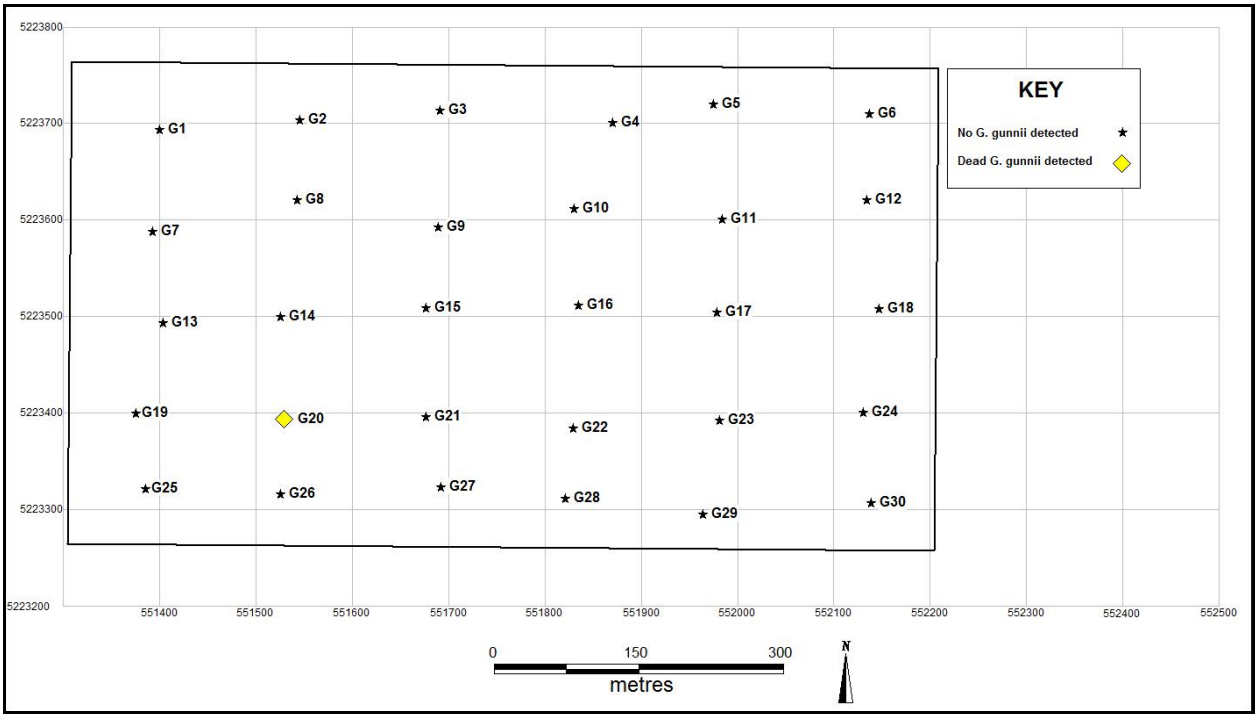


Figure 11. Results of targeted *Gazameda gunnii* survey within the proposed West of Wedge zone (Lease block 4).

Table 3. Coordinates showing location of relocated *Gazameda gunnii*.

Date	Depth	Easting	Northing
31/8/2016	42.4 m	522652	5236069

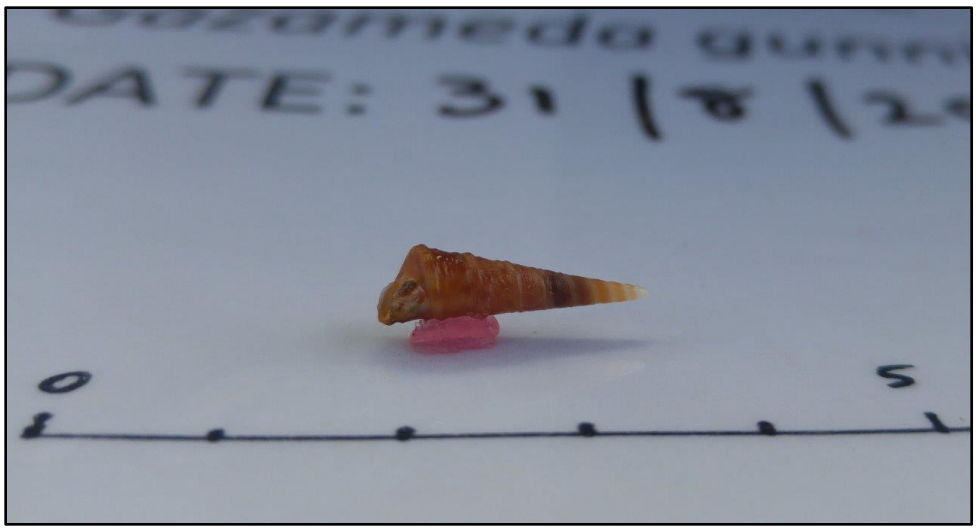


Figure 12. Live specimen of the native screw shell, *Gazameda gunnii,* collected during the targeted survey. Scale bar = 5 cm.

4 REFERENCES

DPIPWE (2016) Initial environmental assessment survey specifications for marine farming zone proposals. Proponent - Tassal Operations Pty Ltd, Proposal – Create new marine farming zone, Location – West of Wedge Island, 10 pp.

IMAS (2014) An environmental assessment of a proposed marine farming zone west of Wedge Island, South Eastern Tasmania. Internal report, 23 pp.

5 APPENDICES

5.1 GPS COORDINATES – SEDIMENT SAMPLING

Site	Easting	Northing	Depth (m)
1	549125	5225098	44.2
2	549716	5225087	44.3
3	550288	5225082	43.3
4	550864	5225087	42.7
5	551426	5225081	40.9
6	552007	5225083	40.2
7	552581	5225077	38.4
8	552574	5224558	39.3
9	552002	5224559	41.3
10	551427	5224553	42.5
11	550850	5224556	43.5
12	550283	5224563	44.6
13	549724	5224523	44.7
14	549130	5224540	44.8
15	549119	5223987	46.2
16	549693	5223983	46.2
17	550274	5223982	45.6
18	550848	5223971	45.0
19	551420	5223970	44.6
20	552002	5223961	43.0
21	552573	5223953	41.1
22	552590	5223424	42.2
23	552020	5223417	43.6
24	551438	5223418	45.5
25	550875	5223417	46.0
26	550282	5223402	47.0
27	549709	5223396	46.9
28	549126	5223389	47.0
29	549113	5222892	47.5
30	549707	5222868	44.5
31	550279	5222870	47.6
32	550872	5222858	47.2
33	551429	5222855	46.8
34	551992	5222849	45.9
35	552585	5222849	43.9
SPM #9805	522653	5236061	NA

5.2 GPS COORDINATES – ROV VIDEO SURVEYS

Site	Easting	Northing	Depth (m)
1	549413	5225093	43.5
2	549988	5225089	43.6
3	550562	5225096	43
4	551147	5225091	41.6
5	551714	5225087	40.2
6	552288	5225087	39.3
7	552282	5224542	40.2
8	551709	5224548	41.3
9	551142	5224557	43.1
10	550558	5224548	44.1
11	549984	5224547	44.7
12	549416	5224537	44.8
13	549406	5223966	46.1
14	549984	5223969	92.3
15	550558	5223971	45.3
16	551136	5223971	44.9
17	551708	5223976	43.6
18	552285	5223960	42.2
19	552293	5223409	43.5
20	551717	5223409	44.7
21	551138	5223401	45.9
22	550561	5223394	46.5
23	549980	5223383	47.1
24	549413	5223395	46.5
25	549409	5222875	47.4
26	549989	5222852	47.5
27	550568	5222852	47.5
28	551135	5222846	46.9
29	551706	5222848	46.2
30	552276	5222841	45.1
SPM #9805	522651	5236064	NA

5.3 GPS COORDINATES – TARGETED *GAZAMEDA GUNNII* SURVEY

Block	Site	Easting	Northing	Block	Site	Easting	Northing
1	1.1	549603	5224922	3	3.1	550049	5223638
1	1.2	549757	5224921	3	3.2	549723	5223433
1	1.3	549920	5224915	3	3.3	549899	5223716
1	1.4	550051	5224916	3	3.4	550066	5223726
1	1.5	550199	5224915	3	3.5	550185	5223741
1	1.6	550349	5224921	3	3.6	550340	5223728
1	1.7	549758	5224824	3	3.7	549603	5223643
1	1.8	549583	5224843	3	3.8	549733	5223640
1	1.9	549911	5224812	3	3.9	549881	5223643
1	1.10	550061	5224813	3	3.10	549593	5223750
1	1.11	550205	5224826	3	3.11	550183	5223630
1	1.12	550366	5224818	3	3.12	550342	5223627
1	1.13	549597	5224728	3	3.13	549588	5223533
1	1.14	549746	5224727	3	3.14	549742	5223540
1	1.15	549913	5224741	3	3.15	549885	5223538
1	1.16	550044	5224727	3	3.16	550029	5223527
1	1.17	550200	5224726	3	3.17	550181	5223530
1	1.18	550359	5224742	3	3.18	550345	5223536
1	1.19	549609	5224635	3	3.19	549601	5223426
1	1.20	549765	5224635	3	3.20	549743	5223731
1	1.21	549899	5224631	3	3.21	549886	5223423
1	1.22	550043	5224622	3	3.22	550042	5223442
1	1.23	550216	5224609	3	3.23	550217	5223427
1	1.24	550363	5224657	3	3.24	550334	5223435
1	1.25	549614	5224514	3	3.25	549614	5223313
1	1.26	549757	5224528	3	3.26	549736	5223330
1	1.27	549902	5224529	3	3.27	549891	5223332
1	1.28	550049	5224539	3	3.28	550039	5223324
1	1.29	550205	5224528	3	3.29	550211	5223314
1	1.30	550374	5224544	3	3.30	550335	5223337
2	2.1	551388	5224930	4	4.1	551400	5223694
2	2.2	551544	5224896	4	4.2	551545	5223704
2	2.3	551682	5224898	4	4.3	551691	5223714
2	2.4	551835	5224894	4	4.4	551870	5223701
2	2.5	551987	5224900	4	4.5	551975	5223720
2	2.6	552142	5224903	4	4.6	552137	5223710
2	2.7	551386	5224806	4	4.7	551392	5223588
2	2.8	551529	5224828	4	4.8	551543	5223621
2	2.9	551689	5224816	4	4.9	551689	5223593
2	2.10	551843	5224802	4	4.10	551830	5223612

Block	Site	Easting	Northing		Block	Site	Easting	Northing
2	2.11	551993	5224818		4	4.11	551984	5223601
2	2.12	552153	5224817		4	4.12	552134	5223621
2	2.13	551394	5224703		4	4.13	551403	5223494
2	2.14	551529	5224724		4	4.14	551525	5223500
2	2.15	551687	5224700		4	4.15	551676	5223509
2	2.16	551851	5224693		4	4.16	551835	5223512
2	2.17	551992	5224712		4	4.17	551979	5223505
2	2.18	552142	5224716		4	4.18	552147	5223508
2	2.19	551400	5224629		4	4.19	551375	5223400
2	2.20	551542	5224609		4	4.20	551529	5223394
2	2.21	551706	5224633		4	4.21	551676	5223396
2	2.22	551859	5224593		4	4.22	551829	5223385
2	2.23	551983	5224615		4	4.23	551981	5223393
2	2.24	552165	5224616		4	4.24	552131	5223401
2	2.25	551390	5224522		4	4.25	551385	5223322
2	2.26	551551	5224523		4	4.26	551525	5223316
2	2.27	551701	5224524		4	4.27	551692	5223324
2	2.28	551859	5224526		4	4.28	551821	5223312
2	2.29	552006	5224509		4	4.29	551964	5223295
2	2.30	552143	5224525		4	4.30	552139	5223307

5.4 OPERATIONAL SUMMARY

Date	Personnel	Start Time	Finish Time	Work Conducted	Cloud Cover	Wind (knots)	Sea
31/8/2015	S. Gray J. Lane J. Valentine	08:00	16:00	*Gazameda gunnii* survey	5/8	10 NW	1-2 m SW swell
1/09/2015	S. Gray J. Lane J. Valentine	08:00	16:00	*Gazameda gunnii* survey	5/8	10 – 20 W	2 m SW swell
5/09/2015	S. Gray J. Lane J. Valentine	08:00	16:00	*Gazameda gunnii* survey	5/8	Light & variable	2 m SW swell
23/09/2016	S. Ibbott L. Smith A. Ford	10:45	17:10	Bathymetric mapping	2/8	Light & variable	<0.5 m
23/09/2015	S. Gray J. Lane I. Cooksey	08:00	17:30	ROV survey	2/8	Light & variable	<0.5 m
24/09/2015	S. Ibbott L. Smith A. Ford	06:00	17:10	Bathymetric mapping	3/8	10 – 30 N/NW	Variable
21/09/2015	S. Gray J. Lane L.Smith	08:00	17:00	Sediment sampling	4/8	Light & variable	<0.5 m