

Shipwrecks – an international biosecurity risk?

On 5 March 2007, Northland Regional Council (NRC) was alerted to the presence of a large shipping hazard drifting approximately 10 nautical miles off Cape Brett in the Bay of Islands. The 15 m long structure was identified as the remains of the refrigerated stern section of a fishing vessel with the freezer engine, cooling fins and insulation material still largely intact (see Figure 1). Further investigations revealed the wreckage most likely originated from a Taiwanese fishing vessel lost in the Pacific Ocean five years ago.

While the primary objective for the NRC was to remove this shipping navigational hazard, the wreckage was also observed to have associated with it a wide range of potentially non-indigenous biofouling and reef dwelling organisms that could potentially pose a biosecurity threat to the area.

On 8 March 2007, an interagency field team was established with the aim of collecting a representative sample of specimens to identify and minimise any potentially significant biosecurity risks. The team comprised representatives from NRC and MAF Biosecurity New Zealand (MAFBNZ), and, under contract to NRC, Golder Associates (NZ) Ltd and Northland Underwater Technical Services.

Methods

The wreckage was towed closer to mainland New Zealand over two days after which it was recovered by a barge and towed to a slipway in Opuia, Bay of Islands.

Representative samples of motile organisms were removed by divers for identification prior to the wreck being removed from the water (see Figures 2a, 2b). Further sampling of encrusting and other non-motile fauna was undertaken on the barge journey to, and on arrival at, Opuia.

Results and discussion

Representatives of 78 taxa were sampled from the wreck. Two of these could not be identified but 76 taxa were identified to the lowest taxonomic level possible (Tables 1 and 2). Of these, 28 were classified as non-indigenous to New Zealand (Table 2).

A rapid risk assessment for each non-indigenous species was undertaken as part of the investigation. Most non-indigenous species were tropical in origin and their environmental tolerances indicated that New Zealand's cooler temperate waters were not favourable for supporting their reproduction and thus establishment of self-sustaining populations. The

Organisms in the wreckage of a fishing vessel found drifting off the coast of New Zealand were identified and their risk of establishing here assessed. The likelihood of the 28 non-indigenous species identified establishing was considered low. However, ship wreckage and floating refuse are potential vectors for spreading marine species.

Kermadec Islands, located approximately 1000 km northeast of mainland New Zealand, could conceivably support some of the species detected although some may already exist there undetected. For instance, the two Echinoids (sea urchins) and the Malacostraca (crustaceans) may already be present in the Kermadec Islands given the known range of the species.

The three exotic bivalves identified (*Dendostrea rosacea*, *Hyothis hyotis* and *Parahyothis quercinus*) are reported as capable of reaching high densities to form small reefs on sandy substrates. If they were to establish, they could have a similar impact as the Asian date mussel *Musculista senhousia*. This exotic bivalve has been present in New Zealand since at least 1978, and is known to form reefs or dense mats on soft substrate, which may smother native bivalves and modify local habitats⁽¹⁾. However, unlike *M senhousia*, *D rosacea*, *H hyotis* and *P quercinus* do not have documented invasive histories elsewhere.

The titan acorn barnacle (*Megabalanus coccopoma*) is a prolific biofouling organism and has previously been detected on international vessels visiting New Zealand (MAFBNZ project ZBS2004-03 Vessel biofouling as a vector for the introduction of

non-indigenous marine species to New Zealand). The impacts of this species outside its native range are unknown and, if established in New Zealand, it would need to compete for primary space on hard substrates with native sessile organisms such as algae, bivalves and other barnacles.

Internationally travelling vessels are well known vectors for non-indigenous marine species. Species arriving by natural drift or associated with flotsam and jetsam are less common. It is commonly believed that oceanic or pelagic species have the potential to be translocated by natural drift. However, the species identified



Figure 1: Portion of the fishing vessel wreckage visible from the surface while moored near Russell (photo: Rissa Williams, MAFBNZ)

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Table 1: List of species identified from the fishing vessel wreckage (indigenous to New Zealand, cryptogenic or status unknown)

Phylum	Class	Species	Biosecurity status	Taxon/Biosecurity comments
Chordata	Actinopterygii	<i>Abudefduf vaiqiensis</i>	Indigenous	Known introduced. Indigenous to Kermadec Islands, first reported from mainland in 1999
Arthropoda	Pycnogonida	<i>Achelia australiensis</i>	Indigenous	Native
Cnidaria	Anthozoa	<i>Actinothoe albens</i>	Indigenous	Endemic
Bryozoa	Gymnolaemata	<i>Aetea australis</i>	Indigenous	Native
Mollusca	Gastropoda	<i>Agnewia tritoniformis</i>	Indigenous	Native
Arthropoda	Maxillopoda	<i>Balanus trigonus</i>	Indigenous	Native
Mollusca	Gastropoda	<i>Bulla anqasi</i>	Indigenous	Native
Echinodermata	Echinoidea	<i>Centrostephanus rodgersii</i>	Indigenous	Native
Mollusca	Gastropoda	<i>Cerithium citrinum</i>	Indigenous	Native
Chlorophyta	Ulvophyceae	<i>Cladophora</i> sp	Status unknown	Status unknown
Mollusca	Gastropoda	<i>Cymatium parthenopium</i>	Indigenous	Native
Mollusca	Gastropoda	<i>Cypraea cernica</i>	Indigenous	Native
Rhodophyta	Florideophyceae	<i>Dasya</i> sp	Status unknown	Status unknown
Annelida	Polychaeta	<i>Dasybranchus</i> sp	Status unknown	Status unknown
Chlorophyta	Ulvophyceae	<i>Derbesia</i> sp	Status unknown	Status unknown
Cnidaria	Anthozoa	<i>Diadumene neozelanica</i>	Indigenous	Endemic
Mollusca	Gastropoda	<i>Dicathais orbita</i>	Indigenous	Native
Annelida	Polychaeta	<i>Dorvilleidae</i>	Status unknown	Status unknown
Echinodermata	Echinoidea	<i>Echinometra mathaei</i>	Indigenous	Native to tropical Indo-Pacific, including the Kermadec Islands
Ochrophyta	Phaeophyceae	<i>Ectocarpales</i>	Status unknown	Status unknown
Arthropoda	Malacostraca	<i>Haplocheira barbimana</i>	Cryptogenic	Known cryptogenic. Native to Australasia and Indonesia
Mollusca	Gastropoda	<i>Heliacus implexus</i>	Indigenous	Native to tropical Indo-Pacific including northern New Zealand
Mollusca	Bivalvia	<i>Heteroglypta contraria</i>	Indigenous	Native
Rhodophyta	Florideophyceae	<i>Heterosiphonia</i> sp	Status unknown	Status unknown
Cnidaria	Hydrozoa	<i>Hydrozoa</i>	Status unknown	Status unknown
Cnidaria	Anthozoa	<i>Isactinia olivacea</i>	Indigenous	Endemic
Annelida	Polychaeta	<i>Leocrates</i> sp	Status unknown	Status unknown
Arthropoda	Maxillopoda	<i>Lepas anatifera</i>	Indigenous	Native
Annelida	Polychaeta	<i>Lumbrineris</i> sp	Indigenous	Native
Mollusca	Bivalvia	<i>Modiolus</i> sp	Status unknown	Status unknown
Mollusca	Bivalvia	<i>Mytilus</i> sp	Status unknown	Either <i>M. edulis</i> or <i>M. galloprovincialis</i>
Arthropoda	Malacostraca	<i>Percnon planissimum</i>	Indigenous	Native to tropical Indo-Pacific
Sipuncula		<i>Phascolosoma</i>	Status unknown	Status unknown
Arthropoda	Malacostraca	<i>Plagusia chabrus</i>	Indigenous	Native. Also in Australian waters
Arthropoda	Malacostraca	<i>Plagusia dentipes</i>	Indigenous	Native
Arthropoda	Malacostraca	<i>Plagusia tuberculata</i>	Indigenous	Native
Rhodophyta	Florideophyceae	<i>Polysiphonia</i> sp	Status unknown	Status unknown
Rhodophyta	Florideophyceae	<i>Rhodomelaceae</i>	Status unknown	Status unknown
Annelida	Polychaeta	<i>Salmacina australis</i>	Indigenous	Native
Arthropoda	Malacostraca	<i>Schizophorida hilensis</i>	Indigenous	Native to tropical Pacific including Kermadec Islands and probably northern New Zealand
Sipuncula		<i>Sipuncula</i>	Status unknown	Status unknown
Ochrophyta	Phaeophyceae	<i>Sphacelaria</i> sp	Status unknown	Status unknown
Mollusca	Bivalvia	<i>Spondylus</i> sp	Status unknown	Status unknown
Porifera	Demospongiae	<i>Spongonella</i> sp	Status unknown	Alien genus, undescribed species
Mollusca	Bivalvia	<i>Streptopinna saccata</i>	Indigenous	Kermadec Islands
Bryozoa	Gymnolaemata	<i>Thalamoporella n</i> sp	Status unknown	Undescribed species
Mollusca	Gastropoda	<i>Vermetidae</i>	Status unknown	Status unknown

Table 2: List of species non-indigenous to New Zealand identified from the fishing vessel wreckage

Phylum	Class	Species	Biosecurity status	Taxon/Biosecurity comments
Arthropoda	Malacostraca	<i>Actumnus setifer</i>	Non-indigenous	Native to Australia, Indo-Pacific
Arthropoda	Malacostraca	<i>Alpheus parasocialis</i>	Non-indigenous	Native to Australia
Bivalvia	Bivalvia	<i>Anomia chinensis</i>	Non-indigenous	Native to South China Sea. Introduced to western USA
Bryozoa	Gymnolaemata	<i>Brettiella culmosa</i>	Non-indigenous	Native to Vanuatu
Bryozoa	Gymnolaemata	<i>Bugula vectifera</i>	Non-indigenous	Native to Indo-Pacific, Japan and Northeast Australia
Bryozoa	Gymnolaemata	<i>Celleporaria pilaefera</i>	Non-indigenous	Native to Indo-Pacific, introduced to the Mediterranean
Mollusca	Bivalvia	<i>Dendostrea rosacea</i>	Non-indigenous	Native to tropical Western Pacific
Echinodermata	Echinoidea	<i>Diadema setosum</i>	Non-indigenous	Native to tropical Indo-Pacific
Echinodermata	Echinoidea	<i>Eucidaris metularia</i>	Non-indigenous	Native to Indo-Pacific
Arthropoda	Malacostraca	<i>Galathea spinosirostris</i>	Non-indigenous	Native to Indo-Pacific
Arthropoda	Malacostraca	<i>Hachijopagurus rubrimaculata</i>	Non-indigenous	Native to Japan
Chordata	Ascidiacea	<i>Herdmania momus</i>	Non-indigenous	Pan tropical
Echinodermata	Holothuroidea	<i>Holothuria impatiens</i>	Non-indigenous	Circumtropical. Part of a large species complex
Mollusca	Bivalvia	<i>Hyotissa hyotis</i>	Non-indigenous	Native to Indo-Pacific. Red Sea to Hawaii and Queensland
Arthropoda	Malacostraca	<i>Mallacoota insignis</i>	Non-indigenous	Native to tropical Indo-Pacific
Arthropoda	Maxillopoda	<i>Megabalanus coccopoma</i>	Non-indigenous	Native to Eastern Pacific; introduced to Western Pacific
Mollusca	Bivalvia	<i>Mimachlamys senatoria</i>	Non-indigenous	Native to tropical Indo-Pacific. Persian Gulf to Great Barrier Reef and New Caledonia
Echinodermata	Ophiuroidea	<i>Ophiactis saviqnyi</i>	Non-indigenous	Pan tropical
Echinodermata	Ophiuroidea	<i>Ophioclastus hataii</i>	Non-indigenous	Tropical Western Pacific
Echinodermata	Ophiuroidea	<i>Ophiocoma erinaceus</i>	Non-indigenous	Native to tropical Indo-Pacific
Echinodermata	Ophiuroidea	<i>Ophiocoma pusilla</i>	Non-indigenous	Native to tropical Indo-Pacific
Echinodermata	Ophiuroidea	<i>Ophioneis porrecta</i>	Non-indigenous	Native to tropical Indo-Pacific
Arthropoda	Malacostraca	<i>Pachygrapsus laevimanus</i>	Non-indigenous	Native to Australia, Indo-Pacific
Mollusca	Bivalvia	<i>Parahyotissa quercinus</i>	Non-indigenous	
Annelida	Polychaeta	<i>Pherecardia striata</i>	Non-indigenous	Known from tropical coral reefs
Mollusca	Bivalvia	<i>Pinctada martensii</i>	Non-indigenous	Native to Western Pacific
Mollusca	Bivalvia	<i>Plicatula australis</i>	Non-indigenous	Native to tropical Indo-Pacific. India to Australia and Philippines
Mollusca	Bivalvia	<i>Scaechlamys squamata</i>	Non-indigenous	Native to Indo-Pacific region

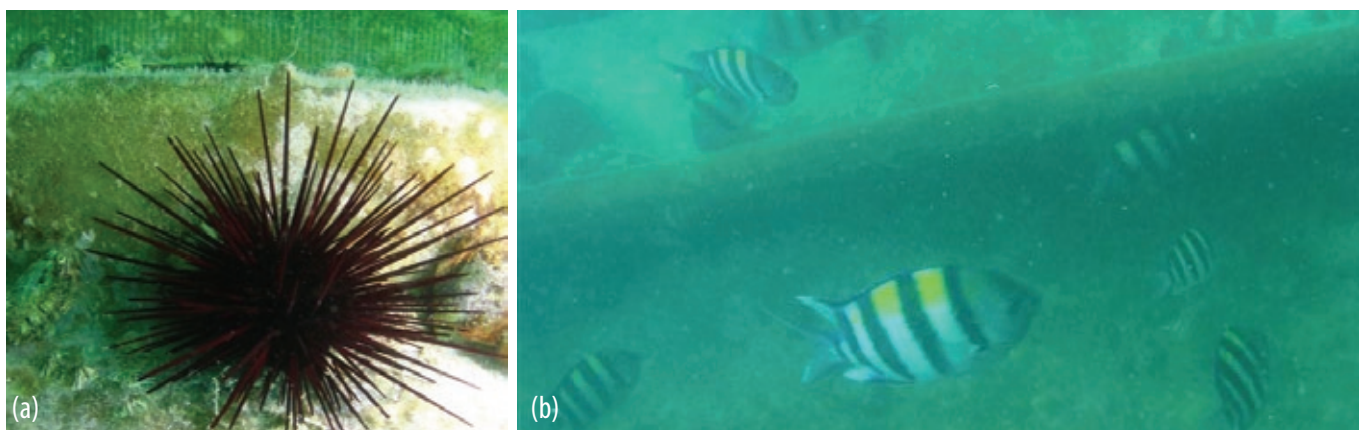


Figure 2: Two motile species identified from the wreckage: (a) a tropical Indo-Pacific echinoid *Diadema* sp, and (b) the Kermadec Island native *Abudefduf vaigiensis* (Photos: Matt Conmee, Northland Underwater Technical Services)



Figure 3: Wreckage being winched from the water onto a barge for removal to Opuia (photo: Rissa Williams, MAFBNZ)



Figure 4: Wreckage ashore at Opuia (photo: Rissa Williams, MAFBNZ)

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from the floating fishing vessel wreckage that drifted into the Bay of Islands are not all pelagic species but include shallow-water demersal and reef-dwelling species. This clearly identifies ship wreckage and other floating refuse as novel vectors for facilitating the spread of non-indigenous marine species, by providing habitat as well as refuge and protection from oceanic conditions such as high seas, and allowing otherwise non-oceanic species to survive long journeys.

The likelihood of the 28 non-indigenous marine species identified from the wreck establishing in New Zealand was considered to be low as they are largely tropical species. The possibility of adverse consequences of establishment is also considered low as these species are not known to be pests outside their native ranges.

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Reference

- (1) Creese R, Hooker S, de Luca S, Wharton Y. Ecology and environmental impact of *Musculista senhousia* (Mollusca: Bivalvia: Mytilidae) in Tamaki Estuary, Auckland, New Zealand. *New Zealand Journal of Marine and Freshwater Research* 31, 225-36, 1997.

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