1. PROJECT INFORMATION

Title	PICES Tohoku coastal field survey (fouling plate) – supplemental study for U.S. tsunami debris spp. List in Year 3
Award period	Jan 20, 2016 – Dec 31, 2016
Amount of funding	$ 86,206 CAD
Report submission date	Dec. 31st, 2016
Lead Author of Report*	Hisatsugu Kato (JANUS), Michio Otani, Taichi Yonezawa (JANUS)

**Although there may be only one lead author of the report, all PIs and co-PIs of the project, as identified in the approved statement of work and listed below, are responsible for the content of the Final Report in terms of completeness and accuracy.*

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2. YEAR 3 PROGRESS SUMMARY

a. Describe progress.

The field surveys for Installation and retrieval of fouling plates, morphological identification, and DNA sequencing were conducted as follows.

- Field survey

All the field surveys are completed in accordance with a following schedule (Table 1).

Table 1 Schedule for the field surveys in the year 3

	Placement (# of plates)	1 month (# plates)	3 month (plan) (# plates)
Miyako	Apr. 26th (30)	May. 31st (15)	Aug. 2nd (15)
Minami-Sanriku	Apr. 26th (30)	Jun. 1st (14*)	Aug. 3rd (15)

* One of the fouling plates placed in Minami-Sanriku was lost in the sea.

- Morphological identification

Analyses for the first and second samples are completed. The lists of species found in the morphological identification are shown in Chapter 4-d.

- DNA sequencing

The samples of the first and second surveys for DNA analysis were sent to Dr. Jonathan Geller at Moss Landing Marine Labs.

Tohoku area

Miyako

Minami-Sanriku

Figure 1 Fouling plates Installation sites in the year 3

b. Describe any concerns or challenges you may have about your project's progress.

The survey is successfully completed. Therefore we have no concerns about the TOHOKU survey project.

3. ABSTRACT

The surveys were conducted at several locations in the Tohoku coast. In the year 2 survey fouling plates of 14cm square were installed in 3 different locations; Miyako (Iwate prefecture), Kesennuma and Matsushima (Miyagi prefecture) in July or August, 2015. In the year 3 survey the fouling plates were installed in 2 different locations; Miyako, Minami-Sanriku (Miyagi prefecture) in April, 2016.
The fouling plates installed at each site were retrieved in about 1 month (the first survey) and 3 months (the second survey) after installation. Finally we successfully got plenty of samples utilized for morphological identification and DNA analysis. The result is shown in Chapter4-d.

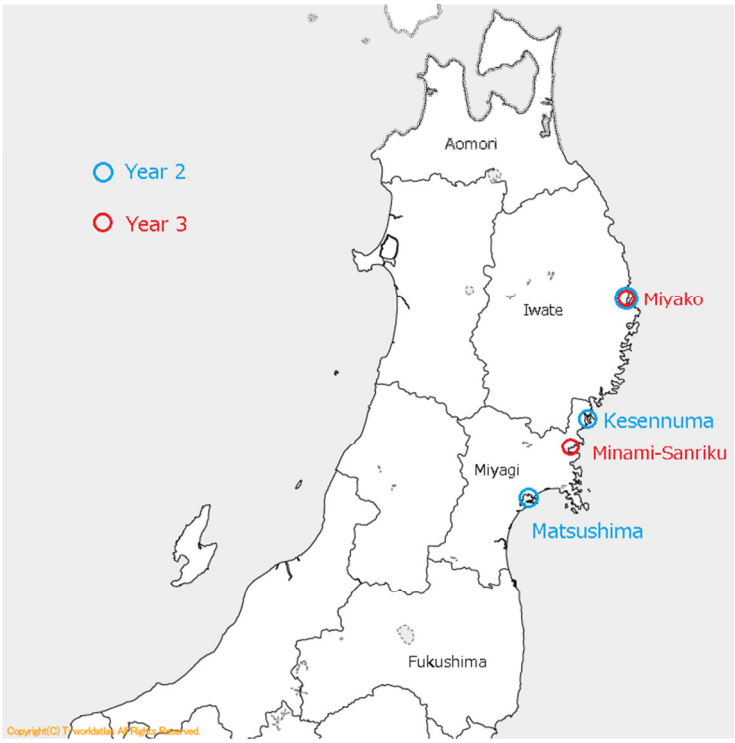


Figure 2 Fouling plates Installation sites in the year 2 and 3

4. PROJECT DESCRIPTION

a) Research Purpose

Tohoku coast is a ria coast and each survey site is in the inlet. The inlets have the brackish-water inputs which make the areas suitable for coastal fishery and the aquaculture. In the ria coasts, shallow and narrow inlets trapped and focused incoming tsunami waves and created destructive swells and currents that pushed large volumes of water far inland. All survey sites suffered serious damage by the tsunami after the Great East Japan Earthquake in 2011.
During the Great East Japan Earthquake and tsunami in 2011, vast amount of debris got washed out from land and some became Japanese Tsunami Marine Debris (JTMD) and reached to Hawaii and west coast of the U.S. and Canada with many coastal fouling organisms attached.
It is uncertain amount and species of fouling organisms which were transferred from Japan to the U.S. and Canada so that the purpose of the survey is to obtain enough samples for identifying invasive species from Tohoku coast.

b) Objectives

The objective of this survey is to obtain a thorough collection of fouling organisms to morphologically and genetically complement the existing collection of JTMD species in Japan and to ship them to U.S. scientists who are in charge of DNA analysis.

c) Methods

The proposed research is the survey which is aimed to obtain a thorough collection of fouling organisms to morphologically and genetically complement the existing collection of JTMD species, as well as to identify additional/new genetic strains that may have invasion potential. The survey was to be conducted at several locations in the Tohoku area. The survey design was planned and organized by mainly U.S. scientists and co-organized by Dr. Takami (Tohoku National Fisheries Research Institute), Mr. Otani and personnel from JANUS.

The survey was conducted as follows:

1. Install fouling plates of 14cm square in 3 different locations; Miyako (Year 2 & 3), Kesennuma (Year 2) and Matsushima (Year 2), Minami-Sanriku (Year 3). The plates installed were shipped from the U.S. scientists (supports were given by Dr. Greg Ruiz, Dr. James Carlton and Dr. Jonathan Geller).

2. Retrieve the fouling plates after 1 month and 3 months of their installation. The schedule of the surveys is shown in Table 2.

3. Analyze the retrieved fouling plate and identify spp. on the plates (basic protocol shown by the U.S. scientists)

4. Detail identification in laboratory and extract samples for DNA analysis – shipment to the U.S.

5. Shipment of oysters and mussels for analysis on parasites (if possible).

Table 2 Schedule of the field survey for year 2 and 3

		Placement (# of plates)	1 month (# plates)	3 month (# plates)
Year 2 (2015)	Miyako	Aug. 12th (30)	Sep. 8th (15)	Nov. 10th (15)
	Kesennuma	Aug. 4th (10*)	Sep. 8th (5)	Nov. 11th (5)
	Matsushima	Jul. 24th (30)	Sep. 10th (15)	Nov. 12th (15)
Year 3 (2016)	Miyako	Apr. 26th (30)	May. 31st (15)	Aug. 2nd (15)
	Minami-Sanriku	Apr. 26th (30)	Jun. 1st (14*)	Aug. 3rd (15)

* In Kesennuma, due to limited availability of space, minimum # of plates were installed

* One of the fouling plates placed in Minami-Sanriku was lost in the sea.

d) Results

The appearance of fouling plates in each location is illustrated in Table 3. The numbers of morphological specimen and samples for DNA analysis are shown in Table 4. The number of the samples for DNA analysis means the number of identified species.

The state of the fouling species varies depending on the location. Number of species found was the highest in Matsushima, and the fewest in Minami-Sanriku. More species were detected in the second survey than the first survey in all sites. Phylum Arthropoda (especially Class Malacostraca) dominated at all sites.

Table 3 Retrieved fouling Plates

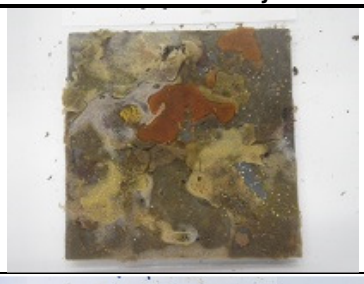
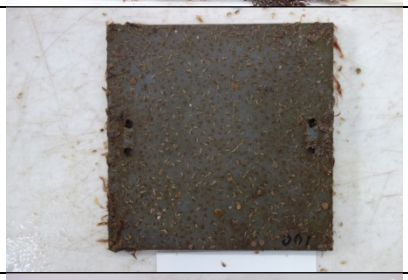
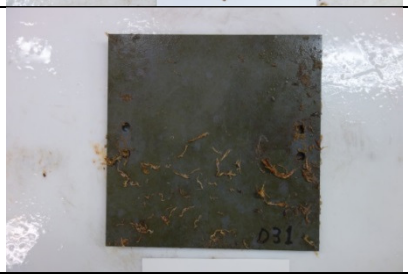
		The first survey	The second survey
Year 2	Miyako		
	Kesennuma		
	Matsushima		
Year 3	Miyako		
	Minami-Sanriku		

Table 4 The numbers of the specimens prepared

		The first survey		The second survey	
		Samples for DNA analysis	Morphological specimens	Samples for DNA analysis	Morphological specimens
Year 2	Miyako	31	14	51	16
	Kesennuma	35	9	65	14
	Matsushima	63	22	79	26
Year 3	Miyako	25	3	45	24
	Minami-Sanriku	14	5	37	13

Table 5 The numbers of the appearance species for year 2 and 3

PHYLUM	Year 2						Year 3			
	Miyako		Kesennuma		Matsushima		Miyako		Minami-Sanriku	
	The first survey	The second survey	The first survey	The second survey	The first survey	The second survey	The first survey	The second survey	The first survey	The second survey
PORIFERA	-	1	-	2	1	3	-	1	-	-
CNIDARIA	1	1	1	1	3	2	-	-	1	1
NEMERTINEA	-	1	-	1	-	1	-	1	-	2
KAMPTOZOA	-	-	-	-	-	1	-	-	-	-
TENTACULATA	1	5	3	5	3	7	3	4	-	3
MOLLUSCA	-	3	3	4	6	9	4	5	2	3
ANNELIDA	2	9	3	15	15	10	2	5	-	5
ARTHROPODA	21	22	21	30	27	35	14	18	11	18
CHORDATA	6	9	4	7	8	11	2	11	-	5
total	31	51	35	65	63	79	25	45	14	37

Lists of all the species found in each survey are shown in the tables below. Most of fouling organisms identified in the surveys are native to Japanese coasts.

Table 6 Identified species in Miyako (Year 2)

The first survey			
	PHYLUM	CLASS	Species
1	CNIDARIA	HYDROZOA	*Halecium pusillum*
2	TENTACULATA	BRYOZOA	*Celleporina* sp.
3	ANNELIDA	POLYCHAETA	*Hydroides ezoensis*
4			*Neodexiospira alveolata*
5	ARTHROPODA	MAXILLOPODA	*Amphibalanus improvisus*
6			*Perforatus perforatus*
7		MALACOSTRACA	*Ampithoe* sp. 1
8			*Aoroides* sp.
9			*Monocorophium achersicum*
10			*Ericthonius convexus*
11			*Jassa slatteryi*
12			*Paradexamine* sp.
13			*Polycheria* sp.
14			*Melita* sp.
15			*Leucothoe nagatai*
16			*Stenothoe* sp. 2
17			*Stenothoe* sp. 1
18			*Caprella equilibra*
19			*Caprella mutica*
20			*Caprella scaura*
21			*Paranthura japonica*
22			*Ianiropsis serricaudi*
23			*Synidotea hikigawaensis*
24			*Cymodoce japonica*
25			*Zeuxo* sp. (aff. *Z. coralensis*)
26	CHORDATA	ASCIDIACEA	*Diplosoma listerarium*
27			*Distaplia dubia*
28			Botryllidae gen. sp. 1
29			Botryllidae gen. sp. 2
30			Botryllidae gen sp. 3
31			Botryllidae gen sp. 4

The second survey			
	PHYLUM	CLASS	Species
1	PORIFERA	DEMOSPONGIAE	*Halichondria* sp.
2	CNIDARIA	HYDROZOA	*Halecium pusillum*
3	NEMERTINEA	ENOPLA	*Nemertellina yamaokai*
4	TENTACULATA	BRYOZOA	*Membranipora* sp.
5			*Tricellaria inopinata*
6			*Celleporaria* sp.
7			*Celleporina porosissima*
8			*Escharella takatukii*
9	MOLLUSCA	GASTROPODA	*Sakuraeolis* sp.
10		BIVALVIA	*Mytilus galloprovincialis*
11			*Musculista senhousia*
12	ANNELIDA	POLYCHAETA	*Hemilepidonotus helotypus*
13			*Anaitides* sp.
14			*Eularia viridis japanensis*
15			*Syllis sp.*
16			*Nereis pelagica*
17			*Platynereis bicanaliculata*
18			*Arabella* sp.
19			*Nicolea* sp.
20			*Hydroides ezoensis*
21	ARTHROPODA	PYCNOGONIDEA	*Anoplodactylus crassus*
22		MAXILLOPODA	*Balanus trigonus*
23			*Amphibalanus amphitrite*
24			*Amphibalanus improvisus*
25			*Fistulobalanus albicostatus*
26			*Perforatus perforatus*
27		MALACOSTRACA	*Ampithoe* sp. 1
28			*Aoroides* sp.
29			*Monocorophium achersicum*
30			*Gammaropsis japonica*
31			*Ericthonius convexus*
32			*Jassa slatteryi*
33			*Polycheria* sp.
34			*Stenothoe* sp. 2
35			*Caprella equilibra*
36			*Caprella mutica*
37			*Caprella scaura*
38			*Paranthura japonica*
39			*Ianiropsis serricaudis*
40			*Synidotea hikigawaensis*
41			*Cymodoce japonica*
42			*Zeuxo* sp. (aff. *Z. maledivensis*)
43	CHORDATA	ASCIDIACEA	*Distaplia dubia*
44			*Ciona savignyi*
45			*Perophora japonica*
46			*Ascicia* sp.
47			*Botryllus schlosseri*
48			Botryllidae gen. sp. 1
49			Botryllidae gen. sp. 2
50			Botryllidae gen. sp. 3
51			*Styela* sp.

Table 7 Identified species in Kesennnuma (Year 2)

	The first survey		
	PHYLUM	CLASS	Species
1	CNIDARIA	ANTHOZOA	*Diadumene lineata*
2	TENTACULATA	BRYOZOA	*Tricellaria inopinata*
3			*Celleporina* sp.
4			*Watersipora cucullata*
5	MOLLUSCA	BIVALVIA	*Anomia chinensis*
6			*Crassostrea gigas*
7			*Protothaca jedoensis*
8	ANNELIDA	POLYCHAETA	*Syllis* sp.
9			*Hydroides ezoensis*
10			*Neodexiospira alveolata*
11	ARTHROPODA	MAXILLOPODA	*Chthamalus challengeri*
12			*Balanus trigonus*
13			*Amphibalanus improvisus*
14			*Perforatus perforatus*
15			*Megabalanus rosa*
16		MALACOSTRACA	*Ampithoe* sp. 2
17			*Gammaropsis japonica*
18			*Ericthonius convexus*
19			*Jassa slatteryi*
20			*Polycheria* sp.
21			*Pontogeneia* sp.
22			*Maera pacifica*
23			*Melita* sp.
24			*Gitanopsis* sp.
25			*Anamixis* sp.
26			*Parapleustes* sp.
27			*Stenothoe* sp. 2
28			*Caprella equilibra*
29			*Paranthura japonica*
30			*Ianiropsis serricaudi*
31			*Cirolana harfordi japonica*
32	CHORDATA	ASCIDIACEA	*Diplosoma listerianum*
33			Botryllidae gen sp. 1
34			Botryllidae gen sp. 2
35			*Symplegma reptans*

	The second survey		
	PHYLUM	CLASS	Species
1	PORIFERA	CALCAREA	*Grantessa* sp.
2		DEMOSPONGIAE	*Halichondria* sp.
3	CNIDARIA	ANTHOZOA	ACTINIARIA
4	NEMERTINEA	ENOPLA	*Nemertellina yamaokai*
5	TENTACULATA	BRYOZOA	*Amathia distans*
6			*Tricellaria occidentalis*
7			*Celleporina porosissima*
8			*Escharella takatukii*
9			*Watersipora cucullata*
10	MOLLUSCA	GASTROPODA	*Mitrella bicincta*
11		BIVALVIA	*Mytilus galloprovincialis*
12			*Musculus cupreus*
13			*Crassostrea gigas*
14	ANNELIDA	POLYCHAETA	*Halosydna brevisetosa*
15			*Lepidonotus elongatus*
16			*Eulalia viridis japanensis*
17			*Eulalia* sp.
18			*Nereiphylla castanea*
19			*Syllis* sp.
20			*Neanthes caudata*
21			*Nereis multignatha*
22			*Nereis neoneanthes*
23			*Platynereis bicanaliculata*
24			*Armandia* sp.
25			*Polyophthalmus pictus*
26			*Nicolea* sp.
27			*Hydroides ezoensis*
28			*Neodexiospira alveolata*
29	ARTHROPODA	MAXILLOPODA	*Balanus trigonus*
30		MAXILLOPODA	*Amphibalanus improvisus*
31			*Perforatus perforatus*
32			*Megabalanus rosa*
33		MALACOSTRACA	*Ampithoe* sp. 1
34			*Aoroides longimerus*
35			*Monocorophium sextonae*
36			*Monocorophium uenoi*
37			*Gammaropsis japonica*
38			*Ericthonius convexus*
39			*Jassa slatteryi*
40			*Podocerus* sp.
41			*Polycheria* sp.
42			*Maera pacifica*
43			*Maera* sp.
44			*Melita rylovae*
45			*Gitanopsis sp.*
46			*Parapleustes* sp.
47			*Stenothoe* sp. 2
48			*Orchomene* sp.
49			*Cypsiphimedia mala*
50			*Caprella equilibra*
51			*Caprella polyacantha*
52			*Caprella penantis*
53			*Caprella scaura*
54			*Paranthura japonica*
55			*Ianiropsis serricaudis*
56			*Cirolana harfordi japonica*
57			*Dynoides dentisinus*
58			*Eualus leptognathus*
59	CHORDATA	ASCIDIACEA	*Aplidium* sp.
60			*Diplosoma listerianum*
61			*Ciona intestinalis* type A
62			*Ciona savignyi*
63			*Ascidia sydneiensis*
64			Botryllidae gen. sp.2
65			*Styela canopus*

Table 8 Identified species in Matsushima (Year 2)

	The first survey		
	PHYLUM	CLASS	Species
1	PORIFERA	CALCAREA	*Grantessa* sp.
2	CNIDARIA	HYDROZOA	*Eudendrium* sp.
3		ANTHOZOA	*Diadumene lineata*
4			*Anthopleura* sp.
5	TENTACULATA	BRYOZOA	*Amathia distans*
6			*Bugula neritina*
7			*Bugula stolonifera*
8	MOLLUSCA	GASTROPODA	*Dendrodoris fumata*
9		BIVALVIA	*Musculista senhousia*
10			*Chlamys* sp.
11			*Anomia chinensis*
12			*Crassostrea gigas*
13			*Theora fragilis*
14	ANNELIDA	POLYCHAETA	*Lepidonotus elongatus*
15			*Anaitides* sp.
16			*Eulalia viridis*
17			*Proceraea* sp.
18			*Syllis* sp.
19			*Neanthes caudata*
20			*Nereis multignatha*
21			*Nereis neoneanthes*
22			*Platynereis bicanaliculata*
23			*Dorvillea* sp.
24			*Nicolea* sp.
25			Terebellidae gen. sp.
26			*Pseudopotamilla* sp.
27			*Sabella* sp.
28			*Hydroides ezoensis*
29	ARTHROPODA	PYCNOGONIDEA	*Callipallene* sp.
30			*Anoplodactylus crassus*
31		MAXILLOPODA	*Amphibalanus improvisus*
32		MALACOSTRACA	*Ampithoe* sp. 1
33			*Aoroides longimerus*
34			*Corophium acherusicum*
35			*Jassa slatteryi*
36			*Paradexamine* sp.
37			*Polycheria* sp.
38			*Melita rylovae*
39			*Gitanopsis* sp.
40			*Anamixis* sp.
41			*Colomastix* sp.
42			*Leucothoe nagatai*
43			*Parapleustes* sp.
44			*Stenothoe* sp. 1
45			*Stenothoe* sp. 2
46			*Liljeborgia serrata*
47			*Orchomene* sp.
48			*Cypsiphimedia mala*
49			*Caprella penantis*
50			*Caprella scaura*
51			*Paranthura japonica*
52			*Ianiropsis serricaudi*
53			*Cymodoce japonica*
54			*Eualus leptognathus*
55			*Heptacarpus rectirostris*
56	CHORDATA	ASCIDIACEA	*Didemnum* sp.
57			*Ciona intestinalis* type A
58			*Ciona savignyi*
59			*Ascidia zara*
60			*Ascidia sydneiensis*
61			Botryllidae gen. sp.
62			*Molgula manhattensis*
63			*Tridentiger trigonocephalus*

	The second survey		
	PHYLUM	CLASS	Species
1	PORIFERA	CALCAREA	*Grantessa* sp.
2		DEMOSPONGIAE	*Halichondria sitiens*
3			*Haliclona* sp.
4	CNIDARIA	HYDROZOA	*Eudendrium* sp.
5		ANTHOZOA	*Diadumene lineata*
6	NEMERTINEA	ANOPLA	*Procephalothrix* sp.
7	KAMPTOZOA		*Barentsia discreta*
8	TENTACULATA	BRYOZOA	*Amathia distans*
9			*Membranipora* sp. 2
10			*Bugula neritina*
11			*Tricellaria inopinata*
12			*Celleporina porosissima*
13			*Cryptosula pallasiana*
14			*Escharella takatukii*
15	MOLLUSCA	GASTROPODA	*Brachystomia minutiovum*
16			*Dendrodoris fumata*
17		BIVALVIA	*Mytilus galloprovincialis*
18			*Modiolus kurilensis*
19			*Musculista senhousia*
20			*Chlamys farreri nipponensis*
21			*Chlamys* sp.
22			*Anomia chinensis*
23			*Crassostrea gigas*
24	ANNELIDA	POLYCHAETA	*Harmothoe* sp.
25			*Halosydna brevisetosa*
26			*Lepidonotus elongatus*
27			*Nereiphylla castanea*
28			*Nereis multignatha*
29			*Platynereis bicanaliculata*
30			*Marphysa* sp.
31			*Amphitrite* sp.
32			*Sabella* sp.
33			*Hydroides ezoensis*
34	ARTHROPODA	PYCNOGONIDEA	*Anoplodactylus crassus*
35		MAXILLOPODA	*Balanus trigonus*
36			*Amphibalanus amphitrite*
37			*Amphibalanus eburneus*
38			*Amphibalanus improvisus*
39			*Fistulobalanus albicostatus*
40		MALACOSTRACA	*Ampithoe tarasovi*
41			*Ampithoe* sp. 2
42			*Aoroides longimerus*
43			*Monocorophium acherusicum*
44			*Monocorophium uenoi*
45			*Jassa slatteryi*
46			*Paradexamine* sp.
47			*Maera* sp.
48			*Melita rylovae*
49			*Gitanopsis* sp.
50			*Anamixis* sp.
51			*Colomastix* sp.
52			*Leucothoe nagatai*
53			*Parapleustes* sp.
54			*Stenothoe* sp. 1
55			*Stenothoe* sp. 2
56			*Liljeborgia serrata*
57			*Orchomene* sp.
58			*Cypsiphimedia mala*
59			*Caprella scaura*
60			*Paranthura japonica*
61			*Ianiropsis serricaudis*
62			*Cymodoce japonica*
63			*Dynoides dentisinus*
64			*Dynoides dentisinus*
65			*Eualus leptognathus*
66			*Heptacarpus rectirostris*
67			*Halicarcinus messor*
68			*Hemigrapsus takanoi*
69	CHORDATA	ASCIDIACEA	*Aplidium* sp.
70			*Didemnum* sp.
71			*Ciona intestinalis* type A
72			*Ciona savignyi*
73			*Ascidia sydneiensis*
74			*Ascidia zara*
75			Botryllidae gen. sp. 1
76			Botryllidae gen. sp. 2
77			*Styela canopus*
78			*Molgula manhattensis*
79		OESTEICHTHYES	*Tridentiger trigonocephalus*

Table 9 Identified species in Miyako (Year 3)

The first survey			
	PHYLUM	CLASS	Species
1	TENTACULATA	BRYOZOA	*Tricellaria inopinata*
2			*Celleporina porosissima*
3			*Microporella* sp.
4	MOLLUSCA	GASTROPODA	*Barleeia angustata*
5			PROSOBRANCHIA fam. gen. sp.
6		BIVALVIA	*Mytilus galloprovincialis*
7			*Hiatella orientalis*
8	ANNELIDA	POLYCHAETA	Lumbrineridae gen. sp.
9			Serpulidae gen. sp.
10	ARTHROPODA	MAXILLOPODA	*Amphibalanus eburneus*
11		MALACOSTRACA	*Ampithoe* sp. 1
12			*Aoroides* sp.
13			*Monocorophium achersicum*
14			*Gammaropsis japonica*
15			*Ericthonius convexus*
16			*Jassa slatteryi*
17			*Pontogeneia* sp.
18			*Stenothoe* sp. aff. *dentirama*
19			*Caprella equilibra*
20			*Caprella mutica*
21			*Caprella scaura*
22			*Paranthura japonica*
23			*Zeuxo* sp.
24	CHORDATA	ASCIDIACEA	*Distaplia dubia*
25			Botryllidae gen. sp.

The second survey			
	PHYLUM	CLASS	Species
1	PORIFERA	DEMOSPONGIAE	*Halichondria sp.*
2	NEMERTINEA	ENOPLA	*Nemertellina yamaokai*
3	TENTACULATA	BRYOZOA	*Tricellaria inopinata*
4			*Celleporina porosissima*
5			*Pacificincola perforata*
6			Escharella takatukii
7	MOLLUSCA	GASTROPODA	*Lirularia iridescens*
8		BIVALVIA	*Mytilus galloprovincialis*
9			*Vilasina decorata*
10			*Musculus cupreus*
11			*Hiatella orientalis*
12	ANNELIDA	POLYCHAETA	*Harmothoe sp.*
13			Syllis sp.
14			*Megasyllis nipponica*
15			*Nereis vexillosa*
16			*Serpulidae gen. sp.*
17	ARTHROPODA	MALACOSTRACA	*Ampithoe lacertosa*
18			*Aoroides sp.*
19			*Monocorophium acherusicum*
20			*Gammaropsis japonica*
21			*Ericthonius convexus*
22			*Jassa slatteryi*
23			*Podocerus sp.*
24			*Polycheria sp.*
25			*Pontogeneia sp.*
26			*Stenothoe sp. aff. dentirama*
27			*Gordonodius zelleri*
28			*Caprella equilibra*
29			*Caprella mutica*
30			*Caprella scaura*
31			*Paranthura japonica*
32			*Ianiropsis serricaudis*
33			*Cymodoce japonica*
34			*Zeuxo sp.*
35	CHORDATA	ASCIDIACEA	*Aplidium sp.*
36			*Diplosoma listerianum*
37			*Distaplia dubia*
38			*Ciona savignyi*
39			*Perophora sp.*
40			*Ascidiella aspersa*
41			*Botrylloides violaceus*
42			*Botryllus sp.*
43			*Botryllidae gen. sp.*
44			*Botryllidae gen. sp. 2*
45			*Styelidae gen. sp.*

Table 10 Identified species in Minami-Sanriku (Year 3)

The first survey			
	PHYLUM	CLASS	Species
1	CNIDARIA	HYDROZOA	*Obelia sp.*
2	MOLLUSCA	GASTROPODA	*Mitrella bicincta*
3		BIVALVIA	Mytilus galloprovincialis
4	ARTHROPODA	MALACOSTRACA	*Ampithoe sp. 1*
5			Ericthonius convexus
6			*Jassa marmorata*
7			*Jassa slatteryi*
8			Jassa sp.
9			Stenothoe sp. aff. dentirama
10			*Stenothoe sp. 1*
11			*Caprella californica*
12			*Caprella equilibra*
13			*Caprella mutica*
14			*Caprella penantis*

The second survey			
	PHYLUM	CLASS	Species
1	CNIDARIA	HYDROZOA	*Obelia sp. (almost hydranth lacking)*
2	NEMERTINEA	ENOPLA	*Nemertellina yamaokai*
3			*Tetrastemma nigrifrons*
4	TENTACULATA	BRYOZOA	*Tricellaria inopinata*
5			*Celleporina porosissima*
6			Watersipora subatra
7	MOLLUSCA	GASTROPODA	*Sakuraeolis sp.*
8		BIVALVIA	*Mytilus galloprovincialis*
9			*Musculus cupreus*
10	ANNELIDA	POLYCHAETA	*Autolytus sp.*
11			*Syllis sp.*
12			*Nereis pelagica*
13			Platynereis bicanaliculata
14			*Terebellidae gen. sp.*
15	ARTHROPODA	MAXILLOPODA	*Perforatus perforatus*
16			*Megabalanus rosa*
17		MALACOSTRACA	*Ampithoe lacertosa*
18			*Ampithoe sp. 2*
19			*Aoroides longimerus*
20			*Gammaropsis japonica*
21			*Ericthonius convexus*
22			*Jassa marmorata*
23			*Jassa slatteryi*
24			*Jassa staudei*
25			*Polycheria sp.*
26			*Stenothoe sp. aff. dentirama*
27			*Caprella equilibra*
28			*Caprella mutica*
29			*Caprella penantis*
30			*Paranthura japonica*
31			*Ianiropsis serricaudis*
32			*Cymodoce japonica*
33	CHORDATA	ASCIDIACEA	*Didemnum sp.*
34			*Diplosoma listerianum*
35			*Distaplia dubia*
36			*Ascidia sydneiensis*
37			*Botryllidae gen. sp.*

e) Discussion

N/A

f) Challenges

The challenge encountered during the two years survey was to get the understanding and cooperation of local fisherman who is necessary for installing and retrieving the fouling plates. To try addressing this we asked National Fisheries Research Institute or the like to introduce cooperative local fisherman to us.

g) Achievements

The achievement of our project is that we obtained plenty of samples of sessile organisms for morphological identification and DNA analysis. The samples we obtained must be helpful for the scientists trying to identify invasive species.

h) Literature Cited

N/A

5. OUTPUTS

a. Completed and planned publications

N/A

b. Poster and oral presentations at scientific conferences or seminars

N/A

c. Education and outreach

N/A

6. RESEARCH STATUS AND FUTURE STEPS/PLANS

All the planned work has been completed on schedule at this time.