

Sumiko KOBAYASHI\*: **A taxonomical note on *Pittosporum tobira* and its allied species**

小林純子\*: トベラとその近縁種について

*Pittosporum tobira* (Thunb.) Ait. and its allied species (Tobira complex in sense of Gowda) are found in the coastal regions of Japan, Ryukyus and the Bonin Isls., and further extending to South Korea, Eastern China and North Western Formosa.

Up to the present, many species belonging to this group have been described from these areas by several authors, such as Kaempfer, Thunberg, Aiton, Hooker et Arnot, Hayata, Koidzumi, Nakai, Tuyama, Gowda, and Hatushima. However, the delimitation of species is inconsistent according to the authors; e.g. Gowda recognized 6 species and 2 varieties, while Hatushima recognized only one species, *P. tobira*. In last few years, I have had the opportunities to observe these species of Bonin, Ryukyu and Japan Isls. under the natural condition, and to examine many herbarium specimens collected from China, Korea, Formosa, as well as of these areas, including the type specimens. As a result, I should propose the following system composed of 6 species and 3 varieties with a new name or combination.

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## Key to the species

- A. Inflorescences simple, umbellate, pubescent or glabrous, with few flowers; petals 7-13 mm long, strongly reflexed; carpels 3, over 2 mm thick; leaves small to medium in size, 3-6 cm long, obovate or oblong-obovate, obtuse or rounded at apex, broadest above or slightly above the middle.
- B. Inflorescences pubescent with long or both long and short T-shaped hairs, with flowers of 6-10; flowers 9-13 mm long; carpels 2-4 mm thick; leaves medium in size, 4.5-6 cm long, coriaceous, obovate, broadest above the middle; Japan and Korea..... 1a. *P. tobira*
- B. Inflorescences pubescent with short T-shaped or glandular hairs or glabrous, with 4-7 flowers; flowers 7-9 mm long; carpels 2 mm thick; leaves small, 3-6 cm long, thin, chartaceous, obovate-oblong, broadest slightly above the middle.
- C. Inflorescences densely pubescent, with flowers of 6-7; flowers 9 mm long; leaves small, 3-5 cm long; E. China (Soochow).....  
..... 1b. *P. tobira* var. *chinense*
- C. Inflorescences glabrous or minutely pubescent, with 4-6 flowers; flowers 7-9 mm long; leaves small, 4-6 cm long; capsules small, glabrous, 8-12 mm in diameter; Formosa (N.W.) and China (Fukien)..... 1c. *P. tobira* var. *calvescens*
- A. Inflorescences complicated, cymose, glabrous or pubescent, with many to a few flowers; petals 7-15 mm long, slightly reflexed; leaves small to large, 2-15 cm long, chartaceous, elliptical or oblanceolate-oblong, acute to obtuse or rounded at apex, broadest at or slightly above the middle.
- B. Inflorescences with many flowers; peduncles and pedicels pubescent with short T-shaped or glandular hairs.
- C. Flowers small, petals 7-8 mm long; leaves medium in size, 4-10 cm long.
- D. Inflorescences densely pubescent; Ryukyu (Amami).....  
..... 2a. *P. lutchuense*
- D. Inflorescences slightly pubescent; Ryukyu (Amami, Okinawa, Yaeyama, Daito, Senkaku).. 2b. *P. lutchuense* var. *denudatum*
- C. Flowers large, petals over 10 mm long; leaves large to small in size, 4-15 cm long.

- D. Inflorescences slightly pubescent, with long peduncles and short pedicels; peduncles and pedicels erecto-patent; petals 12-13 mm long; leaves elliptical -or oblanceolate-oblong, acute or obtuse at apex, 4-13 cm long, broadest at or slightly above the middle; Bonin Isls. (Mukojima, Chichijima, Hahajima)  
 ..... 3. *P. boninense*
- D. Inflorescences slightly pubescent or only with glandular hairs, with short peduncles and long pedicels; pedicels pendulous; petals 12-15 mm long; leaves oblong-obovate or obovate, rounded at apex, 8-15 cm long, broadest above the middle, undulate; Bonin Isls. (Chichijima) ..... 4. *P. chichijimense*
- B. Inflorescences with a few flowers; peduncles and pedicels glabrous; fruit solitary; leaves small, 2-8 cm long.
- C. Ovary usually pubescent; flowers over 10 mm long; fruit large, 15-22 mm across, globose or subglobose, with long nodding pedicel, dehiscent; carpels 3.5-5.0 mm thick; Bonin Isls. (Hahajima) ..... 5. *P. beecheyi*
- C. Ovary glabrous; flowers less than 10 mm long; fruit small, 7-10 mm across, globose, with short erect pedicel, indehiscent; carpels 1.0-1.5 mm thick; Bonin Isls. (Mukojima, Chichijima)  
 ..... 6. *P. parvifolium*
- 1) **Pittosporum tobira** (Thunb.) Ait., Hortus Kewensis ed. 2, 2: 27, 1811; Gowda in Journ. Arn. Arb. 32: 309, 1951.  
*Evonymus tobira* Thunb. in Nova Acta Reg. Soc. Upsal. 3: 208, 1780 et Fl. Jap. 99, 1784.  
*Celastrus tobira* Thunb., Plant. Japon. Nov. Spec. 6, 1824.  
*P. tobira* var. *macrophyllum* Nakai in Bot. Mag. Tokyo 41: 501, 1927.  
*P. tobira* var. *lanatum* Masamune, Enum. Tracheophyt. Ryukyu Insularum 5: 109, 1955.
- 1a) var. **tobira**  
 Nom. Jap. Tobera.  
 Representative specimens examined. Japan. Honshu. Aikawa-cho, Isl. Sado, Niigata Pref., H. Kitami, MAK (179041). Misaki, Motoyoshi-gun, Miyagi Pref, K. Kimura et S. Sugaya, TUS (16570). Isl. Yakushima, A. Miyagawa, MAK (158527). Tokara. Isl. Kuchinoshima, S. Sako 7363, KAG. Isl. Gwaja, S. Sako

& K. Kawanabe 2411, KAG.  
 Isl. Akuseki, S. Sako 6205,  
 KAG. Isl. Takarajima. S.  
 Hatusima 15836, KAG.  
 Tsushima, Izuhara, Y. Yabe,  
 TI. Mt. Matsunashiyama, H.  
 Koyama 3065, KYO. Iki,  
 Kameishi, K. Ohki, TI.  
 Querpaert. T. Nakai in 1917,  
 TI and T. Nakai in 1930,  
 TI. S. Korea. Isl. Kyobun,  
 T. Nakai 11336, TI. Isl.  
 Kyosai, T. Nakai 11321, TI.  
 Distr. Japan and S.  
 Korea (Fig. 1).

Ecology. Sunny slopes  
 near the seashores or open  
 thickets on hill-side, often  
 limestone, up to 200 m alt.  
 in coastal forest.

Fl. Season. April~June.

This species has some morphological variation especially in flowers, the size, shape and texture of leaves and the length or character of indumentum on inflorescence. As a whole, the sizes of flowers and leaves are invariable showing a similar value in Japanese regions; petals 10-13 mm long and 4.5-5.0 mm wide (average of about 100 female flowers), leaves 5.7-5.9 cm long and 2.5-2.7 cm wide (average of about 300 mature leaves). As for the leaves, there found some exceptions, for example the specimens collected in Kanagawa, Enoshima (T. Yamamoto, TI) and Shizuoka, Yugashima and Shuzenji (T. Yamamoto, TI) have large leaves (10-16 cm long, 5-7 cm wide). These specimens are all sterile. Nakai described var. *macrophyllum* for these specimens. In Kyushu, both flowers and leaves are smaller; petals 8-10 mm long and 4.0-4.5 mm wide, leaves 4.5-4.8 cm long and 2.3-2.5 cm wide. These values are the same as those of Korean, including Querpaert, representatives.

Leaf shape and texture are also invariable throughout Japan and Korea;

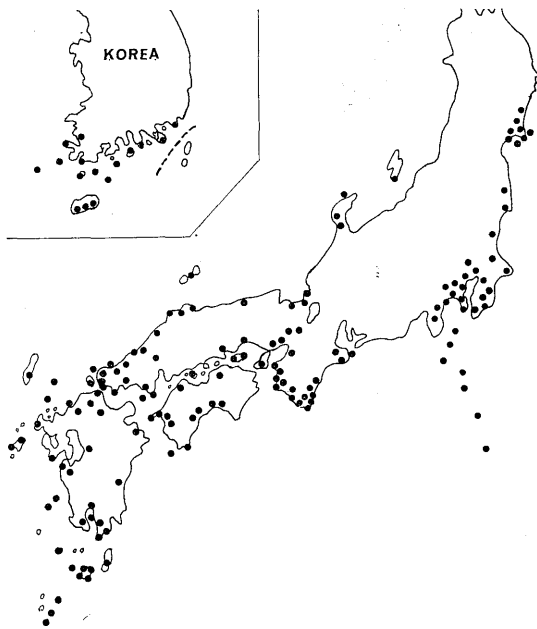


Fig. 1. Distribution map of *Pittosporum tobira* var. *tobira*.

the leaves are coriaceous and obovate in general at an altitude of 50-100 m, but in rather higher altitude up to 200 m and often in limestone areas, more thinner and narrower type of leaves is commonly observed.

The hairs of the standard type on inflorescence of this species are long-armed T-shaped and brownish, and the stalks are composed of 5-7 cells, as observed in main islands of Japan (including Isl. Yakushima). In other allied species of the related areas such as China, Formosa, Ryukyu and Bonin, short-armed T-shaped pale-brown soft hairs with 1-3 stalk-cells are common. In Kyushu and Korea (including Querpaert), however, short- and long-armed hairs are mixed about half and half on an inflorescence.

The specimens from Tanegashima Isl. and Minami-daitojima Isl., which have short-armed soft hairs on the lower surface of the leaves or nerves, have been regarded as var. *lanata* by G. Masamune.

1b) var. **chinense** S. Kobayashi, var. nov.

Folia parva, tenuia, chartacea; inflorescentia umbellata, 6-7-florifera, dense lanata.

Nom. Jap. Shina-tobera (nov.)

Specimen examined. China. Soochow in Kiangsu, S. Oka 359—holotype in TI.

Distr. E. China (Fig. 2).

This variety differs from the typical form of the species (var. *tobira*) in having a different type of hairs (short, adpressed, soft hairs) on inflorescences, much smaller flowers, and thinner and smaller leaves.

1c) var. **calvescens** Ohwi in Journ. Jap. Bot. 12: 331, 1936; Fl. Reip. Pop. Sin. 35(2): 8, 1979.

*P. makinoi* Nakai, Fl. Sylv. Korea. 21: 84, 1936.

*P. tobira* Ait. var. *fukiense* Gowda in Journ. Arn. Arb. 32: 310, 1951.

Nom. Jap. Takasago-tobera.

Representative specimens examined. Formosa. Toyen, T. Tanaka and Y. Shimada 13539—holotype in KYO. Bobokusi, S. Nagasawa 3—lectotype of *P. makinoi* in TI. Tansui, T. Makino, TI. Shintik, S. Honda, TI. Kelung, T. Makino, TI. Ibid., C. Owatari, TI. Ibid., S. Nagasawa, TI.

Distr. N.W. Formosa and S.E. China (Fig. 2).

Fl. Season. March~April.

Leaves small, 4-6 cm long, 2-3 cm wide, obovate-oblong, broadest slightly above the middle, rounded at apex; inflorescences umbellate, glabrous or mi-

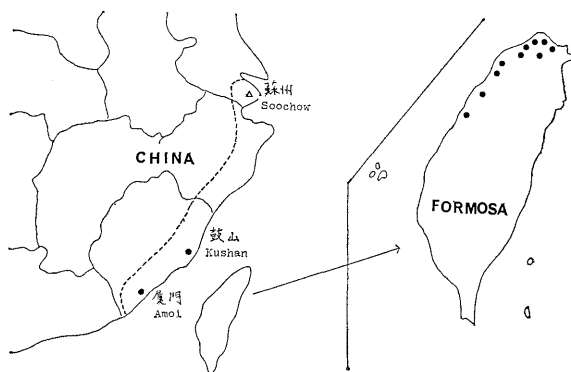


Fig. 2. Distribution map of *Pittosporum tobira* var. *calvescens* (●) and var. *chinense* (△).

nutely pubescent (glandular hairs only or with short-armed T-shaped hairs), with 5-6 flowers; flowers small; petals 7-9 mm long; capsules globular, 8-12 mm in diameter.

According to the description of Gowda, var. *fukiense* Gowda seems to be the same with this variety.

2) *Pittosporum lutchuense* Koidzumi, Pl. Nov. Amami Oshimensis 5, 1928; in Acta Phytotax. Geobot. 1: 165, 1932.

2a) var. **lutchuense**

Nom. Jap. Okinawa-tobera.

Representative specimens examined. Ryukyu. Isl. Amami-ohshima (leg. Captain A. Carpenter in anno 1883) ex Koidzumi; *ibid.*, Z. Tashiro—lectotype in KYO.

Distr. Endemic to Islands Amami (Fig. 3).

Fl. Season. March~April.

This species is characterized by dense pubescence of short-armed T-shaped hairs accompanied by short glandular hairs on new branches and inflorescence. The leaves are elliptical- or oblanceolate-oblong and with manifestly reticulated veins; inflorescences are more complicated; flowers are much smaller; petals are slightly reflexed; and peduncles are more slender than those of *P. tobira*.

2b) var. **denudatum** (Nakai) S. Kobayashi, stat. nov.

*P. denudatum* Nakai, Fl. Sylv. Korea. 21: 84, 1936.

*P. tobira* (non Aiton) Ito et Matsumura in Journ. Coll. Sci. Univ. Tokyo

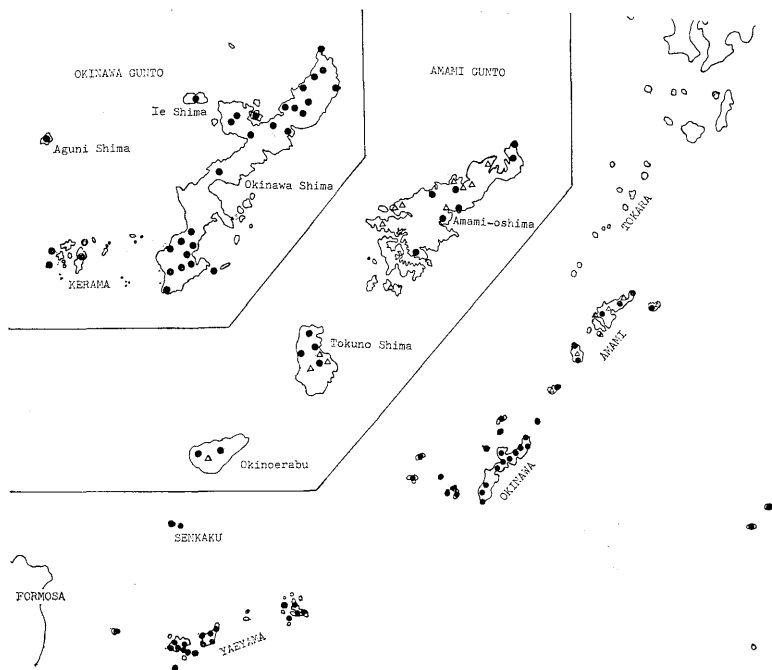


Fig. 3. Distribution map of *Pittosporum lutchuense* var. *lutchuense*( $\Delta$ ) and var. *denudatum*( $\bullet$ ).

12: 309, 1899; Matsumura Ind. Pl. Jap. 2(2): 192, 1912 (pro parte, quoad specimen in Liukiu lectum); Makino & Nemoto, Fl. Jap. 845, 1925 (excl. specim. ex Hondo, Kyushu, Bonin et Formosa).

*P. pauciflorum* var.  $\beta$ . ? Hook. et Arnot, Bot. Cap. Beechey voyage 259, 1841 (pro parte, quoad plant ex Loochoo).

Non. Jap. Ryukyu-tobera.

Representative specimens examined. Ryukyu. Isl. Okinawa. Nago, G. Nakahara—lectotype of *P. denudatum* in TI. Circa Shuri, K. Miyake, TI. Izumisaki, J. Matsumura, TI. Isl. Amami-Oshima. Sine loco speciali, T. Uchiyama, TI. Loochoo. Sine loco speciali, J. Matsumura, TI. Isl. Miyako, Hirara, M. Tagawa & K. Iwatsuki 4470, KYO. Isl. Ishigaki, Kannonzaki, M. Furuse, RYU. Isl. Yaeyama, Isl. Iriomote, Urauchigawa, T. Uchiyama, TI. Isl. Kita-Daitojima, T. Yamazaki 609, TI. Isl. Minami-Daitojima, S. Hatushima 33920, RYU. Isl.

Senkaku, Uotsurijima, K. Shimabuku & K. Ohgami 4447, TI.

Distr. Endemic to Ryukyus (Amami, Okinawa, Yaeyama, Daito, Senkaku) (Fig. 3).

Fl. Season. March~April.

This variety differs from the typical variety of the species (var. *lutchuense*) in having a glabrous young branches and leaves, fewer hairs on inflorescences; the leaves are oblanceolate, obtuse or rounded at apex. Some variations are observed in shape of the leaves and the character of indumentum. A specimen, which had elliptical-oblong leaves with acute apex and was collected in Okinawa by Matsumura, were once named *R. Matsumurae* by Nakai as inedited herbarium name. Although their localities are uncertain, probably they might have certain habitat in higher altitude in the island.

3) ***Pittosporum boninense*** Koidzumi in Bot. Mag. Tokyo 31: 260, 1917: Gowda in Journ. Arn. Arb. 32: 313, 1951.

Nom. Jap. Shiro-tobera.

Representative speimen examined. Bonin Islands. Hahajima, H. Hattori—holotype in TI.

Distr. Endemic to the Bonin Isls. (Mukojima, Chichijima, Hahajima) (Fig. 4).

Fl. Sesason. March~April.

The species has the widest variation in morphology and ecology among the Bonin species. The range of distribution is also wide, from lowland to the top of the mountains of moderate humidity in Chichijima and higher parts of Hahajima, including the moss-forest of Mt. Chibusa and the top of Mt. Sekimon. This species is especially variable in the frequency of inflorescence ramification and leaf size. That is, the population in the valley of Mt. Mikazuki of Chichijima is characterized by mediate shape between this species and *P. chichijimense*, while the specimens from Nagasakibana or Minamizaki of Chichijima show intermediate characters of this species and those of *P. beecheyi*. In spite of such variation, the leaf shape, especially of leaf apex, the length of the peduncles and the inflorescence type are very useful for recognizing this species.

As a whole this species has the closest relationship to *P. lutchuense* var. *denudatum* of the Ryukyu among the four Bonin species.

4) ***Pittosporum chichijimense*** Nakai [in Rigakukan 26(5): 5, 1928, nom. nud., in Bull. Biogeogr. Soc. Jap. 1: 258, 1930, nom. nud.]; Tuyama in Bot.



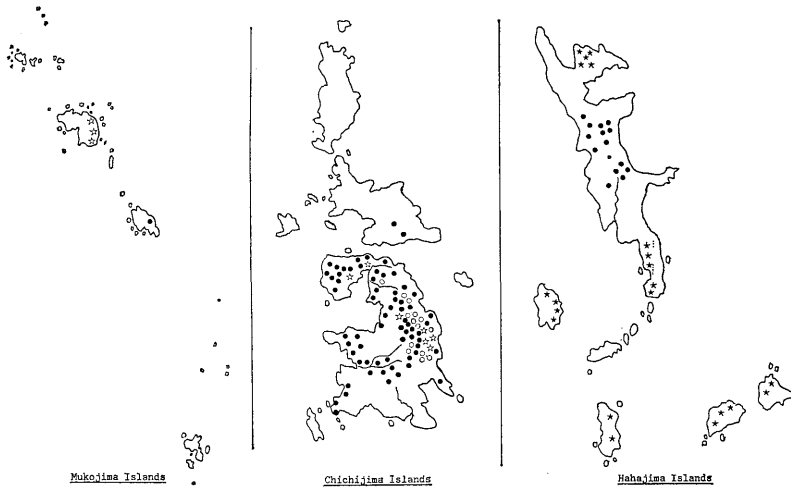


Fig. 4. Distribution of *P. boninense* (●), *P. chichijimense* (○), *P. parvifolium* (☆), and *P. beecheyi* (★) in the Bonin Islands.

Mag. Tokyo 49: 446, fig. 9, 1935, in Nakai, Iconog. Pl. Asia-Or., 1-2: 31, Tab. 15, 1936; Gowda in Journ. Arn. Arb. 32: 314, 1951.

Nom. Jap. Oomi-tobera.

Representative specimens examined. Bonin Islands. Chichijima. Mt. Asahi-yama, Nakai—lectotype in TI. Takedabokujō, Nakai, TI.

Distr. Endemic to the Bonin Isls. (Chichijima) (Fig. 4).

Fl. Season. March~April.

This species has more reduced inflorescence, thinner and larger leaves with undulate margin and long petioles with long and slender pedicels than the previous species. The habitat is limited to the gloomy moist forests of higher central parts in Chichijima. These morphological and ecological data show that this species is adapting the most humid environment among the Bonin species.

5) ***Pittosporum beecheyi*** Tuyama in Bot. Mag. Tokyo 49: 445, fig. 8, 1935.

*P. pauciflorum* Hooker et Arnot var.  $\beta$ . Hooker et Arnot, Bot. Beechey Voy. 259, 1838 (quoad Pl. Bonin).

*P. parvifolium* (non Hayata) sensu Gowda in Journ. Arn. Arb. 32: 312, 1951.

Nom. Jap. Hahajima-tobera.

Representative specimen examined. Bonin Islands. Isl. Hahajima, Higashidai, Nakai—holotype in TI.

Distr. Endemic to the Bonin Isls. (Hahajima) (Fig. 4).

Fl. Season. August~December.

This species has close resemblance to *P. tobira* of Japan in habitat, the external shape, and in size and texture of leaves. Its distribution is limited to Hahajima and its adjacent small isles of the Bonin Islands. This species has two types of the leaves: the specimens from southern parts of Hahajima (Nakanodaira~Omotohama) have broad and rounded leaves with rotundate apexes, looking like a miniature of *P. chichijimense* of Chichijima, while the specimens from northern parts of Hahajima (around Kitakō or Higashidai) or Mukohjima and other adjacent small isles have narrow and small leaves like a tiny *P. boninense*. It is an interesting fact that *P. boninense* in Hahajima is found at rather higher altitude, while *P. beecheyi* is in lowland forest near the sea and adjacent small isles. Morphological resemblance between this species and *P. tobira* seems to be caused by the similar environmental conditions.

6) **Pittosporum parvifolium** Hayata, Icon. Pl. Formos. 3: 31, 1913.

*P. tobira* (Thunb.) Ait. var. *sakurarii* Gowda in Journ. Arn. Arb. 32: 331, 1951, ut *sukurarii*.

Nom. Jap. Kobano-tobera.

Representative specimen examined. Bonin Islands. Isl. Chichijima, Hatsune, H. Hattori—holotype in TI.

Distr. Endemic to the Bonin Isls. (Mukojima, Chichijima) (Fig. 4).

Fl. Season. November~December.

Gowda's description of this species is based on the five herbarium specimens collected by Wilson in Hahajima. But as they have long pediceled solitary or umbellate flowers, those specimens are considered to be *P. beecheyi*. Based on this confusion she treated *P. beecheyi* Tuyama as a synonyme of *P. parvifolium*. However, *P. parvifolium* is a rare species and has never been found in Hahajima yet.

It may be assumed that *P. parvifolium* is a result of extreme reduction of the plant sizes both in vegetative and reproductive organs, and its dwarfish leaves, a solitary female flower and a single fruit seem to indicate an extraordinary adaptation to the strict environment.

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トベラ *Pittosporum tobira* (Thunb.) Ait. とその近縁種—M. Gowda の *Tobira-complex*—の個々に関しては、多くの報告があるが、その取扱いはそれぞれ異なる。最近著者は本州各地のほか、琉球、小笠原のトベラを野外で観察する機会を得た。また、これらの地域のほか、中国、朝鮮、台湾産の腊葉標本を多数見ることが出来た。今回はその結果認められた 6 種、3 変種（新名と新組合せを含む）について報告した。

*Tobira-complex* は花序の形態と分岐の回数、花と葉の形態の相違から、大きく、*P. tobira*, *P. lutchuense* の 2 グループに分けられ、花序や若枝、葉裏脈上の毛の形質や量から、それぞれのグループ内で更に 2~3 の小グループが認められる。毛の形質にも 2 型が認められその質的量的な移行は、北は朝鮮、南は九州南部まで及んでおり、屋久島の南トカラ列島に、他の形質も含めた両種の境界があると思われる。小笠原産の種（特に *P. boninense*）は琉球産の *P. lutchuense* var. *denudatum* との関連が考えられる。

□Falkowski, P.G. (ed.): **Primary Productivity in the Sea**. Environmental Science Research, Vol. 19. ix+531 pp. 1980. Plenum Press, New York. ¥18,400. 1) 藻類の一次生産の展望, 2) 藻類によるエネルギー転換: 色素と光の利用, 3) 藻類による物質の転換: 栄養の吸収, 4) 藻類の生長速度, 5) 海の一次生産, 6) 物質の再循環の 6 章から成る。地球の全一次生産量の約 30% を占める海の生産力をよく理解するために行われた藻類の生理学と波動力学に関する学際シンポジウムの講演集であり、従って分類に直接関係する章はない。しかし最近の藻類の分類・類縁の考察には色素や光合成をはじめ、生理、生化学に関する諸形質が重要な基準にとりあげられていることから、藻の分類に携わる人や藻に興味をもつ人達にとっても学ぶべきところがある。  
(千原光雄)

□Duke, J. A. (ed.): **Handbook of Legumes of World Economic Importance** 345 pp. 1981. Plenum Press, New York. \$54. 種子植物の中でマメ科は最も多種類の有用植物を含むが、その中から特に重要な 150 種を選びだし、その全部について学名、英名、主なシノニム、簡潔な線画、および利用法、形態的特徴、分布、生態など多くの事項についてのデータが整理されている。全体がよくまとめられており、形態的な特徴についても花、豆果、種子に重点を置いた記載となっている。USA を主とする 65 名の著者の共同執筆で、良い仕事をしている専門家が数多く、その力が適切に生かされた好著である。やや大型であるが (28×22 cm)、造本、印刷がよく、読みやすい。

(大橋広好)