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Japanese Bryozoans from the Meiji Era at the Natural History Museum, London, Part 1: the Mitsukuri and Owston Collections

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1. Introduction

Ever since Ludwig Döderlein initiated a tradition of marine research in Sagami Bay in 1880, this small bay (*ca*. 2,700km^2) (Figure 1) immediately south of Tokyo is regarded as a world-famous area for the discovery of rare and unique marine animals. Today, the importance of the Döderlein legacy is well established thanks to the studies of numerous researchers mainly from Japan. The same is true for the 1905 collections of his younger colleague, Franz Doflein. Yet, a third period of Meiji time bryozoans, the collections by Professor Kakichi Mitsukuri and Alan Owston have received less attention. Aside from

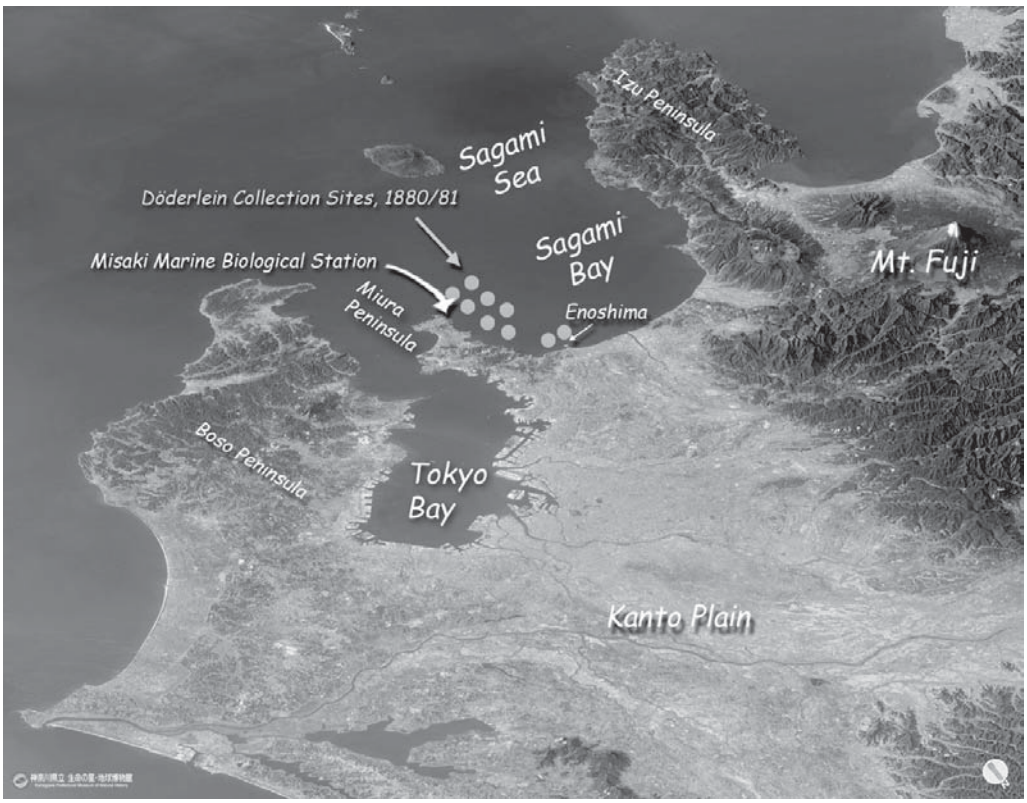

Figure 1. Aerial photograph of Sagami Bay, showing (Bryozoa) sampling locations (solid circles) by Döderlein (see Fujita 2007). Reproduced from National Museum of Nature and Science (2007). Photo credit: Kanagawa Prefectural Museum of Natural History, produced by Dr Shuichi Niida.

Sir Sidney Harmer, who discussed some of the species in his *Siboga* volumes, the collections, which are located at the Natural History Museum in London, have never been studied in their own right. These specimens fill a gap in the 130 years monitoring of Sagami Bay, since the contemporary Doflein collection experienced losses in World War II. Here we provide information firstly on the historical background to these collections in order to understand where, how and why the material may have come to the UK more than 110 years ago and secondly on all the species that are represented in bryozoan collections of Mitsukuri and Owston in London, according to the taxonomical identifications by Sir Sidney Harmer.

2. The Misaki Marine Biological Station

The marine fauna of Sagami Bay is exceptionally rich. This was first recognized by Ludwig Döderlein (1855–1936), Professor of Natural History in the Medical Department of the newly founded University of Tokyo (Figure 2). Döderlein stayed in Japan for two

Figure 2. Ludwig Döderlein (1855–1936) in Tokyo, 1881 (centre, dark coat) surrounded by some of his Japanese students and a German colleague. Image extracted from a larger group photograph, kindly provided by the Döderlein family.

years as an "*oyatoi* (=employee) *gaikokujin* (=foreigner)" professor. He started collecting early in 1880, immediately after his arrival in Japan (Fujita 2007, Namikawa 2009), thus initiating the 130 years tradition of research in Sagami Bay. In April 1881, Döderlein wrote in his unpublished diary:

> bought a great number of things: .. Euplectella and some other sorts of glass-sponges,.... Cidaris papillata, crayfish, Gorgonians, etc. I asked the people to collect these kinds of things for me as I would come back next month. I had to buy a big basket in order to take all of it with me. I collected various things on the beach and also, took with me some living specimens in big glasses ...There is hardly anyone who doesn't leave that lovely island (Enoshima) without having bought a souvenir from the stalls to take it home. The zoologist can use those shops to gain best profit from them. Here he can buy what any zoological museum is lacking and ardently wishing for at a very low price..."

So, why is Sagami Bay so rich?

Today we believe that two factors contribute to Sagami Bay being a hot spot of biodiversity, where Boreal and Subtropical species and deep water and shallow water organisms meet in an extremely confined space: (1) the complex topography of the seabed, showing a steep vertical gradient towards a maximum depth of about 1,500 metres; (2) the unique oceanographic conditions present in the bay, characterised by the Oyashio Current transporting cold seawater from the north and slipping under the warm seawater of the Kuroshio Current arriving from the south (National Museum of Nature and Science 2007, with review of literature).

Figure 3. The Misaki Marine Biological Station founded in 1886, at Irifune in the town of Misaki. Redrawn from Misaki Marine Biological Station (1999). (© National Museum of Nature and Science, Tokyo)

Döderlein's observations were apparently communicated to Kakichi Mitsukuri, Professor of Zoology at the Science Department, University of Tokyo, and in 1884 the marine biological station at Misaki was established, situated in the extreme south of the Miura Peninsula, in Kanagawa Prefecture. The University of Tokyo obtained a site in the town in 1885, and the laboratory was completed soon after (Figure 3). The first marine biological laboratory was named the Misaki Marine Biological Station (MMBS) on 1st April 1887 (summarized from Misaki Marine Biological Station, 1999). An excellent description of the biological station and its surroundings was conveyed in 1904 by the ichthyologist, Professor Bashford Dean (1867–1928) of Columbia University who stayed there as a guest, along with fellow zoologist, Professor James Francis Abbott of Washington University and a Russian ichthyologist, Professor P. Schmidt of the Museum of the Academy of Science (Dean 1904).

3. Professor Kakichi Mitsukuri

Kakichi Mitsukuri (Figure 4) was born in Edo on the 1st December 1857,[1] the second son of Shusei Mitsukuri (1826–1886). He came from a prominent Japanese family of physicians, lawyers and scholars.[2] In 1873 Kakichi arrived in the USA, along with two of his brothers, to attend the Hartford Academy in Hartford, Connecticut followed by the

Figure 4. Professor Kakichi Mitsukuri (1858–1909). From National Museum of Nature and Science (2007). (© National Museum of Nature and Science, Tokyo)

Troy Polytechnic School (Jordan 1909). He went on to study for a Ph.D. in zoology between 1877 and 1881 at Yale University in New Haven. On his way home to Japan in 1881, he travelled through Europe, where he studied developmental zoology with Francis Maitland Balfour (1851–1982), Professor of Animal Morphology at the University of Cambridge, and later visited the Stazione Zoologica di Napoli, meeting its director, Felix Anton Dohrn (1840–1909).

The origins of Japanese zoology lie with Edward Sylvester Morse (1838–1925) (Figure 5), the first Professor of Zoology in the Science Department of the Imperial University of Tokyo and his successor, Charles Otis Whitman (1842–1910) (Figure 6), who helped modernise science in Japan during the Meiji Era and was the founder of the Woods Hole Research Institute. After his return to Japan, Mitsukuri succeeded Whitman as Professor of Zoology in 1882 and encouraged his countrymen in their pursuit of knowledge, offering advice on a wide range of topics, such as pearl cultivation

Figure 5. Edward Sylvester Morse (1838–1925)

Figure 6. Charles Otis Whitman (1842–1910)

(Mikimoto 1934). In 1883 Kakichi obtained a Ph.D. from John Hopkins University in Baltimore. In 1886 Mitsukuri was instrumental in establishing the laboratory at Misaki, and became its first director in 1887. It is during this period that Kakichi published a series of papers on the embryology of turtles [1886-1896], which are considered to be his finest work. In 1893 he became councillor of the university and in 1896 he was made head of the Japanese fur-seal commission. In 1901 Mitsukuri became Dean of the College of Science of the Tokyo University and in 1907 he was decorated with the Order of the Sacred Treasure in recognition of his public service (Jordan 1909). Prof. Mitsukuri was highly respected abroad and under a list of university officers in 1906, he was listed as being a Foreign Member of the Linnean Society (London), a Correspondent of the Academy of Sciences Philadelphia, a Corresponding Member of the New York Academy Sciences and an Honorary Member of the California Academy of Sciences. Widely regarded as one of the leading Japanese zoologists of his time, Prof. Kakichi Mitsukuri died in Tokyo on the 16th September 1909 after a long illness.

4. Alan Owston (1853–1915)

Alan Owston (Figure 7) was not a zoologist by profession. He was born on 7th August, 1853 in Pirbright, Surrey, the middle child of the Rev. Francis Owston[3] (1820–1908), a Yorkshireman, and his wife, Eliza (née Stedman)[4] (1824–1916). In 1871, after attending St Johns College in Hurstpierpoint, Surrey,[5] Alan departed from England to work as a merchant in Japan, working for at least two companies, Lane C. & Co. and E. C. Kirby and Co.,[6] mainly in Yokohama[7] during the 1870s. He married twice fathering nine children.[8]

As well as being a businessman, Owston had two major hobbies, natural history and

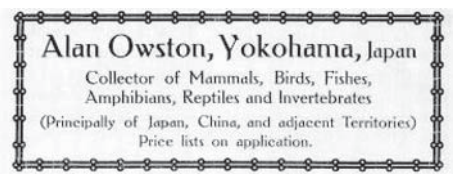

Figure 7 (left). Alan Owston (1853–1915). From: National Museum of Nature and Science (2007). (© National Museum of Nature and Science, Tokyo)

Figure 8 (above). Owston advertisement from 1911.

Figure 9. Professor David Starr Jordan (1851–1931)

sailing, which he was to combine into his business over the next 44 years. A founder of the Yokohama Yacht Club which was established on the 10th September 1886, Owston often collected using his yacht, the *Golden Hind* (Weintraub 1998).

Owston collected, or arranged for the collection, of a wide range of Asian specimens, some of which he would offer for sale (Figure 8). Today, his collections, which are found in museums all over the world, give an indication of his many contacts and clients. Perhaps one of his best known specimens was a deep water shark, which Owston took to Professor Kakichi Mitsukuri at the University of Tokyo for study. Mitsukuri took the specimen with him when he visited the United States to attend an International Fur Seal Conference and requested that the celebrated ichthyologist, Professor David Starr Jordan (1851–1931) (Figure 9) identify and describe it. Jordan ascertained that the specimen belonged to a new family of lamnoid sharks, and in 1898 he named the species *Mitsukurina owstoni* in recognition of both Mitsukuri and Owston.

By the time he died in 1915, Owston's experience in Japanese natural history was recognized worldwide. After visiting Japan in 1907 the ornithologist Collingwood Ingram (1880–1981), wrote:

> With regard to the bibliography of Japanese birds, I omitted to refer to the several pamphlets or annotated "lists" printed privately by Mr Alan Owston in Yokohama. Although they contain notes of the briefest descriptions, in consideration of the author's wide experience of Japanese ornithology they are of very great interest, and moreover, unacknowledged quotations have frequently been made from them[9]."

Alan Owston died in Yokohama on 30th November 1915 and is buried in the Negishi Cemetery, Yokohama.

5. The History of Bryozoan Studies in Sagami Bay

Today, the importance of the Döderlein legacy has been well established thanks to the Monbusho grant "*Taxonomic and historical studies on Prof. Ludwig Döderlein´s collection of Japanese animals*" (1997–2003) (see Nishikawa 1999, Scholz 2009). In 1890 Arnold Edward Ortmann (1863–1927) (Figure 10), based on the Japanese bryozoans collected by Döderlein, published the first bryozoan monograph on Japanese bryozoans. The collection, thought to have been destroyed in the Second World War, was re-discovered by Professor Shun F. Mawatari in 1993 (Mawatari 2009). Döderlein inspired his younger colleague and friend Franz Doflein (1873–1924) (Figure 11) to continue marine biology studies in Japan. In July 2005, a Japanese-German team visited the Bavarian State Collection of Zoology in Munich, a journey funded by the Center of Excellence (COE) program of the Hokkaido University, in order to borrow specimens for an exhibition in Japan, and to initiate studies on the marine invertebrates and fishes kept there. They were lucky to find a rich collection of bryozoans and other organisms from Sagami Bay, collected by Haberer (1903/1904) and Doflein (1904/1905) (Scholz *et al*. 2006). However, it transpired that a large part of the collection, including types described by Buchner (1924), were found to have been destroyed in the Second World War. The surviving bryozoan material, from both the Döderlein/Ortmann and the Doflein/Haberer/Buchner collections from Sagami Bay has subsequently been revised taxonomically by Masato Hirose (2010) within the scope of his Ph.D. thesis.

Figure 10. Arnold Edward Ortmann (1863–1927), ca. 1920. Image courtesy by Timothy A. Pearce, Pittsburg USA. (© Carnegie Museum of Natural History)

Figure 11. Franz Doflein (1873–1924). Image courtesy of Mrs Dorothea Schwarz, Munich. (© Bavarian State Collection of Zoology (ZSM), Munich)

Figure 12. Sir Sidney Harmer (1862–1950)

6. Sir Sidney Harmer (1862–1950)

Sir Sidney Frederic Harmer (Figure 12) was born on the 9th March 1862 in the parish of Heigham, in the city of Norwich, Norfolk. He was one of five children of Frederic William Harmer (1835–1923), wool merchant, manufacturer and amateur geologist, and his wife, Mary Young Lyon (1835–1908). Sidney was educated at Amersham Hall in Reading and at the age of seventeen gained a scholarship to study for a B.Sc. in natural sciences at University College London from 1878 to 1881. He went on to King's College, Cambridge, where he obtained first classes in both parts of the natural sciences tripos (1883 and 1884) (Stearn 1981). In 1885 Harmer became a university lecturer in advanced invertebrate morphology and in 1900 he became Superintendent of the Cambridge University Museum of Zoology.

In 1891, during his time in Cambridge, Sidney married Laura Russell Howell (1867–1956), daughter of Arthur Pearce Howell (1835–1911) and Laura Maria Russell (1841–1919) at Stoke D'Abernon in Surrey, England. They had four children.[10]

In 1907 Harmer moved to London and became Keeper of Zoology at the British Museum (Natural History), following the retirement of Sir Edwin Ray Lankester (1847–1929). Sidney was Director of the Museum from 1919 to 1927 and then President of the Linnean Society (1927–1931), being awarded the Linnean Medal in 1934.

Harmer's first three volumes on *The Polyzoa of the Siboga-Expedition* were published in 1915, 1926, and 1934. On 22nd October 1950, Sidney died at his home in Cambridgeshire. Although the fourth volume had been prepared by 1941, its publication was interrupted by the second world war and Harmer's declining health. It was finally finished and edited by Dr Anna Birchall Hastings before being published posthumously in 1957, some seven years after Harmer's death.

7. The Mitsukuri and Owston Collections

The Mitsukuri and Owston collections appear to have been originally sent to Sidney Harmer when he was at Cambridge, arriving in England between 1896 and 1903. In a letter to Harmer dated 1st August 1896, Prof. Mitsukuri lists various invertebrates he is sending to the museum and asks for others in exchange. He also recommends Alan Owston as "*a reliable dealer*", along with the Kaigyoasha Natural History store.[11] In April 1902 Owston sends sixty three bottles of mainly bryozoans and asks for "*a reasonable price for them*".[12] In another letter five months later, Owston acknowledges the receipt of a cheque for £5 and states that all the material was collected from the Sagami Sea or in Tokyo Bay.[13] On several occasions Harmer obviously bought other interesting specimens from Owston for the Cambridge Museum, such as a giant hydroid and a goblin shark.[14-17]

According to the NHM acquisition registers, the Mitsukuri and Owston material came to London as part of an exchange between the British Museum (Natural History) and the Cambridge University Museum of Zoology. The exact timing of this exchange is unknown at present; some of the specimens were not registered until recently. A large amount of material still remains in Cambridge at the University Museum of Zoology, and this will be discussed in future studies.

The Mitsukuri and Owston bryozoan collections are more or less contemporary to the Doflein/Haberer collection and help fill an important gap in time, and in the long-term monitoring of Sagami Bay that continued afterwards under the direction of the Showa Emperor (1928–1988). Nowadays this is supervised by the National Museum of Nature and Science in Tokyo. Faunal changes over more than 130 years have thus been reported continuously, and the collections document the impact of growing urbanization in the 20th Century.

As documented by the respective *Siboga* volumes, the Mitsukuri and Owston collections of Japanese bryozoans were intensively used by Harmer for the purpose of taxonomical comparisons, most notably in the parts published in 1934, and 1957. Harmer paid considerable attention to several bryozoan collections from Japan not only those by Owston and Mitsukuri, but also those of Döderlein (described by Ortmann 1890) and Doflein (described in part by Buchner 1924), and an earlier collection by John Aylen (1860); the latter is held at the Natural History Museum London (NHM) together with the Owston and Mitsukuri material. Evidently, the collections were selectively studied by Harmer. He chose those specimens for study that were, for example, *Celleporina radiata*, not represented in the *Siboga* collection (Harmer 1957, p. 904) (Figure 13a, b). Although he provided detailed descriptions and some illustrations of those specimens he had studied, their true taxonomic status remains to be validated. Harmer deferred to Ortmann (1890), most probably without having seen the samples and thus relying on the rather brief descriptions and the "old fashioned-style" of the illustrations, as they were characterized by Mawatari and Suwa (1998). The latter provided one of the few studies on the Döderlein collections that were thought to be lost in two world wars, until the Döderlein material was re-discovered by Mawatari in 1993. Only very recently, a monographic study and re-

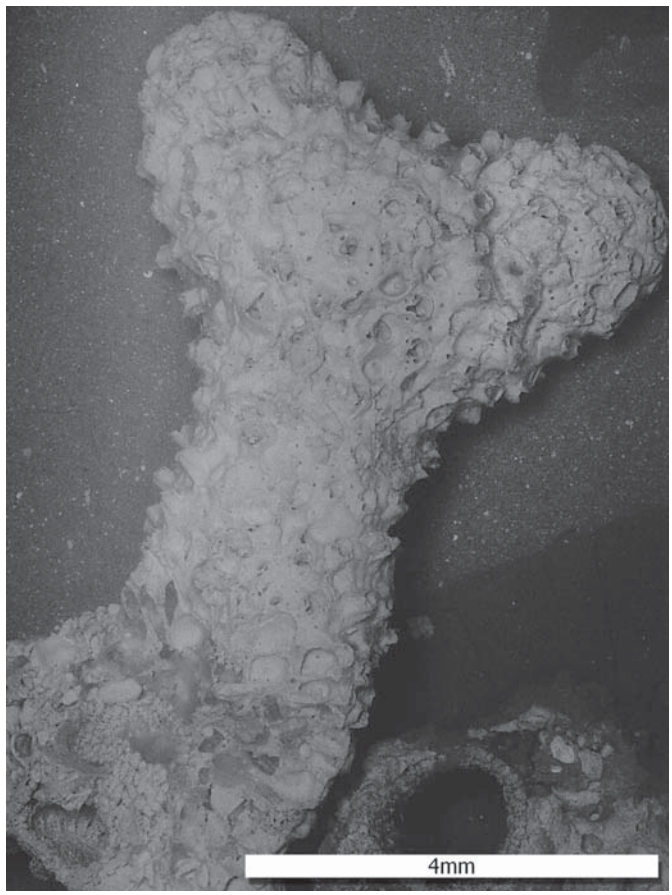

Figure 13a (left). Celleporina radiata *(Ortmann). This specific colony was listed in Harmer 1957: 903, discussed by him on page 904, and illustrated on page LXII Fig. 7, 8 (©Natural History Museum, London).*
Figure 13b (right). Re-illustration of the uncoated sample using a Zeiss EVO 15LS SEM (©Natural History Museum, London).

illustration of the bryozoans of the Döderlein collection, including the Ortmann (1890) types, has been completed by Hirose (2010). Research on Japanese bryozoans was continued by Okada in numerous reports, for example Okada 1923. The Okada types have apparently been lost and there will be a need to define neotypes (see Hirose 2010), and for that the collections of historical Japanese bryozoans kept at the NHM will be very useful. Our task in the years to come will be to validate the Harmer types in cases where Harmer relied on the Ortmann monography.

According to the preliminary results uncovering parts of the collection that have survived until today, the following samples have been preserved at the NHM:

The Mitsukuri Collection consists of 21 slides (see Appendix 1). All the bryozoans were probably collected from the same sample, *Euplectella marshalli* Ijima, 1895, since all samples were listed as from "deep water". The University Museum of the University of Tokyo has a specimen of *Euplectella marshalli* (UMUTZ-PorfH-647), collected by Isao Ijima in 1894, but it is not clear whether this is the actual sample from which the bryozoan colonies have been taken.

The Owston Collection consists of 113 slides collected at Sunosaki (3 miles west of Sunosaki) off Tokyo; Uraga Channel, off Tokyo (collected on 25.6.1899, 29.4.1900, 8.6.1900, 14.2.1901, 21.4.1901, 17.5.1901, 26.5.1901, 28.7.1901); Sagami Bay (collected on 09.6.1901); Okinose, off Tokyo (collected on 07.4.1901, 23.6.1901); Misaki, off Tokyo (collected on 30.6.1901); Tokyo Bay (collected on 09.9.1899); Doketsuba, off Tokyo (collected in Oct.1898) (see Appendix 2).

For his *Siboga* volumes, Harmer studied additional collections from Japan. The oldest collection, and possibly the oldest material of bryozoans from Japan, was donated to the NHM by a Royal Navy officer, John Aylen (*ca*. 1860). A study of this collection has some implications for the Siboga revision, due to the fact that Harmer (1957) based some of his type material on certain species in the Aylen collection (Voigt and Cook 1983, Grischenko *et al*. 2007).

Likewise, a study has started on the "Mitzobuchi" collection (1901–1903), documenting the various geographical locations in Japan in addition to the contemporary collections of Mitsukuri and Owston. Other NHM historical collections which contain Japanese bryozoans are represented by the *Challenger* material (Busk), the Insole Collection, and the Bassler Collection (exchange material from the Canu and Bassler Philippine volume, 1929).

We are just at the beginning of our journey back into the Meiji Era in Japan, uncovering the legacy of collectors and researchers whose fragile bryozoan samples are, in the language of Newton, like the shoulders of Giants, allowing us to see a little further into Japanese coastal waters.

8. Acknowledgements

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Notes

1 There is some confusion over Kakichi Mitsukuri birth date. In some texts it is given as 15th January, 1857. This might be due to differences in the western calendar against the Japanese lunar calendar.

2 Kakichi Mitsukuri's grandfather was the well known physician and scholar in "Dutch" studies, Dr Gempo Mitsukuri (1799–1863). An uncle and various brothers also held eminent positions in law and academia (see Jordan, 1909).

3 Rev. Francis Owston MA was baptised in Great Driffield,Yorkshire on 12th September 1819, the son of Richard Owston and Sarah Merry.

4 Eliza Owston (née Stedman) was born in Guildford on 11th July 1824. She was the daughter of James Stedman, a surgeon, and his wife, Sarah Remington http://www.exploringsurreyspast.org.uk/GetRecord/SHCOL_1316

5 Census Returns of England and Wales, 1871. Class: RG10; Piece: 1064; Folio: 118, Page: 2, GSU roll: 827490

6 Edward Charles Kirby was one of the founders of the Kobe Engineering and Ship Building Works, formerly the Kobe Iron Works Co. http://www.ampltd.co.uk/digital_guides/

japan_through_wester_eyes_parts_7_and_8/documents/DetailedListing-Part7.pdf

7 Companies mentioned in the diary of Mrs Eliza Owston, November 1875–September 1878. Surrey History Centre Archives, series 1316/1/1 http://www.exploringsurreyspast.org.uk/GetRecord/SHCOL_1316

8 Around 1880 Owston married Shimada Rei Jkao in Japan. They had one daughter. In 1893 Alan married Kame (Edith) Miyahara (1875–1923). They had 8 children all born in Yokohama. After Alan's death in 1915, the family moved to North America. More information on the Owston family can be found at http://www.craigfamilytree.com/html/owston_family.htm

9 Ingram, C. 1908, extract from letter in Letters, Extracts, and Notes, *IBIS* **60**(2), page 387.

10 The four Harmer children were Iris Mary (1894–1992), Russell Thomas (1898–1940), Beryl Laura (1898–1920) and Frederick Evelyn (1905–1995).

11 Kakichi Mitsukuri to Sidney Harmer, letter dated 1st August 1896, Cambridge University Museum Archives, No.3:406.

12 Alan Owston to Sidney Harmer, letter dated 4th April 1902, Cambridge University Museum Archives, No.6:024.

13 Alan Owston to Sidney Harmer, letter dated 5th September 1902, Cambridge University Museum Archives, No.6:025.

14 Alan Owston to Sidney Harmer, letter dated 9th March 1904, Cambridge University Museum Archives, No.6:203.

15 Alan Owston to Sidney Harmer, letter dated 9th June 1904, Cambridge University Museum Archives, No.6:204.

16 Alan Owston to Sidney Harmer, letter dated 22nd July 1903, Cambridge University Museum Archives, No.6:151.

17 Alan Owston to Sidney Harmer, letter dated 14th October 1903, Cambridge University Museum Archives, No.6:152.

Appendix 1

Mitsukuri Collection

Registration no. [NHMUK]	Harmer´s species identification	Label Details
1928.9.13.29.	*Labioporella* sp.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
1928.9.13.64	*Thalamoporella lioticha* Lev.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
1928.9.13.74	*Monoporella* sp.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
1963.9.8.94.	*Mucronella*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
1975.11.5.1.	*Cleidochasma porcellanum*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
1975.7.28.1.	*Characodoma latisinuatum*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
1998.6.18.8.	*Masagophora dutertrei var. japonica* Ortm.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.49.	?*Cellepora*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.50.	*Cellepora radiata* Ortm.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.51.	*Adeonellopsis tuberculata* Busk	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.52.	*Smittia*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.53.	*Smittia*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.54.	*Lepralia*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.55.	*Schizoporella* ? *acuta* Ortm.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.56.	*Schizoporella*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.58.	*Lepralia bidentata,* Ortm.	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.59.	*Lekythopora* (?)	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.60.	*Lekythopora*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.61.	?*Porella*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.62.	*Schizoporella*	From rooting spicules of *Euplectella marshalli,* deep water, Japan
2010.10.25.63.	probably *Tessaradoma* sp.	From rooting spicules of *Euplectella marshalli,* deep water, Japan

Appendix 2

Owston Collection

Registration no. [NHMUK]	Harmer´s species identification	Label Details
1928.9.13.1.	*Aetea anguina* (L)	Uraga Channel, off Tokyo, Japan, 30 fathoms, May 17 1901
1928.9.13.5.	*Caleschara levinseni*	Okinose, off Tokyo, Japan, 40 fathoms
1928.9.13.9.	*Pyrulella corbula* (Hincks)	Japan
1928.9.13.13.	*Chaperia acanthina* (Lamx)	Okinose, off Tokyo, Japan, 40 fathoms
1928.9.13.16.	*Antropora granulifera* (Hincks)	Okinose, off Tokyo, Japan, 40 fathoms
1928.9.13.22.	*Hiantopora intermedia* (Kirkpatrick)	Okinose, off Tokyo, Japan, 20-80 fathoms
1928.9.13.23.	*Hiantopora intermedia* (Kirkpatrick)	Uraga Channel, off Tokyo, Japan, 80 fathoms
1928.9.13.26.	*Onychocella angulosa* (Reuss)	Uraga Channel, off Tokyo, Japan, 80 fathoms
1928.9.13.27.	*Onychocella angulosa* (Reuss)	off Tokyo, Japan, 40 fathoms
1928.9.13.30.	*Steganoporella magnilabris* (Busk)	3 miles W. of Sunosaki off Tokyo, Japan, 53-55 fathoms
1928.9.13.31	*Steganoporella magnilabris* (Busk)	Japan
1928.9.13.32.	*Steganoporella magnilabris* (Busk)	3 miles W. of Sunosaki off Tokyo, Japan, 53-55 fathoms
1928.9.13.38.	*Labioporella* sp.	off Tokyo, Japan, 40 fathoms
1928.9.13.67.	*Thalamoporella lioticha* Lev.	Uraga Channel, off Tokyo, Japan, 30 fathoms, June 16, 1901
1928.9.13.88.	*Cellaria punctata* (Busk)	Okinose, off Yokyo, Japan, 40 fathoms, April 7 1901
1928.9.13.89.	*Amastigia rudis* (Busk)	Uraga Channel, off Tokyo, Japan, 53 fathoms
1928.9.13.90.	*Amastigia rudis* (Busk)	Uraga Channel, off Tokyo, Japan, 80 fathoms
1928.9.13.92.	*Caberea lata* Busk	off Tokyo, Japan, 50 fathoms
1928.9.13.93.	*Caberea boryi* (Aud.)	off Tokyo, Japan, 50 fathoms
1928.9.13.95.	*Scrupocellaria delilii* (Aud.)	Uraga Channel, off Tokyo, Japan, 25 fathoms, May 26 1901
1928.9.13.96.	*Scrupocellaria maderensis*	Uraga Channel, off Tokyo, Japan, 30 fathoms, May 17 1901
1928.9.13.97.	*Scrupocellaria maderensis*	Uraga Channel, off Tokyo, Japan, 30 fathoms, June 16 1901
1928.9.13.102.	*Scrupocellaria diadema* Busk	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, April 21 1901
1928.9.13.109.	*Scrupocellaria spatulata* (d'Orb.)	Uraga Channel, off Tokyo, Japan, 30 fathoms, May 17 1901
1928.9.13.114.	*Canda pecten* Thornely	Uraga Channel, off Tokyo, Japan, 30 fathoms, May 17 1901
1928.9.13.115.	*Synnotum aegyptiacum* (Aud.)	Misaki, off Tokyo, Japan, 50 fathoms, June 30 1901
1928.9.13.116.	*Synnotum aegyptiacum* (Aud.)	Uraga Channel, off Tokyo, Japan, 30 fathoms, May 17 1901
1928.9.13.119.	*Beania magellanica* (Busk)	Mouth of Uraga Channel, off Tokyo, Japan, 20-30 fathoms, July 28 1901

1928.9.13.123.	*Bugula vectifera*	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
1928.9.13.124.	*Bugula subglobosa*	Uraga Channel, off Tokyo, Japan, 30 fathoms, May 17 1901
1928.9.13.125.	*Bugula longicauda*	off Tokyo, Japan, 20-30 fathoms [unstained with natural pigment]
1928.9.13.126.	*Bugula longicauda*	Uraga Channel, off Tokyo, Japan, 150 fathoms
1928.9.13.127.	*Bugula longicauda*	Uraga Channel, off Tokyo, Japan, 150 fathoms
1928.9.13.128.	*Bugula* sp. [allied to *B. longicauda*]	off Tokyo, Japan, 150 fathoms
1934.8.18.13.	*Iodictyum axillare* (Ortm.)	Japan, 20-240 fathoms
1934.8.18.14.	*Iodictyum axillare* (Ortm.)	Japan, 20-240 fathoms
1934.8.18.15.	*Iodictyum deliciosum* Harmer	Doketsuba, off Tokyo, Japan, 150 fathoms
1934.8.18.16.	*Iodictyum deliciosum* Harmer	Japan, 150 fathoms
1934.8.18.27.	*Reteporella obtecta* (Buchner)	Okinose, off Tokyo, Japan
1934.8.18.49.	*Triphyllozoon benemunitum* (Ortmann)	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
1934.8.18.50.	*Triphyllozoon benemunitum* (Ortmann)	Japan, 40 fathoms
1934.8.18.51.	*Triphyllozoon punctiligerum* (Ortmann)	Doketsuba, off Tokyo, Japan, 200 fathoms, March 1900
1934.8.18.52.	*Triphyllozoon punctiligerum* (Ortmann)	Doketsuba, off Tokyo, Japan, 200 fathoms, March 1900
1934.8.18.53.	*Triphyllozoon cornutum* (Ortmann)	Uraga Channel, off Tokyo, Japan, 80 fathoms, June 8, 1900
1934.8.18.56.	*Retepora pacifica* var. *disposita* Buchner, 1924	Uraga Channel, off Tokyo, Japan, 80 fathoms, June 8 1900
1934.8.18.57.	*Retepora* ? *tumescens* Ortmann	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
1963.3.10.20	*Celleporaria aperta* Hincks	Uraga Channel, off Tokyo, Japan, 150 fathoms, April 14 1901
1963.9.8.78.	*Mucronella*	off Tokyo, Japan, 80 fathoms
1963.9.8.79.	*Mucronella*	off Tokyo, 80 fathoms [small NE fragment from 40 fathoms]
1964.3.2.16.	*Flabellopora umbonata* var.	mouth of Uraga Channel, off Tokyo, 40-150 fathoms [large pieces - 150; 3 small pieces-40]
1964.3.2.17.	*Flabellopora* ? *transversa*	Misaki, off Tokyo, Japan, 50 fathoms, June 30 1901
1972.9.1.1.	*Adeonellopsis sp.*	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, June 25 1899
1975.7.28.10.	*Schizoporella argentea* Hincks	off Tokyo, Japan, 40 fathoms [The three small fragments are from 150 fms]
1975.7.28.11.	*Schizoporella argentea* Hincks	off Tokyo, Japan, - fathoms
1975.11.5.2.	*Cleidochasma porcellanum*	3 miles N of Sunosaki, off Tokyo, Japan
1980.2.1.6.	*Schizoporella*	Okinose, off Tokyo, Japan, 40 fathoms
1985.1.20.2.	*Schizoporella*	Uraga Channel, off Tokyo, Japan, 50 fathoms
2002.1.23.6.	*Gephyrophora polymorpha*	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
2010.9.16.1.	*Rhynchozoon*	Uraga Channel off Tokyo, Japan, 20-30 fathoms, April 21 1901
2010.9.16.2.	*Cellepora*	Tokyo Bay off Tokyo, Japan, 6 fathoms, September 1899

2010.9.16.3.	*Rhynchozoon*	Sagami Bay, off Tokyo, Japan, 50 fathoms, June 9 1901
2010.9.24.1.	*Smittia*	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, April 21 1901
2010.9.24.2.	*Schizoporella bidentata* Ortm. 1890	Okinose, off Tokyo, Japan, 40 fathoms
2010.9.24.3.	*Schizoporella insculpta* Hincks	Uraga Channel, off Tokyo, Japan, 30 fathoms
2010.9.24.4.	*Cellepora*	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, June 25 1899
2010.10.25.1.	*Cellepora*	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, July 28 1901
2010.10.25.2.	*Cellepora* + *Schizoporella* + *Diastopora*	Mouth of Uraga Channel, off Tokyo, Japan, 40 fathoms
2010.10.25.3.	*Schizoporella subhexagona,* Ortm. 1890	Uraga Channel off Tokyo, Japan, 50 fathoms
2010.10.25.4.	*Schizoporella subhexagona,* Ortm. 1890	Uraga Channel off Tokyo, Japan, 80 fathoms
2010.10.25.5.	*Adeonellopsis*	Sagami Bay, off Tokyo, Japan, 50 fathoms, June 9 1901
2010.10.25.6.	*Mucronella*	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, July 28 1901
2010.10.25.7.	*Mucronella*	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
2010.10.25.8.	?*Mucronella*	Uraga Channel, off Tokyo, Japan, 150 fathoms, April 29 1900
2010.10.25.9.	*Porella*	Doketsuba, off Tokyo, Japan, 150 fathoms, October 1898
2010.10.25.10.	*Exochella tricuspis* Hincks var. *japonica* Ortm.	(on sea-weed) off Tokyo, Japan, ? fathoms
2010.10.25.11.	*Halysisis*	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms
2010.10.25.12.	*Halysisis*	Uraga Channel off Tokyo, Japan, 30 fathoms
2010.10.25.13.	*Onychoporella selenoides* Ortm.	Uraga Channel off Tokyo, Japan, 150 fathoms
2010.10.25.14.	*Smittia adeonelloides* Ortm.	Uraga Channel, off Tokyo, Japan, 20-30 fathoms, May 26 1901
2010.10.25.15.	*Smittia*	Okinose, off Tokyo, Japan, 40 fathoms, April 7, 1901
2010.10.25.16.	*Smittia adeonelloides* Ortm.	Okinose, off Tokyo, Japan, 40 fathoms, Ap. 7 1901
2010.10.25.17.	*Smittia adeonelloides*	Misaki, off Tokyo, Japan, 50 fathoms, June 30 1901
2010.10.25.18.	*Smittia*	Uraga Channel, off Tokyo, Japan, 25 fathoms, May 26 1901
2010.10.25.19.	*Smittia*	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
2010.10.25.20.	*Smittia*	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901.The piece at Edge of Slide is No. 44.C, from Doketsuba, off Tokyo, 150 faths., Oct. 1898
2010.10.25.21.	*Smittia*	Uraga Channel off Tokyo, Japan, 80 fathoms, June 8 1900
2010.10.25.22.	*Escharoides*	Okinose, off Tokyo, Japan, 40-53 fathoms
2010.10.25.23.	?*Escharoides*	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms

2010.10.25.24.	*Escharoides*	Uraga Channel off Tokyo, Japan, 20-30 fathoms, June 25 1899
2010.10.25.25.	*Lepralia bidentata*	Japan. Backs of zooecia removed before decalfication
2010.10.25.26.	*Rhynchozoon*	Okinose, off Tokyo, Japan, 40 fathoms, April 7 1901
2010.10.25.27.	*Rhynchozoon*	Okinose off Tokyo, Japan, 40 fathoms, April 7 1901
2010.10.25.28.	*Lekythopora*	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms
2010.10.25.29.	*Lagenipora*	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms
2010.10.25.30.	*Lagenipora*	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms
2010.10.25.31.	*Schizoporella*	3 miles W. of Sunosaki, off Tokyo, Japan, 53 fathoms
2010.10.25.32.	*Schizoporella*	Okinose, off Tokyo, Japan, 40 fathoms
2010.10.25.33.	*Schizoporella*	Okinose, off Tokyo, Japan, 40 fathoms
2010.10.25.34.	*Schizoporella*	Okinose, off Tokyo, Japan, 40 fathoms
2010.10.25.35.	*Schizoporella*	Uraga Channel, off Tokyo, Japan, 20-30 fathoms
2010.10.25.36.	*Schizoporella*	Uraga Channel, off Tokyo, Japan, 80 fathoms
2010.10.25.37.	*Schizoporella*	off Tokyo, Japan, 40 fathoms
2010.10.25.38.	*Schizoporella acuta* Ortm.	Doketsuba, off Tokyo, Japan, 150 fathoms
2010.10.25.39.	*Schizoporella acuta* Ortm.	Okinose, off Tokyo, Japan, 40 fathoms
2010.10.25.40.	*Schizoporella aterrima* Ortm. 1890	Okinose, off Tokyo, Japan, 40-200 fathoms
2010.10.25.41.	*Schizoporella biaperta* var. *divergens* Sm.	off Tokyo, Japan, 40 fathoms
2010.10.25.42.	*Schizoporella cecilii* Aud.	Uraga Channel, off Tokyo, Japan, 50 fathoms
2010.10.25.43.	*Schizoporella*	3 miles W. of Sunosaki, off Tokyo, Japan, 53 fathoms
2010.10.25.44.	*Schizoporella cecilii* (Aud.)	on a *Fucus,* Misaki, off Tokyo, Japan, — fathoms
2010.10.25.45.	*Schizoporella insculpta* Hincks (young) (etc).	Uraga Channel, off Tokyo, Japan, 30 fathoms
2010.10.25.46.	*Schizoporella ternata* Ortm., 1890	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms
2010.10.25.47.	*Schizoporella*	Okinose, off Tokyo, Japan, 40 fathoms
2010.10.25.48.	*Cellepora radiata* Ortm.	3 miles W. of Sunosaki off Tokyo, Japan, 53 fathoms