

NORTH PACIFIC MARINE SCIENCE ORGANIZATION (PICES)
PROJECT ON “EFFECTS OF MARINE DEBRIS CAUSED BY THE GREAT TSUNAMI OF 2011”
Year 2 Final Report

1. PROJECT INFORMATION

Title:	PICES Tohoku coast field survey (fouling plate) – supplemental study for U.S. tsunami debris spp. list
Award period	July 15, 2015 – March 31, 2016
Amount of funding	\$ 68,965 CAD
Report submission date	December 12, 2015
Lead Author of Report*	Hisatsugu Kato (JANUS), Michio Otani, Karin Baba (JANUS)

Principal Investigator(s), Co-Principal Investigators and Recipient Organization(s):

Dr. Hisatsugu Kato
Karin Baba

Japan NUS Co., LTD.
Nishi-Shinjuku Kimuraya Building 5F,
7-5-25 Nishi-Shinjuku, Shinjuku-Ku, Tokyo
160-0023, Japan
Phone: (81)-3-5925-6866 (direct)
Email: baba-k@janus.co.jp

Dr. Michio Otani
Rokujo Midori-machi 3-9-10,
Nara City, Japan, 630-8045
Tel & Fax: 81-742-48-8552

2. EXECUTIVE SUMMARY

Introduction

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 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. This 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 in Japan.

Materials and method

The survey was conducted at several locations in the Tohoku coast. Fouling plates of 14 cm square were placed in 3 different locations; Miyako (Iwate prefecture), Kesenuma and Matsushima (Miyagi prefecture) in July or August, 2015 (Figure 1).

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.

The fouling plates were retrieved after about 1 month (the first survey) and 3 months (the second survey) at each site (Table 1).

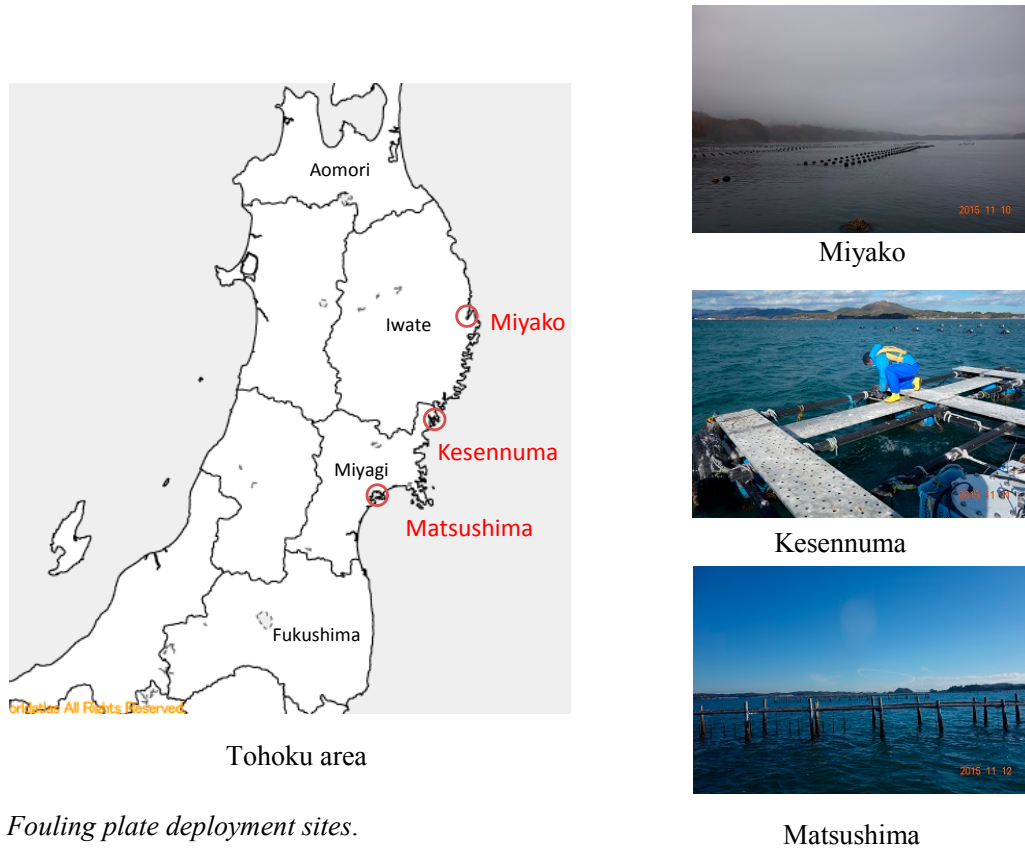


Fig. 1 *Fouling plate deployment sites.*

Table 1 *Schedule of the field survey.*

	Placement (# of plates)	1 month (# plates) First survey	3 month (# plates) Second survey
Miyako	Aug. 12 th (30)	Sep. 8 th (15)	Nov. 10 th (15)
Kesenuma	Aug. 4 th (10*)	Sep. 8 th (5)	Nov. 11 th (5)
Matsushima	Jul. 24 th (30)	Sep. 10 th (15)	Nov. 12 th (15)

*In Kesenuma, due to limited availability of space, minimum # of plates were deployed.

The species of fouling organisms on the fouling plates were identified, and morphological specimens and samples for DNA analysis were prepared. The morphological specimens were stored in 70% ethanol, and the samples for DNA analysis were stored in pure ethanol (99.5%). In case where only small number of samples was available, preparation of samples for DNA analysis was prioritized to preserving for morphological analysis. The DNA samples are to be sequenced by Dr. Jonathan Geller at Moss Landing Marine Laboratories.

Results

The appearance of fouling plates in each location is illustrated in Table 2. The numbers of morphological specimen and samples for DNA analysis are shown in Table 3. 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. The number of species found was the highest in Matsushima, and the fewest in Miyako. 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 4).

Table 2 Retrieved fouling plates.







	First survey	Second survey
Miyako		
Kesenuma		
Matsushima		

Table 3 Number of the prepared specimens.

	First survey		Second survey	
	Samples for DNA analysis	Morphological specimens	Samples for DNA analysis	Morphological specimens
Miyako	31	15	51	16
Kesenuma	35	9	65	14
Matsushima	63	22	79	26

Table 4 Number of the appearance species.

PHYLUM	Miyako		Kesenuma		Matsushima	
	1st survey	2nd survey	1st survey	2nd survey	1st survey	2nd survey
PORIFERA	0	1	0	2	1	3
CNIDARIA	1	1	1	1	3	2
NEMERTINEA	0	1	0	1	0	1
KAMPTOZOA	0	0	0	0	0	1
TENTACULATA	1	5	3	5	3	7
MOLLUSCA	0	3	3	4	6	9
ANNELIDA	2	9	3	15	15	10
ARTHROPODA	21	22	21	30	27	35
CHORDATA	6	9	4	7	8	11
Total	31	51	35	65	63	79

The complete lists of species found in each survey are shown in section 3(c). Most of fouling organisms identified in this survey are native to Japanese coasts. Several non-native species were found such as *Amphibalanus eburneus* and *Amphibalanus amphitrite*. According to the result of this survey, *Crassostrea gigas* was not detected in Miyako. On the other hand, *Caprella mutica*, which is northern species, was detected only in Miyako. Although *Nemertellina yamaokai* was detected only in Hokkaido in the past surveys, it was found in Miyako and Kesenuma in this survey.

3. PROGRESS SUMMARY

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, Dr. Otani and personnel from JANUS.

The survey was to be conducted as follows:

- Deploy fouling plates of 14 cm square in 3 different locations; Miyako (Iwate prefecture), Kesenuma and Matsushima (Miyagi prefecture) (Figure 1). Plates were provided by the U.S. scientists (supports are given by Dr. Greg Ruiz, Dr. James Carlton and Dr. Jonathan Geller).
- Retrieve the fouling plates after 1 month and 3 months of their placement.
- Analyze the retrieved fouling plates and identify spp. on the plates (basic protocol shown by the U.S. scientists).
- Detail identification in laboratory and extract samples for DNA analysis – shipment to the U.S.
- Shipment of oysters and mussels for analysis on parasites (if possible).

The planned deliverables are:

- Progress report by the Contractor as soon as the surveys is completed (Already submitted);
- Supplemental information upon request for the final scientific reports prepared by Principle Investigators of related individual projects;
- Financial report and official financial statement (report of expenditures) by JANUS by April 30, 2016.

a. Describe progress

All the planned activities have been successfully completed. The deployment and retrieval of fouling plates, the morphological identification, and sample extraction for DNA analysis have been conducted as mentioned above. Shipment of oysters and mussels could not have been completed due to financial constraints and non-emergency. These samples are kept frozen and are planned to be shipped with the samples collected during the coming spring surveys.

b. Describe results

The appearance of fouling plates after retrieval and the number of specimen prepared are shown above (Tables 2 – 3). The results of morphological identification in each location are listed in the tables below (Tables 5 – 7).

Table 5 Identified species in Miyako.

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

Table 6 Identified species in Kesennnuma.

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

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

Table 7 Identified species in Matsushima.

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

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

c. Describe any concerns you may have about your project's progress

The morphological analysis of the samples took more time than according to the original plan, and the shipment of the DNA specimen was delayed. As has been already discussed with the U.S. scientists, the samples from the upcoming survey planned in April 2016 will be shipped as soon as the analysis is completed.

Also, there was a financial constraints regarding shipment of frozen samples of oysters and mussels. These samples were non-urgent items, so they will be re-treated with alcohol once the samples from the spring surveys are collected and will be shipped with the newly collected items once they are ready.

d. Completed and planned publications

None

e. Poster and oral presentations at scientific conferences or seminars

None

f. Education and outreach

Yes, we will provide the detail accordingly by April 30, 2016.

4. PROGRESS STATUS

Overall, the project is on track. The team communicated with the scientists from the U.S. during the PST meeting in Japan in February 2016, and the methodologies and concerns were clarified. The coming survey is to be conducted in April 2016 when it is the most species abundant season. This is expected to flourish the potential species lists.