New findings of *Ijimaiella* (Porifera: Hexactinellida: Euplectellidae) from the Bering Sea

K.R. Tabachnick[1*], L.L. Menshenina[2], H. Ehrlich[3]

[1] P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russia.
[2] Biophysical Department, Physical Faculty, Moscow State University, Moscow, 119992, Russia.
[3] Institute of Electronics and Sensor Materials, Technische Universität Bergakademie Freiberg, Freiberg 09599, Germany.
** Corresponding author: tabachnick@mail.ru*
Konstantin Tabachnick ORCID 0000-0002-7669-7233
Larisa Menshenina ORCID 0000-0002-7668-9778
Hermann Ehrlich ORCID 0000-0003-4951-3555

ABSTRACT: New *in vivo* observations and collections of *Ijimaiella,* a monospecific genus of Euplectellidae (Porifera: Hexactinellida) from the Bering Sea provide the first look at the peculiar morphology of this sponge that was known before only from trawled fragments. New data on the spicule content and the generic diagnosis are given. The affiliation of the generic status and its position in the subfamily Corbitellinae is confirmed.
How to cite this article: Tabachnick K.R., Menshenina L.L., Ehrlich H. 2022. New findings of *Ijimaiella* (Porifera: Hexactinellida: Euplectellidae) from the Bering Sea // Invert. Zool. Vol.19. No.2. P.185–190. doi: 10.15298/invertzool.19.2.06

KEY WORDS: Corbitellinae, Bering Sea, genus-species description, Hexactinellida.

Новые находки *Ijimaiella* (Porifera: Hexactinellida: Euplectellidae) из Берингова моря

К.Р. Табачник[1*], Л.Л. Меньшенина[2], Г. Эрлих[3]

[1] Институт океанологии им. П.П Ширшова, РАН, Москва, Нахимовский проспект 36, 117997 Россия.
[2] Кафедра биофизики, Физический факультет, Московский государственный университет им. М.В. Ломоносова, 119992 Россия.
[3] Institute of Electronics and Sensor Materials, Technische Universitȯt Bergakademie Freiberg, Freiberg 09599, Germany.
** Corresponding author: tabachnick@mail.ru*

РЕЗЮМЕ: Новые *in vivo* наблюдения и находки *Ijimaiella,* моноспецифического рода семейства Euplectellidae (Porifera: Hexactinellida) из Берингова моря, добавили новые данные об особенном внешнем виде этой губки, ранее описанной и известной лишь по фрагментам. Приведены новые данные по составу спикул и по диагнозу рода. Принадлежность рода к подсемейству Corbitellinae полностью подтверждена.
Как цитировать эту статью: Tabachnick K.R., Menshenina L.L., Ehrlich H. 2022. New findings of *Ijimaiella* (Porifera: Hexactinellida: Euplectellidae) from the Bering Sea // Invert. Zool. Vol.19. No.2. P.185–190. doi: 10.15298/invertzool.19.2.06

КЛЮЧЕВЫЕ СЛОВА: Corbitellinae, Берингово море, описание рода и вида, Hexactinellida.

Introduction

Ijimaiella is a monospecific genus named in honor of the great Japanese spongiologist Isao Ijima. *Ijimaiella beringiana* was described by Tabachnick (2002) from a single location in the Bering Sea after being collected as several fragments by trawl from the RV 'Akademik Mstislav Keldysh'. During the same expedition a photo of a peculiar sponge was made by the HOV 'Mir' (Fig. 1). Later a fragment belonging to the described species was found in an adjacent location in the Bering Sea using the ROV 'Comanche' operated off the RV 'Akademik M.A. Lavrentyev' with its photo and video registration. Thus the external shape of the sponge was discovered. It became clear that the peculiar sponge photo collected by HOV 'Mir' belongs to the same species.

Examination of the new specimen confirmed the placement of this species in the subfamily Corbitellinae (family Euplectellidae), which is characterized by a basiphytous type of fixation on hard substrata directly from the basal part of the tubular sponge body (Tabachnick, 2002). *Ijimaiella beringiana* is the only known representative of the subfamily Corbitellinae from the Bering Sea. The only other member of this subfamily known from this part of the world is *Regadrella okinoseana*, found on the Pacific side of the Aleutian Islands (Reiswig, Stone, 2011).

The holotype was assigned to a fragment attached to a small stone. All other fragments designated as paratypes were broken parts of the walls and may have belonged to the same specimen. The primary description did not include statistical information on the sizes of the spicules. These data are given below together with the descriptions of the newly found specimens. The high resolution of the ROV imagery revealed important new details on the external morphology of this sponge.

Material and methods

The material was collected during the cruise of the RV 'Akademik Mstislav Keldysh' voyage 22 with Sigsbee trawls and HOV 'Mir'; RV 'Akademik M.A. Lavrentyev' voyage 82 ROV 'Comanche'. The collected materials were fixed in alcohol 80°, some fragments were fixed in alcohol 96° alcohol and stored at –18 °C. For light microscopy, spicule preparations were made by the method described by Janussen *et al.* (2004): a $K_2Cr_2O_7$ solution was made with water ($K_2Cr_2O_7$ powder: water ~1:1 vol%) and H_2SO_4 (96% conc.) was added ($K_2Cr_2O_7$ solution: H_2SO_4 ~1:1 vol%). A dry sponge sample was placed on the microscopic slide; 1–2 drops (depending on sample size) of the $K_2Cr_2O_7$ solution were added. The microscopic slide was heated (ca. 50–70 °C) for a few minutes to let the solution react. After evaporation of the fluid, the slide was removed from the heat and placed on a cold surface (ca. 20 °C) and a few drops of water were added. The water solution was removed by one or several small pieces (at one time) of normal filter paper. Water was added again and the spicule carefully stirred by needles, and again filter paper was used to remove excess water (occasionally it was necessary to repeat this procedure several times). The dry preparations were covered by Canada balsam and cover glass. The preparations were examined with a BIOLAR optical microscope with PA-7 camera lucida adopted for it.

Abbreviations: avg — average; D, d — diameter; HOV — human-occupied vehicles; IORAS — P.P. Shirshov Institute of Oceanology of Russian Ac. of Sc.; IBMRAS — A.V. Zhirmunsky National Scientific Center of Marine Biology of Russian Ac. of Sc.; L — length; max — maximum; min — minimum; n — number of measures; ROV — remotely operated vehicle; RV — research vessel; sta. — station; std — standard deviation

Systematics

Euplectellidae Gray, 1867
Corbitellinae Gray, 1872
Ijimaiella Tabachnick, 2002

DIAGNOSIS. A basiphytous tubular or trumpet-like sponge with thick and large outer wall projections (directed downward) which involve

Fig. 1. The largest specimen of *Ijimaiella beringiana* (center) with trumpet-like oscular margin together with other hexactinellids: *Farrea* and *Acanthascus.* Photograph HOV 'Mir' sta. 2316, depth 3800 m.
Рис. 1. Самый крупный экземпляр *Ijimaiella beringiana* (в центре) с краями оскулюма в виде расширяющейся трубки; рядом стеклянные губки *Farrea* и *Acanthascus*. Фотография сделана с подводного обитаемого аппарата «Мир». Станция 2316, глубина 3800 м.

the atrial cavity. Numerous prostalia lateralia are located on dermal surface. Rare irregular lateral oscula are present on the sponge body in some colonies. An oscular collar of prostalia oscularia and poorly developed sieve-plate are constructed from free rays of the same huge pinular hexactins which are observed in sponges with tubular body construction. Choanosomal spicules are diactins, rarely triactins. Dermalia are hexactins. Atrialia are hexactins and pentactins. Microscleres have discoidal, oxyoidal, floricoidal and rarely onychoidal outer ends and hexactinic, hexasterous and hemihexasterous central parts. Specific microscleres are regular oxyhexasters similar to graphiocomes or pappocomes with short secondary rays.

Ijimaiella beringiana Tabachnick, 2002
Figs. 1–4, Tab. 1.

MATERIAL. IORAS: holotype and paratypes. RV 'Akademik Mstislav Keldysh' voyage 22, sta. 2316, trawl, 55° 36.08'-35,00' N 167° 23.04'-24.46' E, depth 4200–4294 m. Photo RV 'Akademik Mstislav Keldysh' voyage 22, submercible 'Mir' sta. 2316-13, 55° 33' N 167° 17' E depth 3800 m. IBMRAS: lv-82-6 sp1: one fragment and several underwater photos of several specimens. RV 'Akademik M.A. Lavrentyev' voyage 82, sta. 6, ROV 'Comanche', 55.6946-6922° N 167.1238-1203° E, depth 3753–3652 m. lv-82-7 an underwater photograph. RV 'Akademik M.A. Lavrentyev' voyage 82, sta. 7, ROV 'Comanche', 55.3689° N 167.2659° E, depth 1010-664 m.

DESCRIPTION. BODY. A vase-like, basiphytous sponge with thick and large outer projections (diverticula) of the wall (together with the atrial cavity) usually directed down. Numerous prostalia lateralia are located on the dermal surface of the sponge body. In some specimens, the oscular margin is stout (body is tubular or pipe-like). These specimens have a clearly distinguishable oscular collar with prostalia oscularia. A row of prostalia spicules are situated in the vicinity of osculum on the atrial surface whose free rays are directed towards the center of the osculum resulting in a poorly developed oscular sieve-plate. The other specimens have an expanded body (trumpet-like) in which the oscular collar and the poorly developed sieve-plate are not visible. The sizes of these colonies were estimated to be approximately 30-100 cm high and 15–50 cm in diameter. The walls were 3–6 mm thick with the digital outgrowths being approximately 30–300 mm long and 30–50 mm in diameter. Sometimes and in some specimens there were found irregularly situated lateral oscula 4–5 mm in diameter and rare larger ones about 10 mm in diameter (usually on the distal ends of the outgrowths). The lower part of the sponge body that provides the basiphytous fixation is conically tapering towards the bottom and the digital outgrowths do not regularly provide secondary points of attachment.

SPICULES. The spicule content is generally consistent although some differences between the two specimens prompted revision of some spicule dimensional differentiation. New types of spicules are rough diactins, 0.167-0.529/0.015-0.033 mm with a widening in the middle, likely belong to comitalia that accompany the large prostalia hexactins. In small amounts these spicules are also found in the revised holotype. Oxyoidal microscleres, specifically oxyhemi-

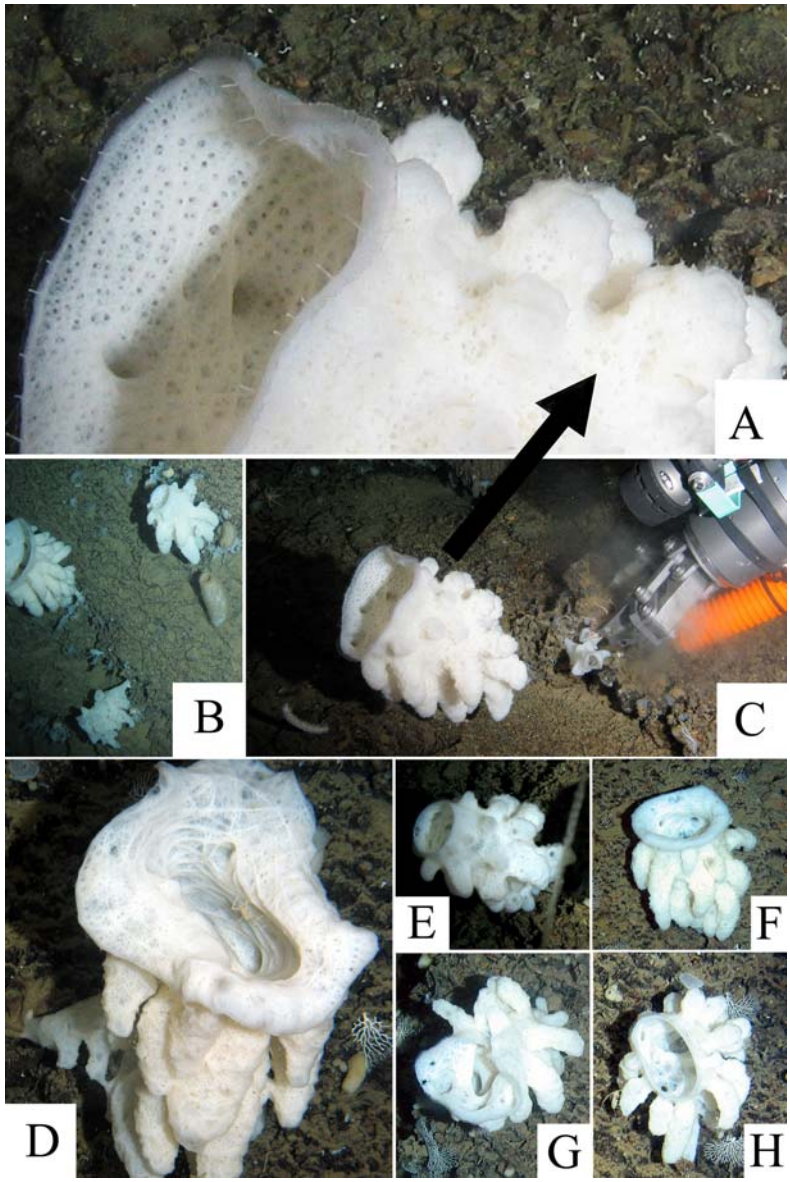

Fig. 2. *Ijimaiella beringiana.* Photograph ROV 'Comanche' sta. 6. A — a magnified upper part with clearly visible oscular collar and a row of outwardly directed pinular rays of prostalia which form a circulate row over the osculum; B — dense aggregation of three specimens of *I. beringiana* and *Acanthascus* sp.; C — the moment of sampling (same specimen to A); D — specimen with irregular upper part, tufts of choanosomal spicules are visible; E, G, H — different specimens with occasional lateral oscula; F — trumpet-like specimen.

Рис. 2. *Ijimaiella beringiana.* Фотография выполнена подводным необитаемым аппаратом «Команч». Ст. 6. A — верхняя часть экземпляра (увеличено), виден воротничок вокруг оскулюма и ряд направленных наружу пинулярных лучей простальных спикул, который окружает оскулюм. B — агрегация трех экземпляров *I. beringiana* и *Acanthascus* sp.; C — взятие образца (A); D — экземпляр с неправильной верхней частью, виден пучок хоаносомальных спикул; E, G, H — различные экземпляры с дополнительными латеральными оскулюмами; F — тромбонообразный экземпляр (расширяющаяся трубка).

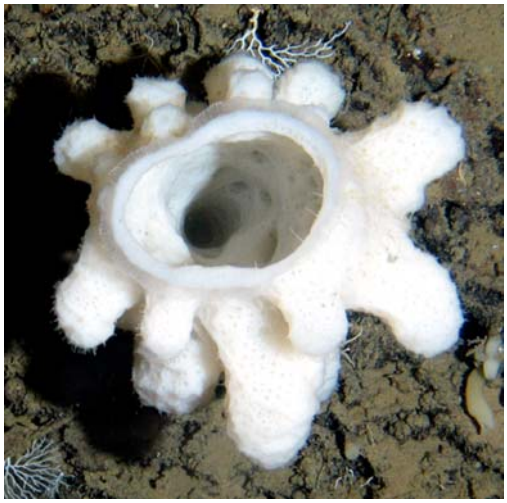

Fig. 3. A smaller tubular specimen of *Ijimaiella beringiana,* view from the upper side. The oscular collar of prostalia oscularia, poorly developed sieve-plate and prostalia lateralia are distinguishable in this specimen. Photograph ROV 'Comanche' sta. 6.
Рис. 3. Небольшой трубчатый экземпляр *Ijimaiella beringiana*, вид сверху. Воротничок вокруг оскулюма из просталия оскулярия, видны слабо выраженная ситовидная пластинка и простальные латеральные спикулы. Фотография выполнена необитаемым подводным аппаратом «Команч», ст. 6.

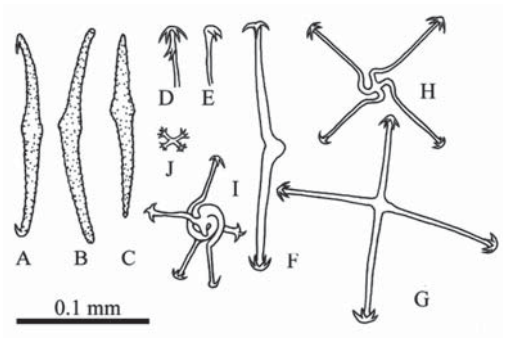

Fig. 4. Spicules of *Ijimaiella beringiana* (see also Tabachnick, 2002). A–C — rough comitalia diactins; D–E — some rare outer ends of discoidal microscleres; F — amphidisc or discodiactin. H–G — discostauractin; I — abnormal discoidal microsclere; J — rare central part of oxyoidal microscleres; A–C — holotype; D–J — specimen from IBMRAS: lv-82-6 sp1.
Рис. 4. Спикулы *Ijimaiella beringiana* (см. также Tabachnick, 2002). A–C — шершавые комитальные диактины; D–E — некоторые редко встречающиеся концы дискоидальных микросклер; F — амфидиски или дискодиактины; H–G — дискостауроактины; I — необычная дискоидальная микросклера; J — редко встречающаяся центральная часть оксиоидальной микросклеры; A–C — голотип; D–J — образец из ИБМ РАН: lv-82-6 sp1.

hexasters, are entirely absent in the newly found specimen. Discoidal microscleres are generally larger and have thicker rays then onychoidal ones. Abnormal discoidal microscleres are rare but present in the form of discostauractins and diactins. These often have curved rays.

Compliance with ethical standards

Conflicts of interest: The authors declare that they have no conflicts of interest.

Acknowledgments. We appreciate the crew of the RV 'Akademik M.A. Lavrentyev' voyage 82 and especially those involved in the service and operation of the ROV 'Comanche', who provided the sampling of the described materials. The research was funded by the Ministry of Science and Higher Education, Russian Federation (grant No. 13.1902.21.0012, contract No. 075-15-2020-796).

References

Janussen D., Tabachnick K.R., Tendal O.S. 2004. Deep-sea Hexactinellida (Porifera) of the Weddell Sea // Deep-Sea Research. II. P.1857–1882.

Reiswig H.M., Stone R.P. 2011. New glass sponges (Porifera: Hexactinellida) from deep waters of the central Aleutian Islands, Alaska // Zootaxa. Vol.3628. P.1–64.

Tabachnick K.R. 2002. Family Euplectellidae Gray, 1867 // J.N.A. Hooper, R.W.M. Van Soest (eds.). Systema Porifera: A Guide to the Classification of Sponges. New York: Kluwer Academic/Plenum Publishers. P.1388–1434.

Responsible editor A.V. Ereskovsky

Table 1. Measurements of spicule types of *Ijimaiella beringiana* (in mm).
Таблица 1. Размерные характеристики спикул разных типов у *Ijimaiella beringiana* (в мм).

	Holotype IORAS 5/2/2048					IBMRAS lv-82-6 sp1				
	n	min	max	avg	std	n	min	max	avg	std
L dermal hexactin distal ray	25	0.061	0.274	0.166	0.051	25	0.067	0.200	0.128	0.031
L dermal hexactin tangential ray	23	0.024	0.312	0.167	0.039	23	0.089	0.289	0.201	0.052
L dermal hexactin proximal ray	19	0.228	1.368	0.674	0.317	9	0.381	1.018	0.638	0.175
L atrial hexactin proximal ray	20	0.068	0.220	0.137	0.044	11	0.081	0.204	0.145	0.036
L atrial pentactin and hexactin tangential ray	25	0.190	0.456	0.240	0.050	15	0.178	0.296	0.240	0.038
L atrial pentactin and hexactin distal ray	25	0.395	1.368	0.893	0.246	10	0.185	1.029	0.622	0.313
L rough diactin	6	0.167	0.289	0.232	0.044	26	0.204	0.529	0.331	0.087
D large floricome	11	0.104	0.144	0.129	0.012					
d large floricome	11	0.016	0.023	0.020	0.002					
D small floricome	8	0.068	0.090	0.080	0.006	3	0.078	0.096	0.085	0.010
d small floricome	8	0.013	0.020	0.016	0.002	3	0.016	0.022	0.019	0.003
D regular oxyhexaster	25	0.065	0.094	0.078	0.008	25	0.067	0.107	0.093	0.010
d regular oxyhexaster	25	0.018	0.023	0.021	0.002	25	0.019	0.030	0.024	0.003
D oxyhemihexaster	25	0.068	0.155	0.105	0.024					
d oxyhemihexaster	25	0.007	0.025	0.013	0.005					
D discohexaster and discohemihexaster	3	0.137	0.173	0.152	0.018	50	0.133	0.200	0.165	0.017
d discohexaster and discohemihexaster	3	0.014	0.022	0.018	0.004	50	0.007	0.037	0.022	0.006
D discohexactin	25	0.130	0.205	0.165	0.019	26	0.126	0.215	0.184	0.016
D onychohexaster and onychohemihexaster	25	0.083	0.130	0.109	0.013	3	0.126	0.148	0.138	0.011
d onychohexaster and onychohemihexaster	25	0.007	0.022	0.015	0.005	3	0.019	0.022	0.021	0.002
D onychohexactin	15	0.101	0.144	0.120	0.014					