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

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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.


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

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

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

*Ijimaiella* is a monospecific genus named in honor of the great Japanese spongologist 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 $\text{K}_2\text{Cr}_2\text{O}_7$ solution was made with water ($\text{K}_2\text{Cr}_2\text{O}_7$, powder: water $\sim$1:1 vol%) and $\text{H}_2\text{SO}_4$ (96% conc.) was added ($\text{K}_2\text{Cr}_2\text{O}_7$, solution: $\text{H}_2\text{SO}_4$ $\sim$1:1 vol%). A dry sponge sample was placed on the microscopic slide; 1–2 drops (depending on sample size) of the $\text{K}_2\text{Cr}_2\text{O}_7$ 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 BIORAL 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
**Ijimaiella** from the Bering Sea

Ijimaiella from the Bering Sea

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. Dermaelia 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 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.

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 discodiaction. H–G — discostauractin; I — abnormal discoidal microsclere; J — rare central part of oxyoidal microscleres; A–C — holotype; D–J — specimen from IBMAS: lv-82-6 sp1.

Compliance with ethical standards
Conflicts of interest: The authors declare that they have no conflicts of interest.

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References

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Table 1. Measurements of spicule types of *Ijimaiella beringiana* (in mm).

Таблица 1. Размерные характеристики спикул разных типов у *Ijimaiella beringiana* (в мм).

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<tr>
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