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Notes on the GRUNOW collection (W) of *Sargassum* subgenus *Bactrophycus* (Phaeophyta, Fucales)

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Specimens of *Sargassum* subgenus *Bactrophycus* in the GRUNOW collection (Naturhistorisches Museum Wien, W) were examined critically in order to know GRUNOW's idea on his numerous subspecific taxa as well as certain species. Necessary typification was made on the following taxa: *Sargassum horneri* f. *minus-dentatum*, *S. ringgoldianum* var. *costatum*, *S. serratifolium* f. *poliophyllum*, *S. serratifolium* f. *subserratum*, *S. serratifolium* f. *fecundum*, *S. serratifolium* f. *amblyocystum*, *S. tortile* var. *polyacanthum* f. *ulophyllum*, *S. siliquastrum* var. *nipponense*, *S. siliquastrum* var. *capitellatum*, *S. fulvellum* var. *wilkesii*, *S. oophorum*, *S. hemiphyllum* var. *anisophyllum*, *S. alloiophyllum*, and *S. confusum* var. *papillatum*. As for the specimens from Japan, there is no need to recognize his taxa basing on the fragmentary materials. *Sargassum oophorum* and *S. alloiophyllum* must be compared with specimens from China and other districts.

In his posthumously published monograph on *Sargassum*, GRUNOW (1915) described several taxa belonging to the subgenus *Bactrophycus*, basing on the specimens from west Pacific area, in addition to many taxa of other subgenera. But none of his taxa were illustrated. Since that time, neither YENDO (1917) nor SETCHELL (1931) mentioned the GRUNOW collection. GRUNOW's collection of *Sargassum* has not been examined critically by later workers on this group of algae. I was not able to locate the specimens of GRUNOW collection in the course of the preparation of a treatise on the subgenus *Bactrophycus* of Japan (YOSHIDA, 1983). Recently, I became aware that the GRUNOW collection is housed in the Naturhistorisches Museum Wien (W). Through the kindness of the curator of W, I could examine the collection of GRUNOW, and I think it is necessary to comment the taxa of the subgenus *Bactrophycus* described by GRUNOW. The specimens belonging to the other subgenera were not yet studied.

1. *Sargassum horneri* f. *minus-dentatum* GRUNOW 1915 : 341

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 1805. East coast of Japan, collected by C. WRIGHT during the U. S. North Pacific Exploring Expedition under command. RINGGOLD and RODGERS, 1853-1856.

Only one specimen (Fig. 1), which is a terminal part of fertile male individual about 13 cm long, represents this taxon. This must be taken as the holotype for this name. Vesicles are cylindrical in shape. Male receptacles are very slender, up to 7 cm long. The leaf is linear in shape, up to 4.5 cm long and 0.5 cm wide. Dentation of leaf margin is shallow. It is difficult to distinguish this form by this leaf character alone from the typical form illustrated by TURNER (1808, pl. 17). On the other hand, the type of *S. horneri* var. *densum* C. AGARDH (LD, herb. AGARDH No. 2867) has similarly narrow leaves. In my opinion, there is no need to recognize this form.

2. *Sargassum ringgoldianum* var. *costatum* GRUNOW 1915: 343.

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2114. This sheet (Fig. 2) has a label "*Sargassum ringgoldianum* HARVEY SCHOTTMÜLLER, 1861 Yokohama". Another label indicates *Sargassum ringgoldianum* HARV. var. *costata* GR. (*Anthophycus japonicus* v. MARTENS det. v. MARTENS). Therefore, this specimen seems to represent at least the isotype of *Anthophycus japonicus* and is the holotype of *S. ringgoldianum* var. *costatum* GRUNOW. On the sheet, there are 7 fragments adhered. Among them, 3 fragments indicated with arrows in Fig. 2 are different from the rest and apparently referable to a certain taxon of the subgenus *Schizophycus*. Other 4 fragments, one fertile and 3 sterile, belong with no doubt to *S. ringgoldianum*. The branch is flat, 3 mm wide. Leaves are linear in shape up to 9 cm long and 1.2 cm wide with retroflexed base, and immersed midrib is evanescent in the upper part. Margin of the leaf is nearly entire. Receptacles are linear in shape with round apex, up to 2 cm long and 3 mm wide, often devoid of subtending leaf. Vesicles are ellipsoid in shape, 1.3 cm long and 0.6 cm wide. From these small specimens, we cannot separate the variety from the typical specimen.

Other specimens in the collection, No. 2119 was collected by C. WRIGHT from the "East coast of Japan" during the U. S. North Pacific Exploring Expedition under commanders RINGGOLD and RODGERS, 1853-1856. This is certainly one of the duplicate specimens of the type of *S. ringgoldianum* described by HARVEY.

3. *Sargassum serratifolium* f. *poliophyllum* GRUNOW 1915: 343

There are several specimens attributed to this name. In W, following 3 specimens are deposited: Herb. Mus. Palat. Vindob. Collectio GRUNOW Nos. 2106, 2107 (Fig. 4), 2108. Collectio GRUNOW No. 2109 is preserved as UC 281508 in the University of California (Berkeley). In PC herb. THURET, a

sterile specimen was located. All these specimens seemed to be duplicates of one collection made by Capt. MEYER in 1858. The locality is uncertain as we can see an indication "Japan? (angeblichen Java)" on the label. A specimen Collectio GRUNOW No. 2108 (Fig. 3) has basal part, while the others are devoid of it. Therefore this specimen is suitable to be selected as the lectotype. The lectotype specimen has conical holdfast, about 1.5 cm high. Stem is cylindrical, twice forked. Main branches are issued spirally from the upper part of the stem, flat or triquetrous, about 2 mm wide. Margin of the main branch is smooth. Lower leaves are linear in shape, up to 7 cm long and 0.9 cm wide, with very shallow denticulation on the margin. Midrib reaches to the apex. Leaves on the upper part of the branch become slender and dentation gradually becoming conspicuous. Vesicles are ellipsoid to nearly spherical in shape, up to 7 mm long. Apex is apiculate or beset with a filamentous coronal leaf. The specimen numbered 2107 (Fig. 4) is a main branch about 70 cm long. Vesicles on this specimen are provided with a coronal leaf similar to ordinary leaves. It is difficult to say that these specimens were collected from Japanese coasts.

In SAP, specimens from Hong Kong and determined by SETCHELL as either *S. serratifolium* or *S. tortile* are very similar to those of GRUNOW. Therefore it may be safe to assume that the GRUNOW specimens were obtained from Chinese or Java coasts, not from Japan. Taxonomic relation of this form must be studied in comparison with Chinese or Indonesian materials.

4. *Sargassum serratifolium* f. *subserratum* GRUNOW 1915: 344

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2099. Japan?

There is only one specimen bearing this name in the file of *S. serratifolium*, this must be taken as the holotype of this taxon. This specimen (Fig. 5) is a fragment of branch about 20 cm long of a sterile individual and devoid of basal part. The branch is flat, bearing leaves alternately in one plane. Most of leaves are simple and with small denticulation on the margin, but a few leaves are once forked. Vesicles are nearly spherical in shape with apiculate apex or bearing short coronal leaf. From these features, it can be safe to attribute this specimen to the subgenus *Schizophycus*, and not to the *Bactrophyucus*.

5. *Sargassum serratifolium* var.? *fecundum* GRUNOW 1915: 344

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2113. Amakusa, Japan, leg. REIN.

There is only one specimen (Fig. 6), therefore this must be the holotype of this taxon. This specimen is a fragment of a branch about 10 cm long with 3 lateral branches of 20 cm long bearing many flat linear receptacles up to 1 cm long. Larger leaf is lanceolate in shape, 3 cm long and 0.9 cm wide with irregular marginal dentation. Leaves on the lateral branches are linear in shape, up to 3 cm long and 3 mm wide with coarse denticulation on the margin. Vesicles are ellipsoid to spherical in shape, 6 mm long and 4 mm wide with apiculate apex. According to GRUNOW, this individual is male. It cannot be decided that this specimen belongs to either *S. serratifolium* or *S. siliquastrum*.

6. *Sargassum serratifolium* var. *amblyocystum* GRUNOW 1915: 344

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2111. Nagasaki, April 1861. Leg. SCHOTTMÜLLER.

Only one specimen (Fig. 7) represents this taxon. This is a fragment of sterile plant about 30 cm long. The leaves are simple with midrib, up to 7 cm long and 1 cm wide, and have marginal denticulation, and seem to spread in the same plane as the branch. This character combined with spherical vesicles without a coronal leaf indicates that this specimen does not belong to the subgenus *Bactrophyucus* and is attributable to the subgenus *Phyllotrichia* because of its similarity to *S. yendoi* OKAMURA et YAMADA or *S. henslowianum* var. *condensatum* YAMADA, although the exact identity is not clear.

7. *Sargassum tortile* var. *polyacanthum* f. *ulophyllum* GRUNOW 1915: 345

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2084. Japonia ad oras orientales insulae Kiushu. Leg. REIN.

Four fragments are pasted on the sheet (Fig. 8). Two of which are vesicles with a coronal leaf. Others are terminal parts of the branch. The leaves are linear in shape, simple without a furcation up to 4 cm long, and have serrated and crisped margin. The expansion of leaves in the same plane as branches and vesicles with coronal leaf indicate that this specimen must be attributed to the subgenus *Schizophycus*, instead of the subgenus *Bactrophyucus*.

In the herbarium of Laboratoire de Cryptogamie, Museum National d'Histoire Naturelle de Paris (PC), herb. THURET, there is a specimen seems to be a duplicate of the above mentioned one. On the sheet of specimen in PC, a name "*Sargassum patens* var. *ulophylla* GRUN." was written by seemingly the same hand as in GRUNOW collection. Attribution of this name to *S. tortile* must be a mistake.

8. *Sargassum siliquastrum* var.? *nipponense* GRUNOW 1915: 347

Herb. Mus. Palat. Vindob. Collectio GRUNOW Nos. 2047, 2048. Nangasaki, April 1861. Leg. SCHOTTMÜLLER.

On the sheet No. 2047 (Fig. 10), 9 fragments of 2 to 25 cm long are pasted. No. 2048 is composed of 2 fragments in an envelope. These seem to be duplicates of one collection. All fragments are terminal part of fertile individual. Leaves are linear to filamentous up to 4 cm long and 2 mm wide with midrib and coarsely dentate margin. Vesicles are ellipsoid to obovoid in shape, about 8 mm long, with a filamentous coronal leaf. Receptacles are linear, compressed. I can say nothing about the difference from typical *S. siliquastrum*, which were also named basing on the specimen from Nagasaki, west coast of Kyushu.

9. *Sargassum siliquastrum* var.? *capitellatum* GRUNOW 1915: 348

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2045. Mare Japonicum. Leg. GAERTNER.

The only specimen (Fig. 9) attributed to this name is a small fragment of 7 cm long with filamentous leaves and spatulate receptacles. From this specimen nothing can be said as to its identity.

10. *Sargassum fulvellum* var. *wilkesii* GRUNOW 1915: 349

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2036. E mari Chinensi. Leg. WILKES.

In the original description, the locality was given as "in mari Japonico". But on the only one specimen bearing this name, label indicates "E mari Chinensi". The specimen (Fig. 12) is a fragment of about 9 cm long. Vesicles are elliptical in shape with mucicous or mucronate apex. The identity of this specimen is quite uncertain.

11. *Sargassum oophorum* GRUNOW 1915: 349

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2030. ex Herb. GREVILLE. Locality unknown.

There is only one specimen numbered 2030 (Fig. 11) in the GRUNOW collection and this must be treated as the holotype. The specimen is a terminal part about 18 cm long of a fertile individual from unknown locality. GRUNOW noted its receptacle as male. Vesicles are ellipsoid in shape with apiculate apex, measuring 9-10 mm long and 5-6 mm in diameter. Receptacles are slender cylindrical, about 1 cm long, issued from an axil of subtending bracteal leaf which is linear lanceolate in shape with cuneate base

and without midrib.

It is difficult to know a whole image of the plant concerned from this imperfect specimen.

12. *Sargassum hemiphyllum* var. *anisophyllum* GRUNOW 1915: 351

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 1999. Lemma Island. Leg. C. WRIGHT (U. S. North Pacific Exploring Expedition under commanders RINGGOLD and RODGERS).

Six fragments are mounted on the sheet (Fig. 13). Among them, 4 are distal parts and other 2 are lower parts. Basal part consists of creeping filaments forked several times. Leaves on the lower part of the branch are hemiphyllous without a midrib, measuring up to 5 cm long, and 6 mm wide. Vesicles are ellipsoid or obovoid in shape, up to 3 mm long with mucous or apiculate apex. Receptacles are simple cylindrical, up to 1 cm long. From this specimen, I cannot say that this plant is conspecific with *S. hemiphyllum*.

13. *Sargassum hemiphyllum* var. *anisophyllum* f. *edentatum* GRUNOW 1915: 351

I could not find out a specimen relevant to this name in his collection.

14. *Sargassum alloiophyllum* GRUNOW 1915: 353

This is a substitute name for *Halochloa heterophylla* MARTENS 1866, because of the presence of earlier name *Sargassum heterophyllum* C. AGARDH 1820. In the GRUNOW collection, there is a specimen numbered 1980 (Loc. : Cheefoo, Golf von Petschili, China. Leg. SCHOTTMÜLLER, det. v. MARTENS). This specimen (Fig. 14) must be at least a duplicate of type collection of *Halochloa heterophylla* VON MARTENS. But, it is uncertain whether this specimen can be regarded as the holotype or not at present. The specimen is about 13 cm high and providing with lower broad leaves and an older branch. Larger leaves are 3.5 cm long and 1.5 cm wide with serrated margin. Older branch bears linear leaves and small elliptical vesicles. This plant is surely belonging to the subgenus *Bactrophyucus*, though it is difficult to determine that this is an independent species.

15. *Sargassum confusum* var.? *papillatum* GRUNOW 1915: 354

Herb. Mus. Palat. Vindob. Collectio GRUNOW No. 2138. Japan. SURINGAR 32.

An envelope on this sheet contains 3 fragments less than 10 cm long (Fig. 15). Leaves are linear, up to 3 cm long with papillate appearance caused by

cryptostomata. It is quite impossible to say even as to specific attribution to *S. confusum*.

As a whole, specimens of the GRUNOW collection are nearly all fragmentary and very imperfect.

Recognition of subspecific taxa in the subgenus *Bactrophycus* is for the moment too premature. We must wait the accumulation of much more information concerning a range of variation within the species from many fields of research.

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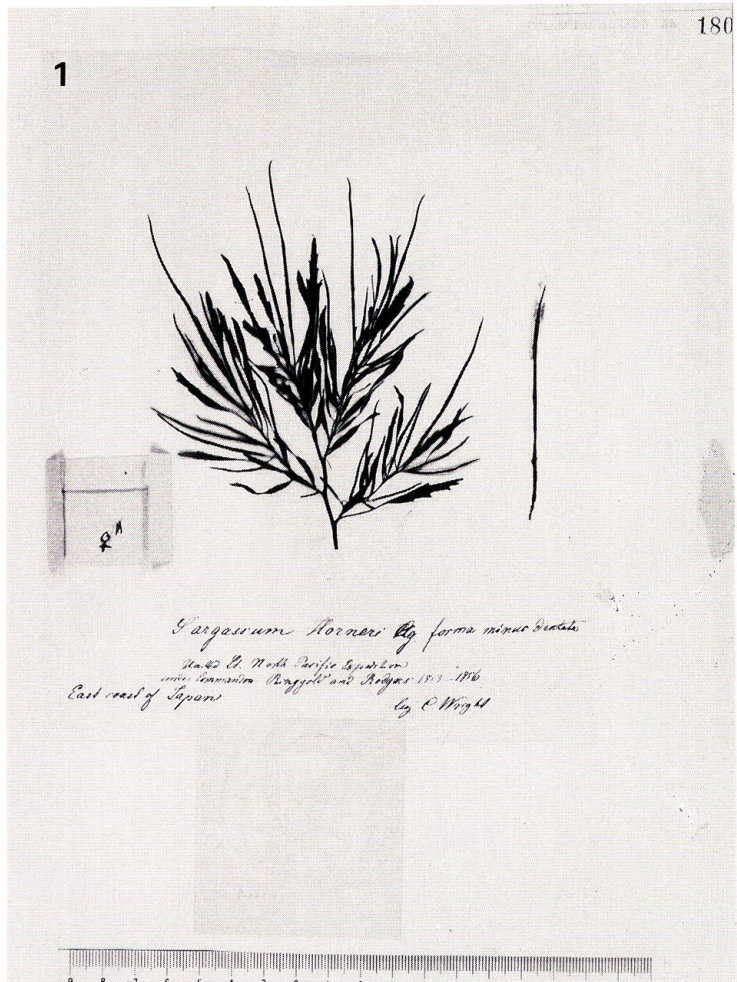


Fig. 1. Holotype of *Sargassum horneri* f. *minus-dentatum* GRUNOW. East coast of Japan. Leg. C. WRIGHT. Collectio GRUNOW No. 1805.



Fig. 2. Holotype of *Sargassum ringgoldianum* var. *costatum* GRUNOW. Yokohama. Leg. SCHOTTMÜLLER, 1861. Collectio GRUNOW No. 2114.



Fig. 3. Lectotype of *Sargassum serratifolium* f. *poliophyllum* GRUNOW. Japan? (angeblichen Java). Leg. Capt. MEYER, 1858. Collectio GRUNOW No. 2108.



Fig. 4. A syntype of *Sargassum serratifolium* f. *poliophyllum* GRUNOW. Japan? 1858. Collectio GRUNOW No. 2107.

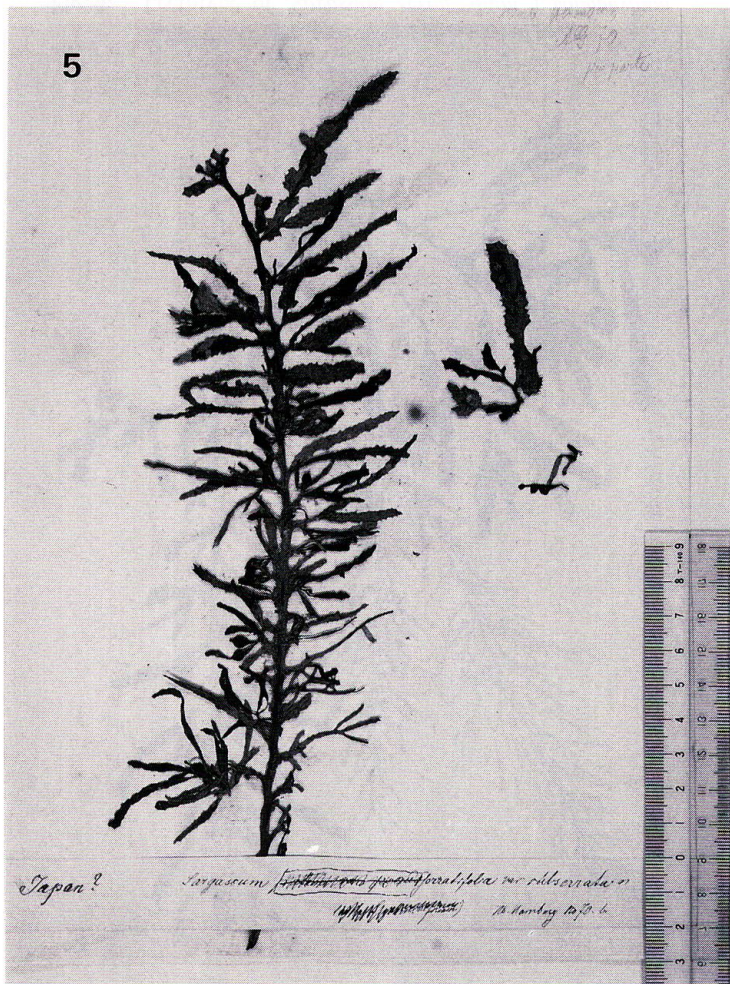


Fig. 5. Holotype of *Sargassum serratifolium* f. *subserratum* GRUNOW. Japan? Collectio GRUNOW No. 2099.

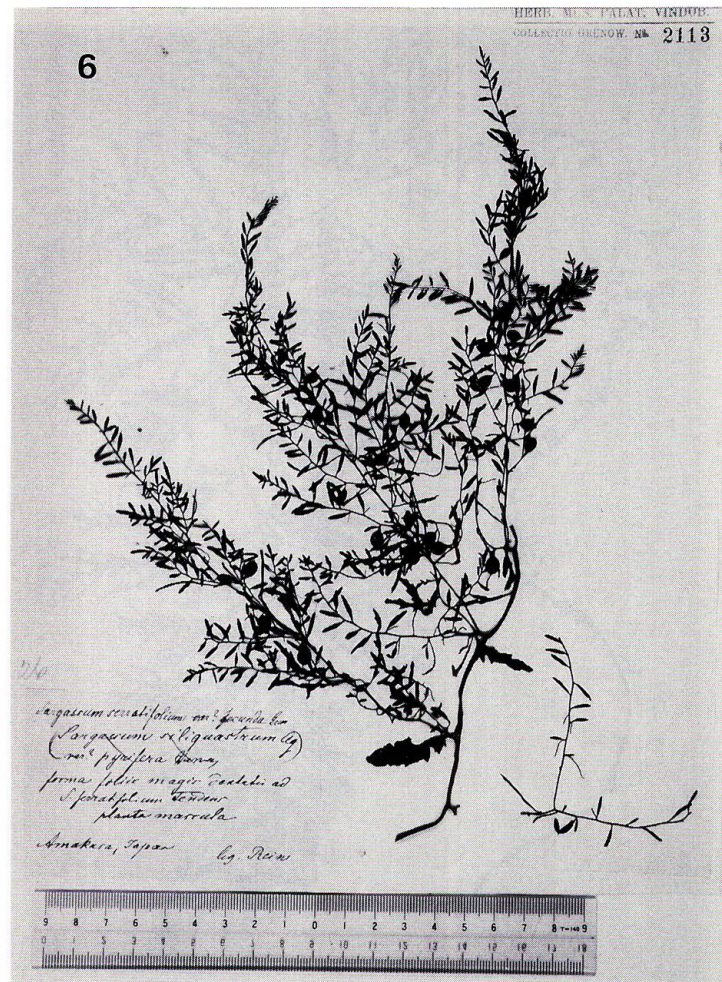


Fig. 6. Holotype of *Sargassum serratifolium* var. *fecundum* GRUNOW. Amakusa, Japan. Leg. REIN. Collectio GRUNOW No. 2113.

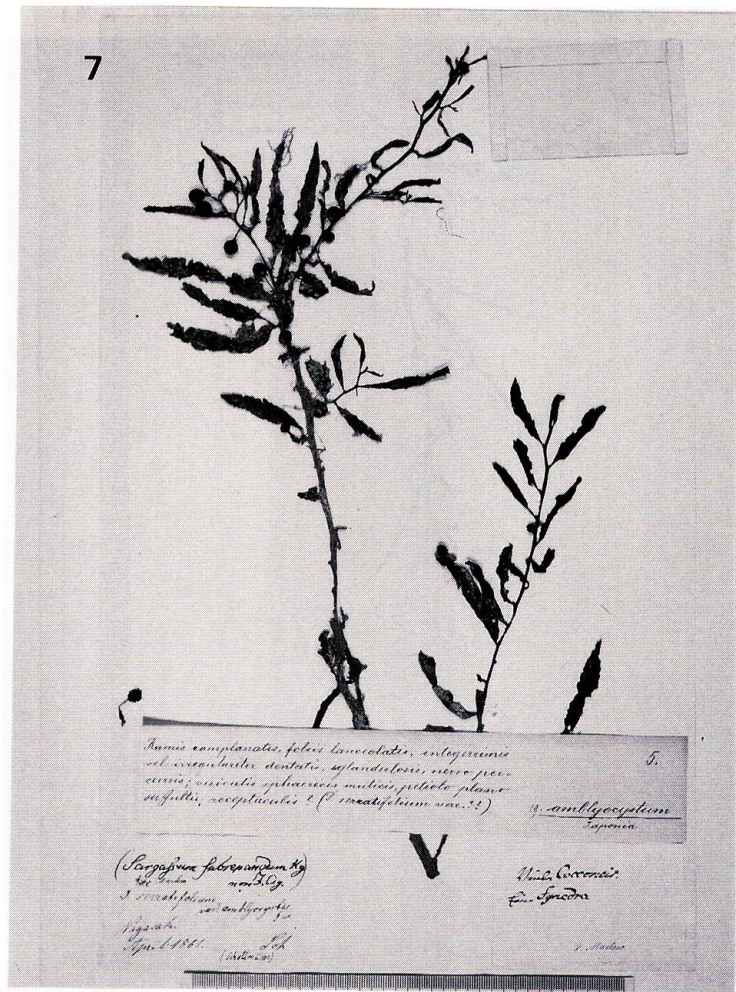


Fig. 7. Holotype of *Sargassum serratifolium* var. *amblyocystum* GRUNOW. Nagasaki. Leg. SCHOTTMÜLLER, April 1861. Collectio GRUNOW No. 2111.

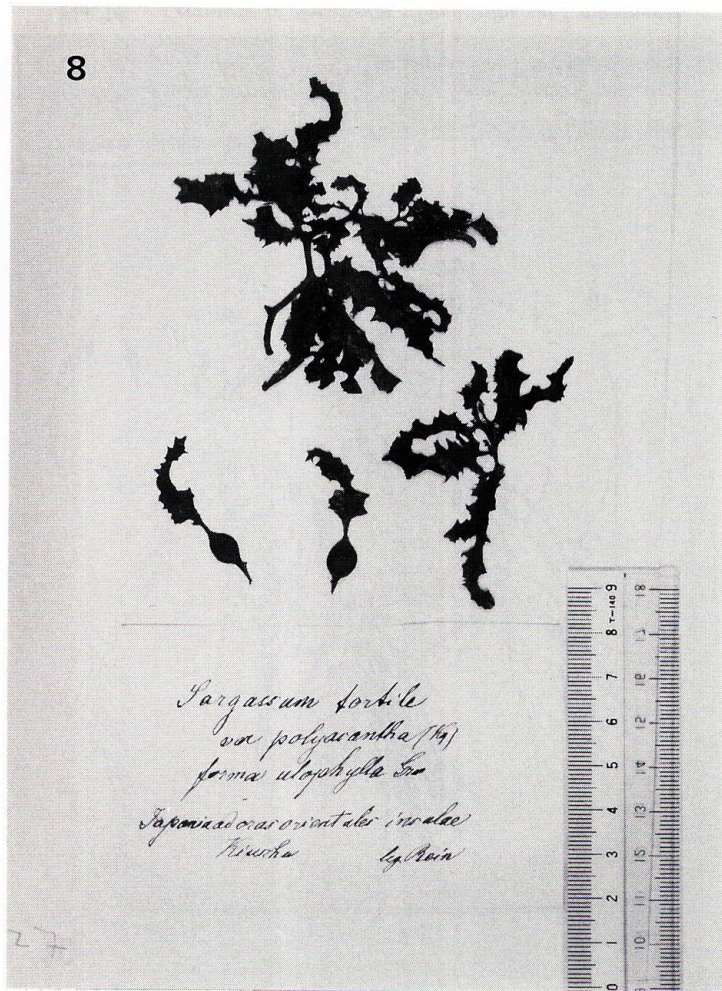


Fig. 8. Holotype of *Sargassum tortile* var. *polyacanthum* f. *ulophyllum* GRUNOW. East coast of Kyushu. Leg. REIN. Collectio GRUNOW No. 2084.

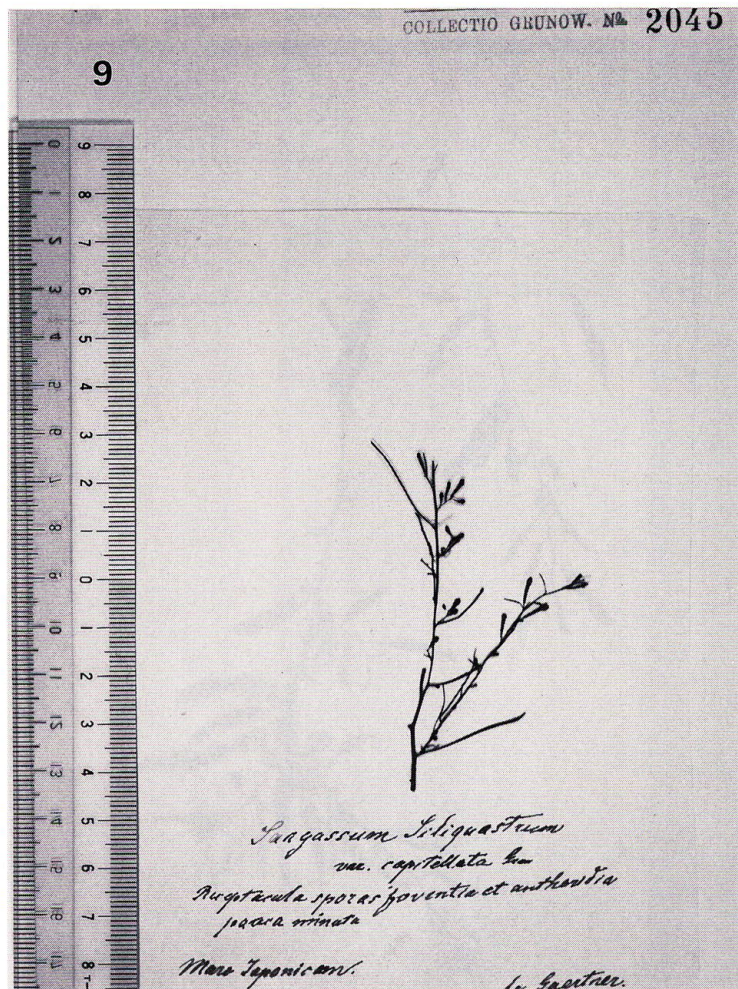


Fig. 9. Holotype of *Sargassum tortile* var.? *capitellatum* GRUNOW. Japan. Leg. GAERTNER. Collectio GRUNOW No. 2045.



Fig. 10. Lectotype of *Sargassum siliquastrum* var.? *nipponense* GRUNOW. Nagasaki. Leg. SCHOTTMÜLLER, April 1861. Collectio GRUNOW No. 2047.

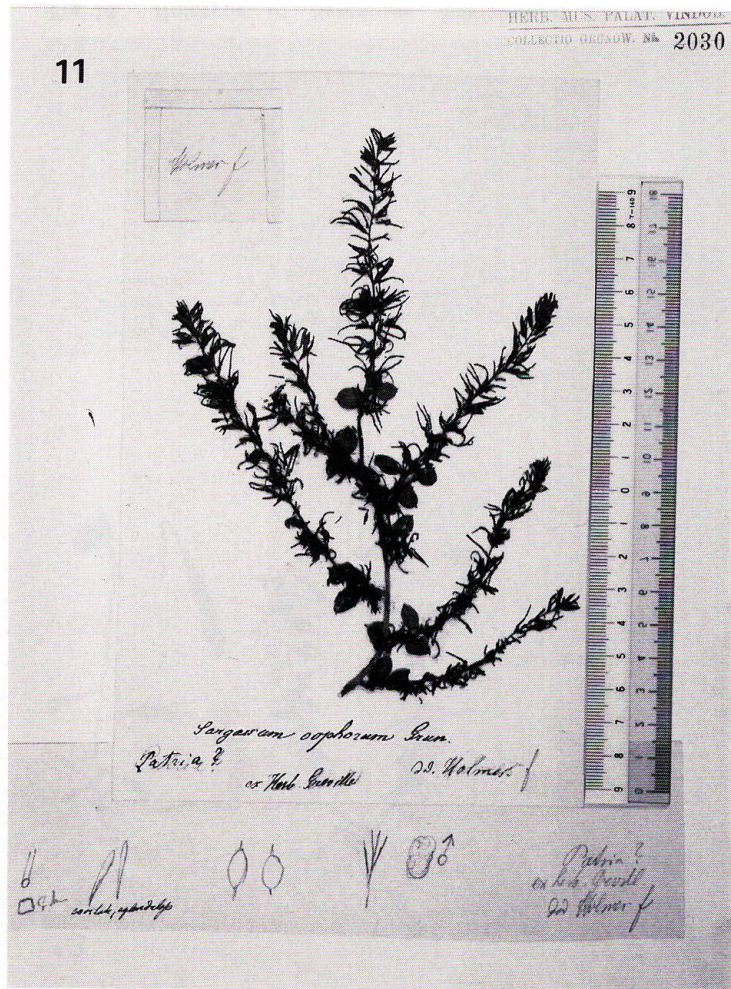


Fig. 11. Holotype of *Sargassum oophorum* GRUNOW. Locality unknown. Collectio GRUNOW No. 2030.

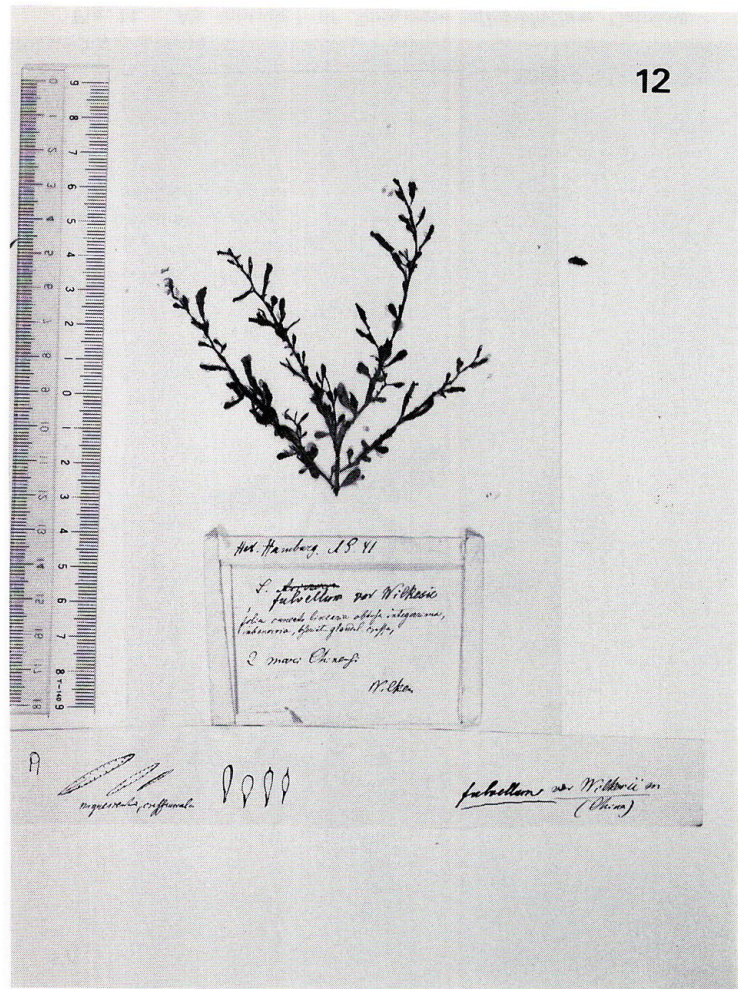


Fig. 12. Holotype of *Sargassum fulvellum* var. *wilkesii* GRUNOW. Chinese sea. Leg. WILKES. Collectio GRUNOW No. 2036.

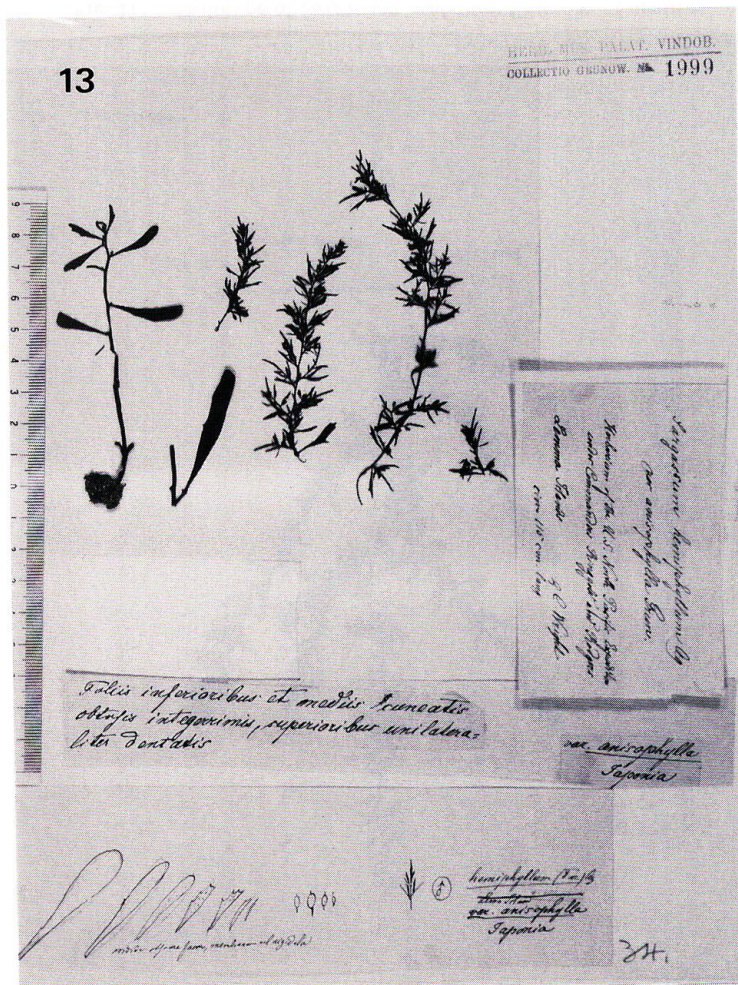


Fig. 13. Holotype of *Sargassum hemiphyllum* var. *anisophyllum* GRUNOW. Lemma Island. Leg. C. WRIGHT. Collectio GRUNOW No. 1999.

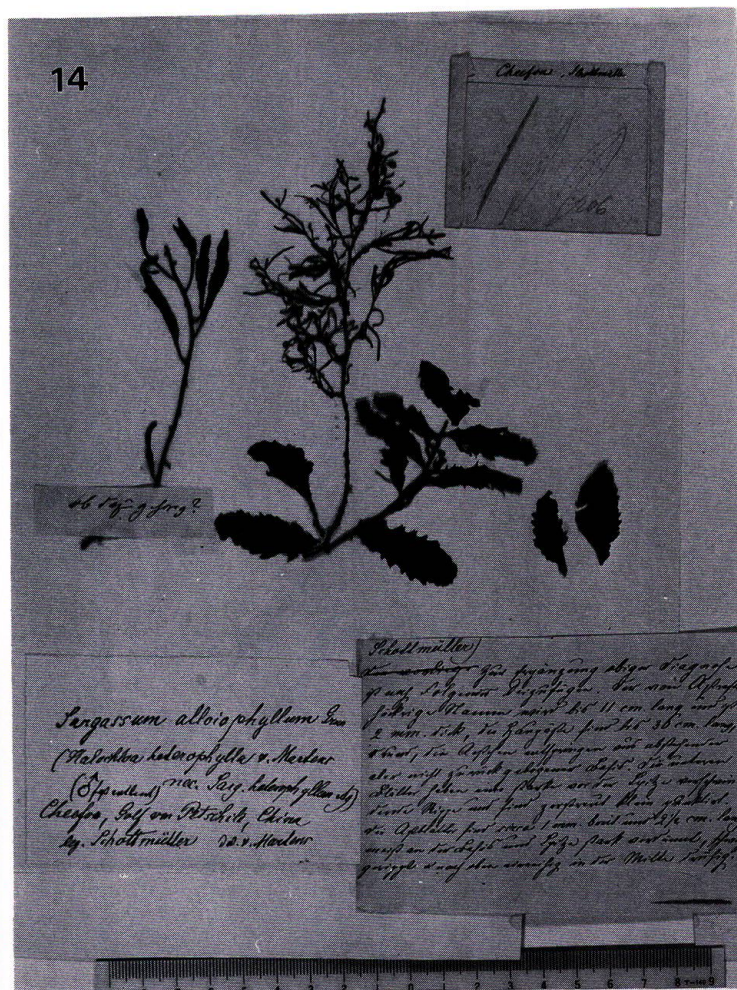


Fig. 14. An inotype? of *Sargassum alloiophyllum* GRUNOW. Chefoo, China. Leg. SCHOTTMÜLLER. Collectio GRUNOW No. 1980.

15

HERB. MUS. PALAT. VIENNAE
COLLECTIO GRUNOW. No. 2138

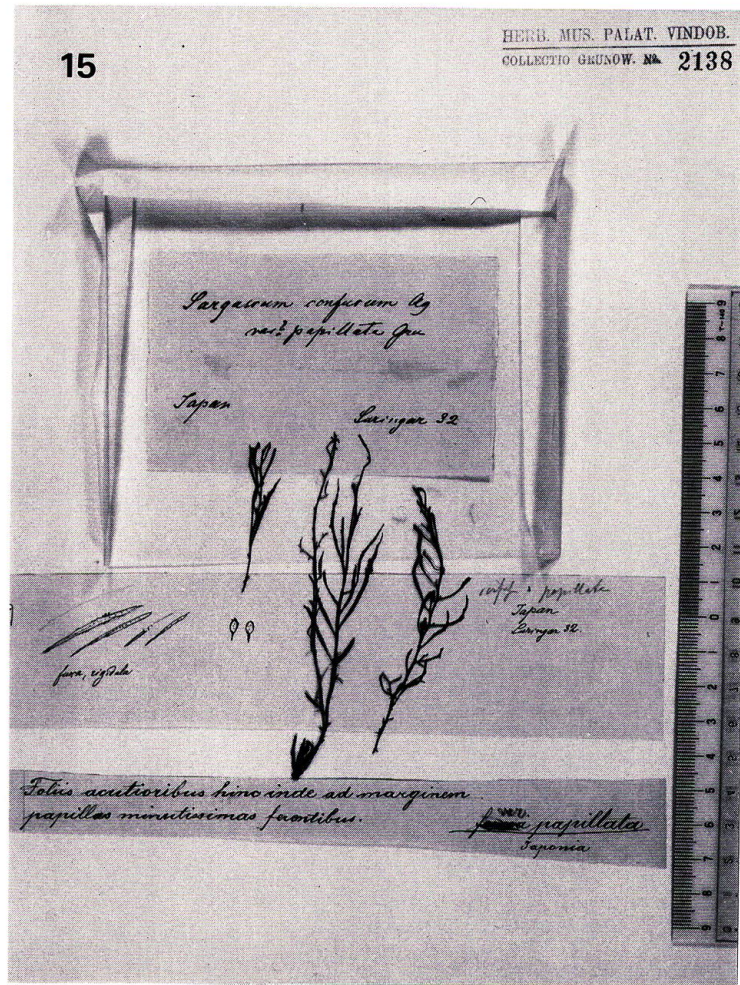


Fig. 15. Holotype of *Sargassum confusum* var.? *papillatum* GRUNOW. Japan. Collectio GRUNOW No. 2138.