Distribution of Scyphomedusae in Japanese and its Adjacent Waters

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(With 2 Text-figures)

With the exception of some deep-sea forms, the Schyphomedusae are generally coastal dwellers and mostly have both the sessile and pelagic stages. The sessile polyps are limited in destribution, but the floating medusae can be carried far away from their home by currents. Therefore, there are two sorts of ranges of distribution for Scyphomedusae ; one enough to complete their reproduction and another enough herein to live only for medusae. As the examples of the latter cases, there can be often found some tropical forms in Japanese waters and medusae of temperate regions are occasionally obtained in Northern parts of Japan. These medusae have been drifted by water currents and are known as temporary visitors. They can not reproduce and settle in habitats in new localities.

The medusae hitherto found in Japan and its adjacent waters are 43 in number as shown in the following list.

Stauromedusae

Fam. Eleutherocarpidae

1. *Stenoscyphus inabai* (Kishinouye)
2. *Haliclystus auricula* Clark
3. *Haliclystus borealis* Uchida
4. *Haliclystus steinegeri* Kishinouye
5. *Haliclystus sinensis* Ling

Fam. Cleistocarpidae

6. *Thaumatoscyphus distinctus* Kishinouye

Fam. Kishinouyeidae

7. *Sasakiella cruciformis* Okubo
8. *Sasakiella tsingtaoensis* Ling
9. *Kishinouyea nagatensis* (Oka)

Cubomedusae

Fam. Charybdeidae

10. *Charybdea rastonii* Haacke
11. *Tamoya bursaria* Haeckel

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(Pteromedusae)

12. *Tetraplatia volitans* v. Busch

Coronatae

Fam. Ephyropsidae

13. *Palephyra pelagica* (Haeckel)
14. *Nausithoë punctata* Kölliker
15. *Stephanoscyphus racemosus* Komai
16. *Stephanoscyphus corniformis* Komai

Fam. Collaspidae

17. *Atolla bairdii* Fewkes
18. *Atolla wyvillei* Haeckel

Fam. Periphyllidae

19. *Periphylla hyacinthina* Steenstrup

Semaeostomae

Fam. Palagidae

Subfam. Eupelaginae

20. *Pelagia panopyra* Péron et Lesueur
21. *Chrysaora helvola* Brandt
22. *Dactylometra pacifica* Goette
23. *Kuragea depressa* Kishinouye

Subfam. Sanderinae

24. *Sanderia malayensis* Goette

Fam. Cyaneidae

25. *Cyanea capillata* Eschscholtz
26. *Cyanea purpurea* Kishinouye
27. *Cyanea nozakii* Kishinouye

Fam. Ulmaridae

Subfam. Umbrosinae

28. *Parumbrosa polylobata* Kishinouye

Subfam. Stenoninae

29. *Phacellophora ambigua* Brandt

Subfam. Aurelinae

30. *Aurelia aurita* Lamarck
31. *Aurelia limbata* Brandt

Rhizostomae

Subord. Kolpophorae

Fam. Cassiopeidae

32. *Cassiopea ornata* Haeckel

Fam. Cepheidae

33. *Netrostoma setouchiana* (Kishinouye)
34. *Netrostoma coerulescens* Maas
35. *Cephea cephea* (Forskål)

Fam. Mastigiadidae

36. *Mastigias papua* L. Agassiz
37. *Thysanostoma thysanura* Haeckel

38. *Phyllorhiza triformis* Haeckel

Subord. Dactyliophorae

Superfam. Inscapulatae

Fam. Lychnorhizidae

39. *Acromitus flagellatus* (Haeckel)

Superfam. Scapulatae

Fam. Stomolophidae

40. *Stomolophus nomurai* (Kishinouye)

Fam. Rhizostomidae

41. *Rhopilema esculenta* Kishinouye

42. *Rhopilema asamushi* Uchida

43. *Rhopilema hispidium* Vanhoeffen

Along the coasts of Japan there are flowing the two currents ; the Oyashio, cold current, from northern part and the Kuroshio, warm current, from southern part. *Cyanea capillata*, a boreal form, is often found in abundance on coasts of Hokkaido and in Mutsu Bay as a temporal visitor flown by the Oyashio. The species is known as a boreal form and seems to reproduce in more northern parts, but does not settle on the Japanese localities above given. Because of rich current of the Kuroshio, there are known several tropical medusae carried from the southern regions as given below, *Netrostoma coerulescens*, *Cephea cephea*, *Thysanostoma thysanura*, *Phyllorhiza triformis* and *Rhopilema hispidium*. Out of them, *Rhopilema hispidium* was recorded only in southern parts of Japan about 60 years ago and *Phyllorhiza triformis* was only once recorded by Haeckel (1880). The three other medusae are rather rare in Japan and one or two specimens are occasionally collected on the Pacific coasts in the southern part of Japan, from Misaki to Kyushu. Judging from the fact that small numbers of the specimens were collected at the same time, these medusae were possibly carried from southern parts.

As the pelagic forms, there are known *Tetraplatia volitans* and *Pelagia panopyra*. These scyphozoans are floating throughout their life on the Kuroshio current. The latter species is very common in Japanese waters and is also found from Formosa, through the Loochoo Islands, to Hakodate, southern part of Hokkaido. The process of metamorphosis of the medusa is also reported. Besides these medusae, *Sanderia malayensis* seems to be pelagic inferring from the purple coloration like *Pelagia* which is very common in pelagic animals dwelling in the Kuroshio current. The medusa is rather common in summer on the coasts of Kyushu and is very dangerous there on account of the poisonous tentacles. The medusa is found at Misaki and in Toyama Bay as northern limits ; one on the Pacific and another on coasts of the Japan Sea.

The Stauromedusae are known as the circumboreal animals. Among the species here given, *Haliclystus auricula* and *Sasakiella cruciformis* seem to be temperate ones, they having been found from Hokkaido and Tsingtao, China. The two stalked medusae, *Stenoscyphus inabai* and *Kishinouyea nagatensis*, are

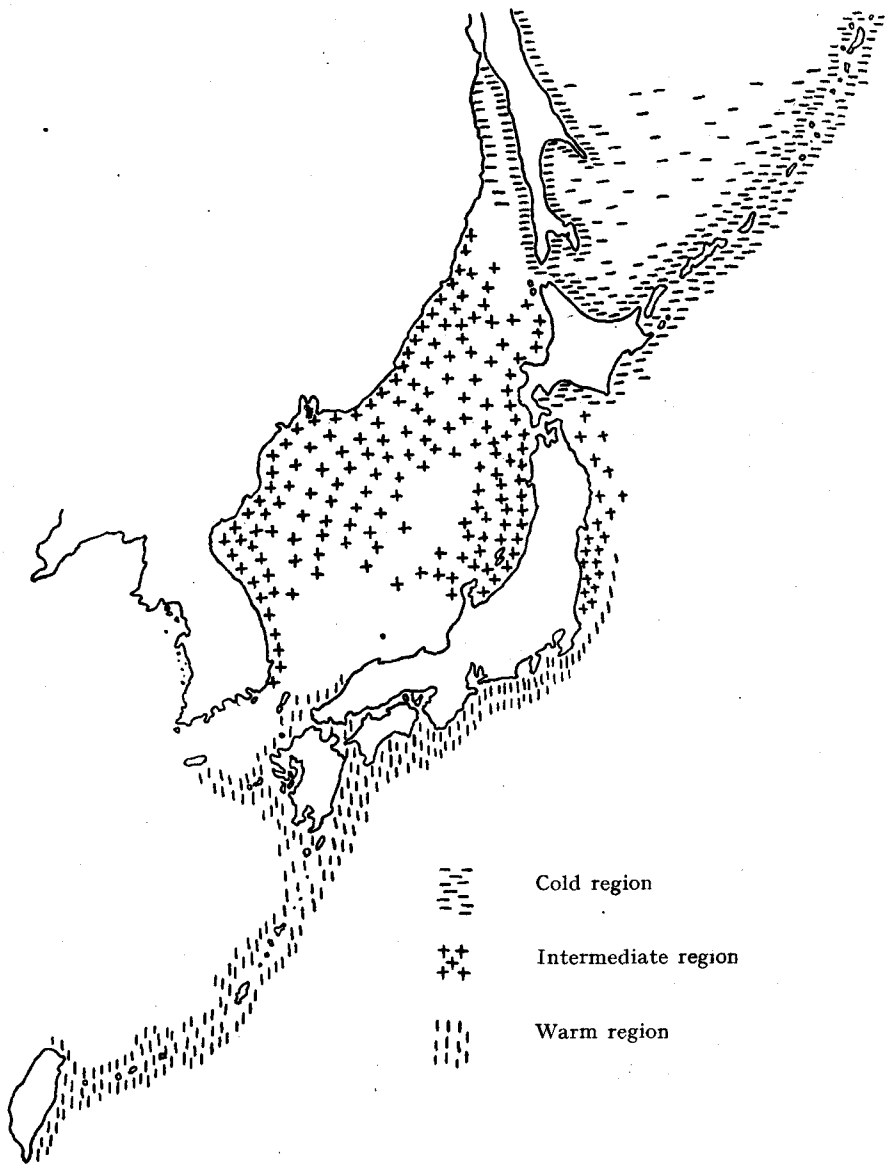

Fig. 1. The map showing the cold, intermediate and warm regions in the vicinity of Japan.

restricted in their distribution only in Japanese waters. The former is found from Kyushu to Hokkaido, but the latter species is only collected from Misaki southward. The boreal forms such as *Haliclystus borealis*, *Haliclystus steinegeri* and *Thaumatoscyphus distinctus* are distributed only on the coasts washed by the cold current Oyashio. The two latter species are found also northward Saghalin and the Commander Islands.

The Cubomedusae are generally known as forms of the tropical region. We have two Cubomedusae, *Charybdea rastonii* and *Tamoya bursaria*, both common in Japanese waters. The former species is found in Formosa, the Loochoo Islands and almost all the coasts of Japan. In Hokkaido the medusa is not uncommon on the southwestern coasts where the effect of the cold current is not distinct. Judging from the annual occurrence of this cubomedusa on the coast of Hokkaido in the summer season, it has surely the sessile stage there. *Tamoya bursaria*, a large tropical form widely distributed in the Pacific, appears every year in the Inland Sea and becomes as annoyance to fisher-men on account of its furious poison of tentacles.

The Coronatae are mostly abyssal and cosmopolitan. The three species, *Atolla bairdi*, *A. wyvillei* and *Periphylla hyacinthina* belong to this group. *Stephanoscyphus corniformis*, of which only the polyp is known, is also of a rather deep-sea form. The littoral scyphopolyp, *Stephanoscyphus racemosus* has been recorded in the vicinity of the Seto Marine Biological Station and also collected by the present writer from the coast of the Loochoo Islands in 1936. The scyphopolyp is possibly an animal of warm water.

In the Semaeostomae, *Chrysaora helvola* and *Aurelia limbata*, both boreal and distributed in the northern Pacific, are common in summer on several coasts of Hokkaido. The fact that the young medusae of these species are often found, shows the occurrence of these polyps on the littoral coasts of Hokkaido. The distribution of them is limited only to the northern and southeastern coasts of Hokkaido and does not range further southward. *Aurelia aurita*, which is very common everywhere in Japan, appears yearly only on the western coasts of Hokkaido nearly in the same locality and in the same season in which *Charybdea rastonii* occurs. *Dactylometra pacifica* is very common in Japan proper southward to the Loochoo Islands. The medusae are abundantly found in spring in calm bays especially from Misaki southward in Honshu and Kyushu. The species appears abundantly in Mutsu Bay during spring and summer. I saw in a summer many medusae of the species being flown northward across the Tsugaru Strait. It is known that the medusa was, though seldom, found also on the eastern coast of Hokkido and also in Saghalin as a temporary visitor.

The Semaeostomae, which are known as common in Honshu, Kyushu and Shikoku, are as follows ; *Pelagia panopyra*, *Dactylometra pacifica*, *Aurelia aurita*. These medusae are very common and their ephyrae are often collected. These species distribute southward to the Loochoo Islands and Foromsa. *Cyanea*

nozakii is very common in the Inland Sea, often found on the Pacific coasts of Honshu northward to Misaki, but rather rare except in the Inland Sea. *Kuragea depressa* is extremely rare but is twice found in the middle part of Japan. *Parambrosa polylobata* is also once found in rather deep sea in Kyushu. *Phacellophora ambigua* is probably a northern form, because it is recorded from the Okhotsk Sea. But the species is often found on the Pacific coasts in middle parts of Honshu.

It is often said by fishermen that there is occasionally found a large brown rhizostome medusa off the western coast of Hokkaido. It seems to the writer that the large rhizostome medusa is possibly *Stomolophus nomurai* which is widely distributed in the Japan Sea from coasts of Korea to Hokkaido. Besides this another rhizostome medusa, *Rhopilema asamushi* occurs in Asamushi Bay and the northern coasts of Honshu facing to the Japan Sea to Tomioka, western coast of Kyushu. Though the Rhizostomae are generally known as medusae of warm waters, the two medusae above mentioned are rather cold-water forms. *Mastigias papua* which is widely distributed in the Indo-Pacific occurs in Formosa, the Loochoo Islands and on the Pacific coasts of the Japanese Islands up to Mito City slightly north to Tokyo Bay. The medusa is one of the commonest species in Japan. *Netrostoma setouchiana* is known in the Inland Sea and on the coasts of Shikoku and Kyushu. This medusa wos also collected in the Fiji Islands and at Madras, the Indian Ocean. *Rhopilema esculenta* has been known as an edible medusa and was found abundantly in the Inland Sea about 40–50 years ago. At present the species is rather few there but is still found in bays of Kyushu in summer.

The distribution of the Japanese medusae will be given in the following table and Figs. 1 and 2. The deep-sea forms are excluded in the table, because most of them are cosmopolitic.

While the Pacific coasts of Japan are remarkably influenced by the warm current Kuroshio, the coasts of the Japan Sea are rather strongly effected by the cold current Oyashio. Therefore, these two coasts are different each other even in the same latitude from the viewpoint of medusan distribution. On the Pacific coasts several tropical medusae are found in the vicinity of Tokyo Bay as temporary visitors and some tropical forms reproduce there. On the coasts of the Japan Sea the tropical medusae are found very few in species and they are hardly found farther northward than Toyama Bay. Only two forms of warm waters *Charybdea rastonii* and *Dactylometra pacifica* are distributed to Hokkaido and to Mutsu Bay. Moreover, two rhizostome medusae of cold water, *Stomolophus nomurai* and *Rhopilema asamushi*, are known generally in the Japan Sea and only rarely found on the western coasts of Kyushu.

When reviewed the distribution of the Scyphomedusae in Japan, one can see a few pairs of opposite distribution ; one as the northern type and another as the southern one : They are *Chrysaora helvola* to *Dactylometra pacifica*, *Cyanea capillata* to *Cyanea nozakii* and *Aurelia limbata* to *Aurelia aurita*. These two

Species \ Localities	Okhotsk Sea	Hokkaido	Japan Sea	Mutsu Bay	Inland Sea	Pacific Coasts of Honshu (Shikoku, Kyushu)	Loochoo Islands	Formosa	China	Philippine and Indo-Pacific
Stenoscyphus inabai		〃	〃	〃	〃	〃				
Haliclystus auricula	〃	〃	〃	〃	〃	〃			〃	
Haliclystus borealis		〃								
Haliclystus steinegeri	〃	〃								
Haliclystus sinensis									〃	
Thaumatoscyphus distinctus	〃	〃								
Sasakiella cruciformis		〃		〃					〃	
Sasakiella tsingtaoensis		〃							〃	
Kishinouyea nagatensis			〃		〃	〃				
Charybdea rastonii		〃	〃	〃	〃	〃	〃			〃
Tamoya bursaria					〃					〃
Tetraplatia volitans						〃				
Palephyra pelagica						〃 (?)				
Nausithoe punctata						〃				
Stephanoscyphus racemosus						〃	〃			
Pelagia panopyra		〃	〃	〃	〃	〃	〃	〃		
Chrysaora helvola	〃	〃								
Dactylometra pacifica		temporary visitor	〃	〃	〃	〃	〃			
Kuragea depressa						〃				
Sanderia malayensis			〃		〃	〃				〃
Cyanea capillata	〃	temporary visitor		temporary visitor						

Species \ Localities	Okhotsk Sea	Hokkaido	Japan Sea	Mutsu Bay	Inland Sea	Pacific Coasts of Honshu (Shikoku, Kyushu)	Loochoo Islands	Formosa	China	Philippine and Indo-Pacific
Cyanea purpurea	once recorded									
Cyanea nozakii					〃	〃				
Phacellophora ambigua	〃					〃				
Aurelia aurita		〃	〃	〃	〃	〃	〃	〃		〃
Aurelia limbata	〃	〃								
Cassiopea ornata										Micronesia
Netrostoma setouchiana					〃	〃				〃
Netrostoma coerulescens						temporary visitor				〃
Cephea cephea						temporary visitor				〃
Mastigias papua						〃	〃			〃
Thysanostoma thysanura						〃				〃
Phyllorhiza triformis						one recorded				〃
Acromitus flagellatus								〃		〃
Stomolophus nomurai		〃	〃							
Rhopilema esculenta					〃	〃			〃	
Rhopilema asamushi			〃	〃		〃				
Rhopilema hispidium						〃			〃	〃

medusae in each pair are all colsely allied forms. The similar case is also in the order Rhizostomae. The medusae belonging to the order are generally forms of warm waters, but some of Scapulatae are distributed in comparatively northern parts. In Japan two Rhizostomae are the northern forms, *Rhopilema asamushi* and *Stomolophus nomurai*. In Europe, *Rhizostoma pulmo* allied to *Rhopilema asamushi* is only medusa found together with *Cotylorhiza tuberculata* in the Mediterranean Sea and in North America, *Stomolophus meleagris*, another member

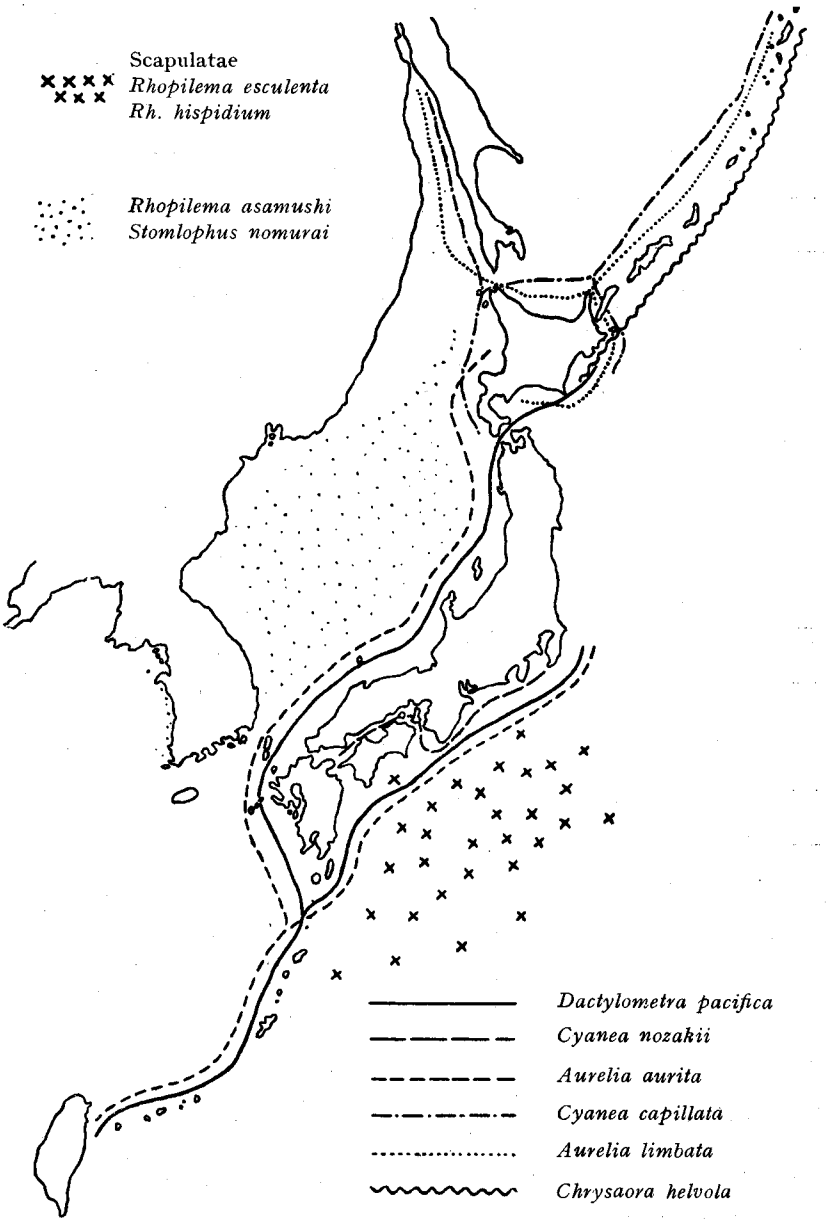

Fig. 2. The map showing the distrbution of a pair of allied species, each in opposite distribution, northern and southern.

of the genus, is also a single medusa found in cold waters.

Literature

Bigelow, H. B., 1913. Medusae and Siphonophorae collected by the U. S. Fisheries Steamer "Albatross" in the northwestern Pacific, 1906. Proc. U. S. Nat. Mus., vol. 44, p. 1–119, pls. 1–6.

————, 1920. Medusae and Ctenophora. Rep. Canadian Arctic Exped. 1913–18. vol. 8, pt. H. p. 1–20, 1–2.

————, 1930. Plankton of the Bermuda Oceanographic Expeditions. VIII. Medusae taken during the years 1929 and 1930. Zoologica, New York Zoological Society, vol. 23, p. 99–189.

Brandt, J. F., 1838. Ausführliche Beschreibung der von C. H. Mertens auf seiner Weltumsegelung beobachteten Schirmquallen nebst allgemeinen Bemerkungen über Schirmquallen überhaupt. Mém. Acad. Imp. d. Sci. St. Pétersbourg, ser. 6, p. 237–411, pl. 1–31.

Goette, A., 1886. Verzeichnis der Medusen, welche von Dr. Sander, Stadtarzt auf S. M. S. "Prinz Adalbert" gesammelt wurden. Sitz. d. könig. preuss. Akad. d. Wissen. z. Berlin, Bd. 39, p. 1–7.

Kirkpatrick, R., 1903. Notes on some medusae from Japan. Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 615–621.

Kishinouye, K., 1899. A new stalked medusa, *Haliclystus steinegeri*. Proc. U. S. Nat. Mus., vol. 22.

————, 1902. Some new Scyphomedusae of Japan. Jour. Coll. Sci. Tokyo Imp. Univ., vol. 17, art. 7.

———— ,1910. Some medusae of Japanese waters. Jour. Coll. Sci., Tokyo Imp. Univ., vol. 27, Art. 9.

Komai, T., 1935. On *Stephanoscyphus* and *Nausithoë*. Mem. Coll. Sci., Kyoto Imp. Univ., ser. B. vol. 11, no. 5.

————, 1936. On another form of *Stephanoscyphus* found in the waters of Japan. The same, vol. 11, no. 3.

————, 1939. On the enigmatic Coelenterate *Tetraplatia*. Jap. Jour. Zool., vol. 8, p. 231–250, pl. 1.

Light, S. F. 1914. Some Philippine Scyphomedusae, including two new genera, five new species, and one new variety. Philippine Jour. Sci., vol. 9, p. 195–231.

————, 1921. Further notes on Philippine scyphomedusan jellyfish. The same, vol. 18, p. 25–45.

Ling, S. W. 1937. Studies on Chinese Stauromedusae 1. Stauromedusae from Tsingtao. The Amoy Marine Biol. Bull., vol. 3, no. 1.

————, 1939. Studies on Chinese Stauromedusae 2. Further Studies on some Stauromedusae from China. Linguan Sci. Jour., vol. 18, No. 3.

Maas, O., 1903. Scyphomedusan der Siboga-Expedition. Monogr. 11, p. 1–91, pl. 1–12.

————, 1909. Japanische Medusan. Beiträge zur Naturgeschichte Ost-Asiens, Abh. Math-phys. Klasse d. k. Bayer. Akad. d. Wiss., Suppl. Bd. 1, Abh. 8, p. 1–52, pl. 1–3.

Mayer, A. G., 1910. Medusae of the world, p. 1–735, pl. 1–76. Carnegie Inst. Washington, publ. No. 109.

————, 1917. Report upon the Scyphomedusae collected by the United States Bureau

of Fisheries Steamer "Albatross" in the Philippine Islands and Malay Archipelago. Smithsonian Institution U. S. Nation. Mus., Bull. 100, vol. 1, pt. 3.

Stiasny, G. 1921. Studien über Rhizostomeen mit besonderer Berücksichtigung der Fauna des Malaiischen Archipels nebst einer Revision des Systems. Capita Zoologica, deel. 1 Afl. 2.

————, 1922. Die Scyphomedusen-Sammlung von Dr. Th. Mortensen nebst anderen Medusen aus dem Zoologischen Museum der Universität in Kopenhagen. Vidensk. Medd. fra Dansk naturh. Foren. Bd, 73.

————, 1937. Über *Netrostoma setouchianum* Kishinouye, eine Rhizostome von Suva (Fischiinseln) Zool. Anz Bd. 120, s. 110–115.

Uchida, T., 1926. The anatomy and development of a Rhizostome medusa, *Mastigias papua* L. Agassiz, with observation on the phylogeny of Rhizostomae. Jour. Fac. Sci., Imp. Univ. Tokyo, sect. 4, Zool., vol. 1, pt. 1

————, 1927. Report of the Biological Survey of Mutsu Bay. 2. Medusae of Mutsu Bay. Sci. Rep. Tohoku Imp., ser. 4, Biol., vol. 2, no. 3.

————, 1929. Studies on the Stauromedusae and Cubomedusae, with special reference to their metamorphoses. Jap. Jour. Zool., vol. 2, no. 2.

————, 1934. Metamorphosis of a Scyphomedusa (*Pelagia panopyra*). Proc. Imp. Acad., vol. 10, No. 7.

————, 1934. A Semaeostome medusa with some characters of Rhizostomae. Proc. Imp. Acad., vol. 10, no. 10.

————, 1935. Remarks on the Scyphomedusan family Pelagidae. Trans. Sapporo Nat. Hist. Soc., vol. 114, pt. 1.

————, 1938. Report of the Biological Survey of Mutsu Bay. 32. Medusae from Mutsu Bay (Revised Report). Sci. Rep. Tohoku. Imp. Univ., ser. 4, Biol., vol. 8, no. 1.

————, 1938. Medusae in Onagawa Bay and its vicinity. The same, vol. 8, no. 1

————, 1938. Medusae in the vicinity of the Amakusa Marine Biological Station. Bull. Biogeorg. Soc. Japan., vol. 8, no. 10.

————, 1940. The Fauna of Akkeshi Bay. XI. Medusae. Jour. Fac. Sci., Hokkaido Imp. Univ., ser. 6, Zool., vol. 7, no. 3.

————, 1947. Some Medusae from the Central Pacific. The same, vol. 9, no. 3.

————, 1947. Medusae in the vicinity of Simoda. The same. vol. 9, no. 4.

————, Scyphomedusae from the Loochoo Islands and Formosa (in press).

Uchida, T. & K. I. Hanaoka, 1933. On the morphology of a stalked medusa, *Thamatoscyphus distinctus* Kishinouye. Jour. Fac. Sci., Hokkaido Imp. Univ., ser. 4. Zool., vol. 2, no. 3.

————, 1934. Anatomy of two stalked medusae with remarks on the distribution of the Stauromedusae in Japan. Jour. Fac. Sci., Hokkaido Imp. Univ., ser 4, Zool., vol. 2, no. 4.