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Marine Algae of the Oshika Peninsula II. Rhodophyceae

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Summary

Ninety species and six forms of Rhodophyceae collected from the coast of Oshika Peninsula are listed in this paper. Two of these collections, *Polysiphonia savatiera* Hariot and *Laurencia undulata* Yamada, are new records for this peninsula. The floristic characters of this peninsula are also described.

It has been geographically well known that the Oshika Peninsula stretches for more twenty kilometers to the Pacific Ocean and the waters around this peninsula are characterized as transition area caused by both the Kuroshio warm current and the Oyashio cold current through a year. It can be supposed that the benthic algal flora on this area differs from that in adjacent areas. The results of our previous observations (1) suggest this possibility. Literature data (2-5) show the floras in adjacent areas are comparatively homogeneous and are different from those in this area. From the same coast of this peninsula, both of the "southern" species growing in the warm temperate waters and the "northern" species growing in the subarctic waters were collected, such as *Padina arborescens*, *Sargassum hemiphyllum*, and others as "southern" species, and *Laminaria japonica*, *L. religiosa*, *Costaria costata*, and others as "northern" species. From the above-mentioned reasons, it is very interesting to investigate the geographical distribution and the floristic compositions of benthic algae of the Oshika Peninsula, and the knowledge will become important in the fields of phycology or fisheries.

The algae were collected from April 1975 to October 1976 and seventeen collection sites are figured in our previous paper. Further collections were made at Koyatori and Tsukahama from December 1976 to March 1977. We could collect some winter species and they were added in our studying materials. Unknown species with insufficient information are not included. As the results of our continuing studies, the species, the seasonal occurrence and the reproductive periodicity of marine red algae were able to be reported for this peninsula. The

floristic characters are also discussed in this paper.

RHODOPHYCEAE

I. BANGIOPHYCIDAE

Bangiaceae

Bangia fusco-purpurea (Dillwyn) Lyngbye

Japanese name: Ushike-nori

Collection: Koyatori (Feb., '77)

Erythrocladia subintegra Rosenvinge

Japanese name: Isohanabi

Collection: Koyatori (July, '76)

Porphyra yezoensis Ueda

Japanese name: Susabi-nori

Collections: Konorihama (June, '76), Tsukahama (Jan., '77), Koyatori (Jan., '77)

Cystocarp: Jan.

Porphyra pseudolinearis Ueda

Japanese name: Uppurui-nori

Collection: Koyatori (Jan., '77)

Cystocarp: Jan.

II. FLORIDIOPHYCIDAE

Chantransiaceae

Rhodochorton howei Yamada

Syn.: *Rhodochorton affine* Yamada

Japanese name: Mirunobeni

Collections: Tsukahama (Jan., '77), Koyatori (Jan., '77)

Helminthocladiaceae

Nemalion vermiculare Suringar

Japanese name: Umizômen

Collections: Shirahama (Aug., '75), Niiyamahama (Aug., '75), Koyatori (July, '76), Tsukahama (July and Aug., '76)

Cystocarp: Aug.

Gelidiaceae

Gelidium divaricatum Martens

Japanese name: Hime-tengusa

Collection: Koyatori (July, '76)

Gelidium pusillum (Stackhouse) Le Jolis

Japanese name: Hai-tengusa

Collection: Koyatori (Aug., '76)

Gelidium amansii Lamouroux

Japanese name: Makusa

Collections: Tsukinoura (July, Oct. and Dec., '75; Apr., '76), Shirahama (Aug., '75), Kobuchi (Aug., '76), Konorihama (June and Aug., '76), Koyatori (July, '76), Tsukahama (Aug., '76)

Cystocarp: July

Tetrasporangium: Apr., July, Oct. and Dec.

Gelidium subfastigiatum Okamura

Japanese name: Nanbugusa

Collections: Ajishima (Oct., '75), Koyatori (Feb., '76)

Pterocladia capillacea (Gmelin) Bornet et ThuretSyn.: *Pterocladia tenuis* Okamura

Japanese name: Obakusa

Collections: Koyatori (July and Aug., '76), Tsukahama (Aug., '76), Tsukinoura (Feb., '77)

Dumontiaceae

Dumontia simplex Cotton

Japanese name: Heraryûmon

Collection: Koyatori (Feb., '77)

Tetrasporangium: Feb.

Neodilsea yendoana Tokida

Japanese name: Akaba

Collections: Koyatori (July, '76), Tsukahama (July, '76)

Tetrasporangium: July

Corallinaceae

Melobesia pacifica Masaki

Japanese name: Abata-mokasa

Collection: Samejima (Aug., '75)

Tetrasporangial conceptacle: Aug.

Lithothamnium erubescens Foslie

Japanese name: Edauchi-ishimo

Collection: Tsukinoura (Dec., '76)

Tetrasporangial conceptacle: Dec.

Lithophyllum okamurai Foslie

Japanese name: Hira-ibo

Collections: Tsukinoura (July, '75) Ajishima (Aug., '75), Samejima (Oct.,

'75)

Tetrasporangial conceptacle: July, Aug. and Oct.

Lithophyllum yendoi Foslie

Japanese name: Umisabi

Collection: Koyatori (July., '76)

Tetrasporangial conceptacle: July

Fosliella lejolisii (Rosanoff) Howe

Japanese name: Shiro-mokasa

Collections: Shirahama (Aug., '75), Kobuchi (Oct., '75), Ajishima (Oct., '75),
Samejima (Oct., '75)

Tetrasporangial conceptacle: Aug. and Oct.

Fosliella zostericola (Foslie) SegawaSyn.: *Heteroderma zostericola* Foslie

Japanese name: Mokasa

Collections: Samejima (Aug., '75), Kobuchi (Dec., '76)

Tetrasporangial conceptacle: Aug. and Dec.

Marginisporum crassissimum (Yendo) Johansen et Chihara

Japanese name: Heritori-kaninote

Collection: Ajishima (Oct. '75)

Tetrasporangial conceptacle: Oct.

Bossiella cretacea (Yendo) Johansen

Japanese name: Isokiri

Collections: Kobuchi (June and Dec., '76), Tsukinoura (Aug., '76), Koyatori
(June and Aug., '76)*Calliarthron yessoense* (Yendo) Manza

Japanese name: Ezo-shikoro

Collection: Niiyamahama (Aug., '75)

Serraticardia maxima (Yendo) Silva

Japanese name: Oo-shikoro

Collections: Ajishima (Oct., '75; May, '77), Niiyamahama (Aug., '75; May,
June and Dec., '76)

Tetrasporangial conceptacle: Aug.

Corallina pilulifera Postels et Ruprecht

Japanese name: Pirihiba

Collections: Samejima (Aug., '75), Niiyamahama (Aug., '75), Koyatori
(Aug., '76; Jan. and Feb., '77), Tsukinoura (Jan. and Feb., '77)

Tetrasporangial conceptacle: July and Aug.

Cryptonemiaceae

Halymenia acuminata (Holmes) J. Agardh

Japanese name: Oo-mukadenori

- Collection: Tsukahama (July, '77)
Grateloupia filicina (Wulfen) J. Agardh
Japanese name: Mukadenori
Collections: Koyatori (Aug., '75), Tsukahama (Aug., '75), Ajishima (Oct., '75), Tsukinoura (Feb., '77)
- Grateloupia divaricata* Okamura
Japanese name: Katanori
Collection: Koyatori (Aug., '76)
- Grateloupia livida* (Harvey) Yamada
Japanese name: Hiramukade
Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76; Jan., '77), Tsukinoura (Feb., '76)
- Grateloupia turuturu* Yamada
Japanese name: Tsurutsuru
Collection: Koyatori (Aug., '76)
- Grateloupia okamurai* Yamada
Japanese name: Kyonohimo
Collections: Konorihama (June, '76), Koyatori (July, '76)
- Grateloupia imbricata* Holmes
Japanese name: Sakuranori
Collections: Koyatori (Aug., '76; Jan. and Feb., '77), Tsukahama (Aug., '76)
Cystocarp: Aug.
- Pachymeniopsis elliptica* (Holmes) Yamada
Japanese name: Tanbanori
Collections: Ajishima (Oct., '75), Tsukahama (Aug., '76)
Tetrasporangium: Oct.
- Pachymeniopsis lanceolata* (Okamura) Yamada
Japanese name: Fudaraku
Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76; Jan., '77)
- Phyllymenia sparsa* (Okamura) Kylin
Japanese name: Hijirimen
Collection: Koyatori (Aug., '76)
- Carpopeltis affinis* (Harvey) Okamura
Japanese name: Matsunori
Collections: Ajishima (Oct., '75), Koyatori (July and Aug., '76), Tsukahama (Aug., '76)
- Carpopeltis flabellata* (Holmes) Okamura
Japanese name: Komenori
Collection: Koyatori (Aug., '76; Jan., '77), Tsukahama (Jan. and Feb., '77), Tsukinoura (Feb., '77)

Carpopeltis crispata Okamura

Japanese name: Tosakamatsu

Collections: Konorihama (June and Aug., '76), Tsukahama (Aug., '76)

Endocladaceae

Gliopeltis furcata Postels et Ruprecht f. *coliformis* Okamura

Japanese name: Fukuro-funori

Collections: Koyatori (July, '76; Jan. and Feb., '77), Yoriisozaki (July, '76), Tsukahama (July, '76; Jan. and Feb., '77), Tsukinoura (Jan. and Feb., '77)

Cystocarp: July

Tetrasporangium: Aug.

Nemastomaceae

Nemastoma lancifolia Okamura

Japanese name: Usuginu

Collection: Tsukahama (Jan., '77)

Schizymenia dubyi (Chauvin) J. Agardh

Japanese name: Benisunago

Collection: Tsukahama (Aug., '76)

Plocamiaceae

Plocamium telfairiae Harvey

Japanese name: Yukari

Collections: Samejima (Oct., '75), Tsukinoura (Dec., '75; Apr. and Dec., '76)

Plocamium recurvatum Okamura

Japanese name: Maki-yukari

Collections: Koyatori (June, '76), Tsukahama (Jan., '77)

Sphaerococcaceae

Caulacanthus okamurai Yamada

Japanese name: Isodantsû

Collections: Konorihama (June, '76), Tsukinoura (Oct., '75), Koyatori (July and Aug., '76), Samejima (Aug., '75; Dec., '76)

Gracilariaceae

Gracilaria verrucosa (Hudson) Papenfuss

Japanese name: Ogonori

Collections: Konorihama (July, '76), Koyatori (Aug., '76), Tsukahama (Aug., '76)

Phylloporaceae

Gymnogongrus flabelliformis Harvey

Japanese name: Okitsunori

Collections: Konorihama (June, '76), Koyatori (July and Aug., '76; Jan. and Feb., '77), Tsukinoura (Jan. and Feb., '77)

Cystocarp: Aug.

Ahnfeltia paradoxa (Suringar) Okamura

Japanese name: Harigane

Collections: Koyatori (May, '75; July and Dec., '76), Yoriisozaki (July, '76), Tsukahama (Aug., '76; Jan. and Feb., '77), Tsukahama (Jan. and Feb., '77), Niiyamahama (Dec., '76)

Cystocarp: May

Gigartinaceae

Gigartina tenella Harvey

Japanese name: Suginori

Collection: Tsukahama (Aug., '76)

Gigartina teedii (Roth) Lamouroux

Japanese name: Shikin-nori

Collection: Tsukinoura (Feb., '77)

Gigartina mamillosa (Goodenough et Woodward) J. Agardh

Japanese name: Ikanoashi

Collections: Ajishima (Oct., '75), Tsukinoura (Feb., '77)

Gigartina mikamii YoshidaSyn.: *Chondrus verrucosus* Mikami

Japanese name: Ibo-tsunomata

Collection: Koyatori (Aug., '76)

Cystocarp: Aug.

Rhodoglossum japonicum Mikami f. *divergens* (Nagai) Mikami

Japanese name: Akaba-ginnansô

Collections: Konorihama (June, '76), Tsukahama (Feb., '77), Koyatori (Feb., '77)

Cystocarp: Feb.

Chondrus ocellatus Holmes f. *ocellatus*

Japanese name: Tsunomata

Collections: Maeami (May, '75), Yoriisozaki (May, '75), Tsukinoura (Oct., '75), Niiyamahama (Aug., '75), Konorihama (Apr., '76), Shirahama (Aug., '75), Tsukahama (May, '75; June, July, Aug., Sept., Oct., Nov. and Dec., '76; Jan., Feb. and Mar., '77), Koyatori (May, '75; May, June, July, Aug., Sept., Oct., Nov. and Dec., '76; Jan, Feb. and Mar., '77), Samejima (Aug. and Oct., '75; Dec., '76)

Chondrus ocellatus Holmes f. *crispoides* Mikami

Japanese name: Tochaka-damashi

Collection: Koyatori (Aug., '76)

Tetrasporangium: Aug.

Chondrus crispus (Linné) Stackhouse

Japanese name: Tochaka

Collections: Konorihama (June, '76), Koyatori (July, '76)

Rhodymeniaceae

Chrysomenia wrightii (Harvey) Yamada

Japanese name: Taoyagisô

Collections: Tsukahama (July, '76), Shirahama (Aug., '76)

Cystocarp: Aug.

Rhodymenia intricata (Okamura) Okamura

Japanese name: Masagoshihari

Collection: Koyatori (Feb., '77)

Champiaceae

Lomentaria catenata Harvey

Japanese name: Fushitsunagi

Collections: Niiyamahama (Aug., '75), Ajishima (Oct., '75), Samejima (Oct., '75), Tsukinoura (Oct. and Dec., '75; June, '76), Kobuchi (Oct., '76), Koyatori (July, '76)

Cystocarp: July

Tetrasporangium: July and Oct.

Lomentaria hakodatensis Yendo

Japanese name: Kosuji-fushitsunagi

Collections: Koyatori (July and Aug., '76; Feb., '77), Tsukahama (Aug., '76)

Tetrasporangium: Aug.

Lomentaria pinnata Segawa

Japanese name: Hime-fushitsunagi

Collection: Konorihama (June, '76)

Champia parvula (Agardh) J. Agardh

Japanese name: Watsunagisô

Collections: Niiyamahama (Aug., '76), Tsukahama (Aug., '76), Koyatori (Aug., '76), Konorihama (Aug., '76)

Tetrasporangium: Aug.

Ceramiaceae

Griffithsia japonica Okamura

Japanese name: Kazashigusa

- Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76)
Tetrasporangium: Aug.
- Ceramium tenerrimum* (Martens) Okamura
Japanese name: Ke-igisu
Collection: Koyatori (Aug., '76)
Tetrasporangium: Aug.
- Ceramium boydenii* Gepp
Japanese name: Amikusa
Collections: Kobuchi (June, Aug. and Dec., '76)
Tetrasporangium: June
- Ceramium japonicum* Okamura
Japanese name: Hane-igisu
Collection: Koyatori (Aug., '76)
- Ceramium kondoi* Yendo
Japanese name: Igisu
Collections: Tsukahama (Aug., '76; Jan., '77)
- Campylaephora crassa* (Okamura) Nakamura
Japanese name: Futo-igisu
Collection: Koyatori (Feb., '76)
- Campylaephora hypnaeoides* J. Agardh f. *typica* Nakamura
Japanese name: Egonori
Collection: Koyatori (July, '76)
Tetrasporangium: July
- Campylaephora hypnaeoides* J. Agardh f. *hamata* (Cotton) Nakamura
Japanese name: Egonori
Collections: Koyatori (July and Aug., '76; Jan. and Feb., '77) Tsukahama
(Aug., '76; Jan. and Feb., '77), Tsukinoura (Jan. and Feb., '77)
Tetrasporangium: July
- Antithamnion nipponicum* Yamada et Inagaki
Japanese name: Futatsugasane
Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76), Samejima (Apr.,
'76)
Tetrasporangium: Aug.
- Callithamnion corymbosum* Lyngbye
Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76)
- Monospora tenuis* Okamura
Japanese name: Kinugegusa
Collections: Ajishima (Oct., '75), Koyatori (Aug., '76), Tsukahama (Aug.,
'76)
Tetrasporangium: Oct.

Delesseriaceae

Acrosorium uncinatum (J. Agardh) Kylin

Japanese name: Kagi-usubanori

Collections: Ajishima (Oct., '76), Koyatori (Aug., '76), Tsukahama (Aug., '76; Jan., '77)

Acrosorium polyneurum Okamura

Japanese name: Suji-usubanori

Collections: Konorihama (June, '76), Tsukahama (Aug., '76), Koyatori (July and Aug., '76)

Acrosorium yendoii Yamada

Japanese name: Hai-usubanori

Collections: Koyatori (July Aug., '76), Tsukahama (Aug., '76; Jan., '77), Tsukinoura (Apr., '76)

Dasyaceae

Heterosiphonia japonica Yendo

Japanese name: Isohagi

Collections: Samejima (Oct., '75; Apr., '76)

Cystocarp: Apr.

Tetrasporangium: Oct.

Heterosiphonia pulchra (Okamura) Falkenberg

Japanese name: Shima-dajia

Collections: Koyatori (Aug., '76), Tsukahama (July, '76) Tsukinoura (Feb., '77)

Dasya sessilis Yamada

Japanese name: Enashi-dajia

Collections: Koyatori (July, '76), Tsukahama (July, '76)

Benzaitenia yenoshimensis Yendo

Japanese name: Bentenmo

Collection: Tsukinoura (Dec., '76)

Cystocarp: Dec.

Rhodomelaceae

Polysiphonia codiicola Zanardini

Japanese name: Bara-itogusa

Collection: Koyatori (Aug., '76)

Tetrasporangium: Aug.

Polysiphonia obsoleta Segi

Japanese name: Hoso-itogusa

Collection: Tsukahama (Aug., '76)

Tetrasporangium: Aug.

Polysiphonia savatieri Hariot

Japanese name: Hime-itogusa

Collection: Koyatori (July, '76)

Cystocarp: July

Antheridium: July

This species is a new record for this peninsula.

Polysiphonia yendoii Segi

Japanese name: Endô-itogusa

Collections: Koyatori (July, '76), Tsukahama (Aug., '76)

Tetrasporangium: July and Aug.

Polysiphonia japonica Harvey

Japanese name: Kiburi-itogusa

Collections: Ajishima (Oct., '75), Tsukahama (Aug., '76), Koyatori (May., '77)

Cystocarp: Aug. and Oct.

Tetrasporangium: Aug. and Oct.

Polysiphonia urceolata (Dillwyn) Greville

Japanese name: Syôzyô-kenori

Collections: Koyatori (Feb. and Mar., '77)

Tetrasporangium: Feb. and Mar.

Polysiphonia marrowii Harvey

Japanese name: Moro-itogusa

Collection: Koyatori (Mar., '77)

Tetrasporangium: Mar.

Polysiphonia senticulosa Harvey

Japanese name: Mutsu-itogusa

Collection: Tsukahama (Aug., '76)

Tetrasporangium: Aug.

Polysiphonia forcipata Harvey

Japanese name: Kuro-itogusa

Collection: Tsukahama (Aug., '76)

Tetrasporangium: Aug.

Chondria crassicaulis Harvey

Japanese name: Yuna

Collections: Yoriisozaki (May, '75), Shirahama (Aug., '75), Ajishima (Oct., '75), Samejima (Aug. and Oct., '75; June, '76), Niiyamahama (May and Dec., '76), Koyatori (June, July, Aug. and Dec., '76; Jan., Feb. and Mar., '77), Tsukinoura (Dec., '76; Feb., '77), Tsukahama (July, Aug. and Dec., '76; Jan., Feb. and Mar., '77)

Laurencia obtusa (Hudson) Lamouroux

Japanese name: Magire-sozo

Collection: Koyatori (July, '76; Aug., '77), Shirahama (Aug., '76)

Tetrasporangium: Aug.

Laurencia japonica Yamada

Japanese name: Omote-sozo

Collection: Tsukahama (Aug., '76)

Tetrasporangium: Aug.

Laurencia okamurai Yamada

Japanese name: Mitsude-sozo

Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76)

Tetrasporangium: Aug.

Laurencia pinnata Yamada

Japanese name: Hane-sozo

Collections: Koyatori (Aug., '76), Tsukahama (Aug., '76),

Tetrasporangium: Aug.

Laurencia intermedia

Japanese name: Kuro-sozo

Collections: Shirahama (Aug., '75), Ajishima (Oct., '75), Samejima (Aug. and Oct., '75; Apr., June and Aug.' 76), Koyatori (July and Aug., '76), Tsukinoura (Aug., '76)

Tetrasporangium: Aug. and Oct.

Laurencia undulata Yamada

Japanese name: Kobu-sozo

Collections: Yoriisozaki (July, '76), Koyatori (July, '76) Tsukahama (July, '76)

Tetrasporangium: July

This species is a new record for this peninsula.

Symphycladia latiuscula (Harvey) Yamada

Japanese name: Isomurasaki

Collections: Ajishima (Oct., '75), Koyatori (July and Aug., '76; Jan. and Feb., '77), Tsukahama (Aug., '76; Jan. and Feb., '77), Tsukinoura (Jan. and Feb., '77)

Rhodomela larix (Turner) C. Agardh

Japanese name: Fujimatsumo

Collection: Maeami (May, '75)

Tetrasporangium: May

Discussion

The waters around the Oshika Peninsula are well known as a transition area caused by a cold and a warm current. It can be supposed that both of the currents will influence the floral composition of this peninsula and the character is different from that of the adjacent waters. In our algal collections from the

coasts of the Oshika Peninsula during the period from April 1975 to March 1977, we were able to identify ninety species and six forms of red algae, two of which, *Polysiphonia savatiera* Hariot and *Laurencia undulata* Yamada, are new records for this peninsula. Among them, the numbers of species considered as representatives of the "northern" species growing in the subarctic waters were 14 and those of "southern" species growing in the warm temperate waters were 22.

In an earlier study on the phytogeography of Japanese Pacific coasts, Okamura (37) proposed the existence of five algal sections. One of the boundary lines was set in the Oshika Peninsula by him. Therefore, the Pacific coasts of northern Japan were divided into the subarctic and the temperate section that are separated from each other by this peninsula. The Sanriku coasts which are north of this peninsula were included in the subarctic section. According to literature data on the Marine algal flora along this coast (2-6), the flora shows a subarctic character and is comparatively homogeneous. The numbers of "northern" species collected from this coast are 32-34 and those of "southern" species are 17-22. Although the collecting year is different in each researcher, there is a variance in the number between the "northern" species and the "southern" species and it is clearly recognized that the "northern" species dominant the "southern" species on this coast. In our collections from the coast of the Oshika Peninsula, the numbers of species as representatives of the "northern" species are 23 and those of "southern" species are 36. When we consider the composition of both types of species between the Sanriku coast and the Oshika Peninsula, the numbers of "southern" species which were collected from the Oshika Peninsula, but not from the Sanriku coasts, are 15 (One species of green algae, six species of brown algae, and eight species of red algae). These results show that there is a different character in the floristic composition between the Sanriku coasts and the Oshika Peninsula.

On the other hand, Segawa (13) presented us a useful indicator showing a character of algal flora along the Pacific coasts of Japan, which is the ratio of the number of species of Chlorophyceae to Phaeophyceae. The ratio of the Sanriku coasts calculated by him was 0.4. The ratio calculated from the literature data of the Sanriku coasts varies from 0.38 to 0.49. From our data, the ratio of the Oshika Peninsula is 0.44. When we compare these ratios with each other, we find a similarity rather than a difference in the floristic characters between the Sanriku coasts and the Oshika Peninsula.

Indeed, it is difficult to conclude the floristic characters of the Oshika Peninsula from our observations, but this area is characterized by a long stretch of coast and it constitutes a boundary area between gradually changing northern and southern floras. This may be caused by the following facts that some limited "southern" species are able to survive under low winter temperatures, and some limited "northern" species also survive under high summer temperatures, but other

“southern” and “northern” species are not able to survive under these conditions. However, our ecological data for the benthic flora are scanty, and it will be necessary to continue the field observations in order to explain the floristic characters of the Oshika Peninsula.

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