Morphological and genetic confirmation of extensive distribution of a pelagic polychaete Poebiobius meseres Heath, 1930 (Annelida Flabelligeridae)

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ABSTRACT
A pelagic polychaete, Poebiobius meseres Heath, 1930 (Annelida Flabelligeridae), is mainly known from California, Northeast Pacific, and is well studied in the region. However, little is known from Northwest Pacific, which is needed for understanding its biodiversity and accurate distribution. We report morphological and genetic data of this species collected off Tohoku, Japan and off the Aleutian Islands, USA, and confirm ITS extensive distribution (over 4000 km).

INTRODUCTION
Pelagic polychaetes often have wide-range distribution due to their pelagic habits (Dales & Peter, 1972). However, their distributional pattern is not well clarified due to the difficulty of sampling across several countries for covering broad distribution. Further information on their distribution is needed for understanding their life cycle and biogeography.

A pelagic polychaete genus, Poebiobius Heath, 1930, is unique in its morphology, i.e., it lacks segmentation/chaetae and was classified as Poebiidae that was thought to be the key for understanding the connectivity between polychaetes and echinurans (Heath, 1930). Recent molecular phylogenetic analyses showed that this genus is contained in Flabelligeridae (Burnette et al., 2005; Osborn & Rouse 2008, 2010). Poebiobius meseres Heath, 1930 is the sole species of Poebiobius and is distributed in the Pacific Ocean (Heath, 1930; McGown, 1960; Salazar-Vallejo, 2008). Recently, an undescribed species of Poebiobius was found in the Atlantic Ocean (Christiansen et al., 2018). Poebiobius meseres was reported mainly from Northeast Pacific (Salazar-Vallejo, 2008). However, some of the papers indicated that the species is also present in Northwest Pacific and Southeast Pacific (Yamada, 1954; McGown, 1960). Salazar-Vallejo (2008) reviewed specimens of P. meseres collected from Northeast Pacific and concluded there are at least two morphotypes in this species. Salazar-Vallejo (2008) also mentioned “some other records in the Western Pacific and in subtropical localities should be confirmed” for a better understanding of Poebiobius diversity. Although there are records by McGown (1960) of P. meseres from Japanese waters, the paper did not provide any morphological and genetic data, and thus, we could
not infer that the distribution record consists of one or more species in Pan-North Pacific. Morphological information accompanied with its genetic data are needed for understanding of the biodiversity and distribution of *Poeobius* species. In this study, we report *P. meseres* collected from Aleutian and Japanese waters with morphological and genetic confirmation.

**MATERIAL AND METHODS**

Sampling from two localities: i) Vertical Multiple Plankton Sampler (VMPS) was applied on 6 August 2017, three specimens were collected from 750–1000 meters of depth, off Aleutian Islands (54°17.7229′ N, 166°23.7795′ W), USA, during the MR17-04 cruise by R/V Mirai; ii) ROV Hyper-Dolphin was operated on 9 October 2013, one specimen was collected from 433 meters of depth, off Sanriku (39°36.984′ N, 142°15.543′ E), Japan, during the NT 13-21 cruise by R/V Natsushima. All the specimens were fixed and preserved in 70% ethanol. The preserved specimens were observed under stereoscopic microscopes (Nikon SMZ1500 and OLYMPUS BX51); photographs were taken using a digital camera (Nikon D5200). Voucher specimens were deposited in the JAMSTEC (No. JAMSTEC-1170056154 and 1130040972). DNA extraction, sequencing, and phylogenetic analysis were conducted by use of cytochrome c oxidase subunit I (COI) following the method of Jimi & Fujiiwara (2016). The genetic distance was calculated following Jimi & Fujiiwara (2016). Newly obtained sequences have been deposited in the DNA Data Bank of Japan (DDBJ): DDBJ No. LC508300 (Aleutian), No. LC508299 (Japan). Additional COI sequences of *Poeobius meseres* from California and *Trophoniella hephaistos* from Japan as an outgroup were obtained from GenBank (GenBank No. EU694130 and LC136932) (Osborn & Rouse 2008; Jimi & Fujiiwara 2016). COI gene of *Daylithos* sp., another member of the outgroup, was sequenced and deposited in DDBJ (DDBJ No. LC508301.

**RESULTS**

**Systematics**

Phylum ANNELIDA Lamarck, 1809

Classis POLYCHAETA Grube, 1850

Ordo TEREBELLIDA sensu Rouse et Fauchald, 1997

Familia FLABELLIGERIDAE Saint-Joseph, 1894

Genus *Poeobius* Heath, 1930

*Poeobius meseres* Heath, 1930
DISCUSSION

In morphological observation (Fig. 1), the *P. meseres* specimens have the following features as reported in previous studies (Salazar-Vallejo, 2008): i) body depressed without segmentation, parapodia or chaetae, ii) transparent cuticle, iii) the presence of branchiae and nephridial lobe, iv) pelagic. Other features completely align with the previous genus diagnosis. In genetic analysis, Aleutian and Japanese specimens form a monophyletic clade (Fig. 2). The genetic K2P distance between Aleutian-Japan was 0.02. On the bases of the morphological identity between Japanese and Aleutian individuals, this genetic distance seems to be intraspecific variations. On the other hand, between Aleutian/Japan-California there were 0.055–0.057. There is no conclusive proof that this genetic distance is intraspecific variation because detailed morphology of the Californian specimen used for the molecular analysis was not shown. According to the description of Salazar-Vallejo (2008), *Poeobius meseres* contained at least two morphological variations. Our specimens are identical with one of the morphological variations in the following features: i) single nephridial lobe; ii) 10 branchiae; iii) branchiae are the same length or slightly longer than palps. However, there is no information on the features from the Californian individuals used for the molecular analysis. Genetic connectivity between individuals collected from Japanese and Californian waters is not discussed due to the lack of genetic information. More sequences with morphological data are needed for understanding of the Pan-North Pacific connectivity of this species.

Recently, studies about their "cosmopolitan" nature revealed the limited distribution of the polychaete species in a certain area (Hatchings & Kupriyanova, 2018). Pelagic polychaetes have been thought to be cosmopolitan based on morphological analysis, but the genetic confirmation is critical for understanding their accurate distribution. Our morphological and genetic data support extensive distribution (about 4000 km) of the pelagic species.

ACKNOWLEDGENENTS

We thank the crews of the R/V Mirai and Natsushima, scientific members of the cruise MR 17-
04 and NT 13-21 for them help in the sampling. This study is partly supported by JSPS KAKENHI No. JP17J05066 to NJ.

REFERENCES


