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Notes on *Cornus* (Cornaceae) in Nepal

By

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八田洋章*・岩科　司*：ネパール産ミズキ属（*Cornus* L.）ノート

The authors had the opportunity to investigate the *Cornus* species in Nepal; far east region in July and August 1991 and Langtang Valley in July 1992 as members of the botanical expedition supported by a grant from the Monbusyo International Scientific Research Program (Field Research), from the Ministry of Education, Science and Culture, Japan.

Three *Cornus* species: *C. macrophylla*, *C. oblonga* and *C. capitata* are collected at warm temperate region about 2000m above sea level in Nepal. The former two species have the inflorescences of corymbose cyme belong to subgenus *Kraniopsis* Raf., while *C. capitata* characterized by flowers aggregated into sessile heads (reduced cymes) surrounded by petal-like involucral bracts is classified into subgenus *Cynoxylon* Raf.

It has been discussed whether *C. macrophylla* is the same species as *C. brachypoda* which distributes in Japan and the Korean Peninsula for long time. *C. oblonga* is a distinctive species because it has a different phenological behavior and furthermore has 4-3 locular ovaries from other *Cornus* species. In addition, *C. capitata* is of interest because of different characteristics of winter buds from that of Japanese *C. kousa* in spite of being in the same group.

The present notes aims at describing these three Himalayan *Cornus* species on the above mentioned points of view.

1. Outline of the genus *Cornus* L.

About 60 species of the genus are mainly distributed in temperate regions of the Northern Hemisphere extending to Central and South America, with one exceptional species in Africa. The genus *Cornus* contains a series of types of inflorescences from the bractless corymbose cyme to the umbell or big bracteate capute. The taxonomical treatment of the genus has varied widely, i.e. Linneus (1753), Bentham and Hooker (1876), Wangerin (1910) and Rehder (1949) had treated *Cornus* as one genus in a broad sense and subdivided them into either subgenera or sections. Flowering plants of Himalaya (Polunin and Stainton 1984), Iconographia Cormophytorum Sinicorum (II) (Institutum Botanicum, Academia Sinica 1972), Makino's new Illustrated Flora of Japan (Makino 1961), Flora of Japan (Ohwi 1965) have accepted this systems. On the other hand, Nakai (1909, 1914, 1949) proposed that the genus *Cornus* was segregated into a number of genera, and Hutchinson (1942, 1959, 1967), Hara (1948), Soon and Hu (1990) supported this proposition. Hara (1989) treated *Cornus controversa* and *C. macrophylla* as *Swida controversa* and *S. macrophylla*, respectively, and *C. kousa* as *Benthamidia kousa* in Heibonsha's Wild Flowers of Japan, Woody Plants. In any cases there is no doubt that *Cornus* is a natural group even if this is treated as different genera as mentioned above. In this report, the genus *Cornus* is used *sensu lato* because the genus may be simplified by staying with *Cornus* without causing

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confusion.

2. Three *Cornus* species in Nepal.

A. *Cornus macrophylla*

(1) Taxonomical position – *C. macrophylla* is a member of subgenus *Kraniopsis* which is characterized by an ebracteate cymose or paniculate inflorescence. Two species with the same inflorescence type; *C. controversa* in eastern Asia and *C. alternifolia* in northern United States and adjacent Canada are sometimes classified into another subgenus *Mesomora* Raf.

Only these two species are distinctive in having alternative leaves, stones with a characteristic deep apical pit, and a chromosome number (2n=20) that differs from subgenus *Kraniopsis* (2n=22).

These corymbose cyme species have been treated as subgenus *Cornus* or section *Cornus* in many cases (Hutchinson 1942, Rehder 1949) but the rules of nomenclature bar the use of *Cornus* for these species because the name has earlier been applied to a species with an umbel inflorescence such as *C. mas*. Corymbose cyme species consequently are given as *Swida* Opiz when they are split off from *Cornus*. These non-involucrate species are the most perplexing and are distinct from 30 species distributed mainly in North America and eastern Asia.

(2) Is *C. macrophylla* the same species with *C. brachypoda*?

Today, it is still unclear whether *C. macrophylla* of western China and Himalayas is the same or different from *C. brachypoda* of Japan. The main difference between these plants is the shape of the style which is either club-shaped (*C. macrophylla*) or cylindric (*C. brachypoda*) (Fig. 1). Eyde (1988) cited and agreed with Wangerin and Koehne who, at the beginning of 20 century claimed that club-like style defines a group of species, i.e. the Corynostylae. They used the feature of the style to keep *C. brachypoda* separate. On the other hand, Hemsley and Schneider maintained that *C. brachypoda* must be merged with *C. macrophylla* as neither botanist could see a constant difference in the styles nor even by examining live plants. Rehder (1916) observed that both Japanese and Korean specimens always have cylindric style, but Himalayan specimens are not uniformly clavate and vary even in the same inflorescence. Moreover, he came to a conclusion that the shape of styles is too variable for separating *C. brachypoda*.

Botanists e.g., Li (1944) and Hu & Soong (1983) of the People's Republic of China agreed with Rehder's opinion. In Japan, Ohwi's (1965) Flora of Japan recognized *C. brachypoda*, but Hara's work did not. Li (1944) pointed out that *C. alsophila*, which was collected in Yunnan Province in 1917 and named by Smith based on the non club-like specimen, is a synonym of *C. macrophylla* because of the above reason.

The authors observed live plants of *C. macrophylla* in Nepal, Yunnan and Sichuan Provinces of China, and *C. brachypoda* in Taiwan, Korea and Japan, but we could not find the difference between them. We also agree with Rehder that *C. brachypoda* has to be a synonym of *C. macrophylla*.

B. *Cornus oblonga*

The author (H. Hatta) observed this plant in western Nepal with *C. macrophylla* growing nearby. There is an opinion that *C. oblonga* has an important place in *Cornus* systematics, because this species has many differences compared with other *Cornus* species.

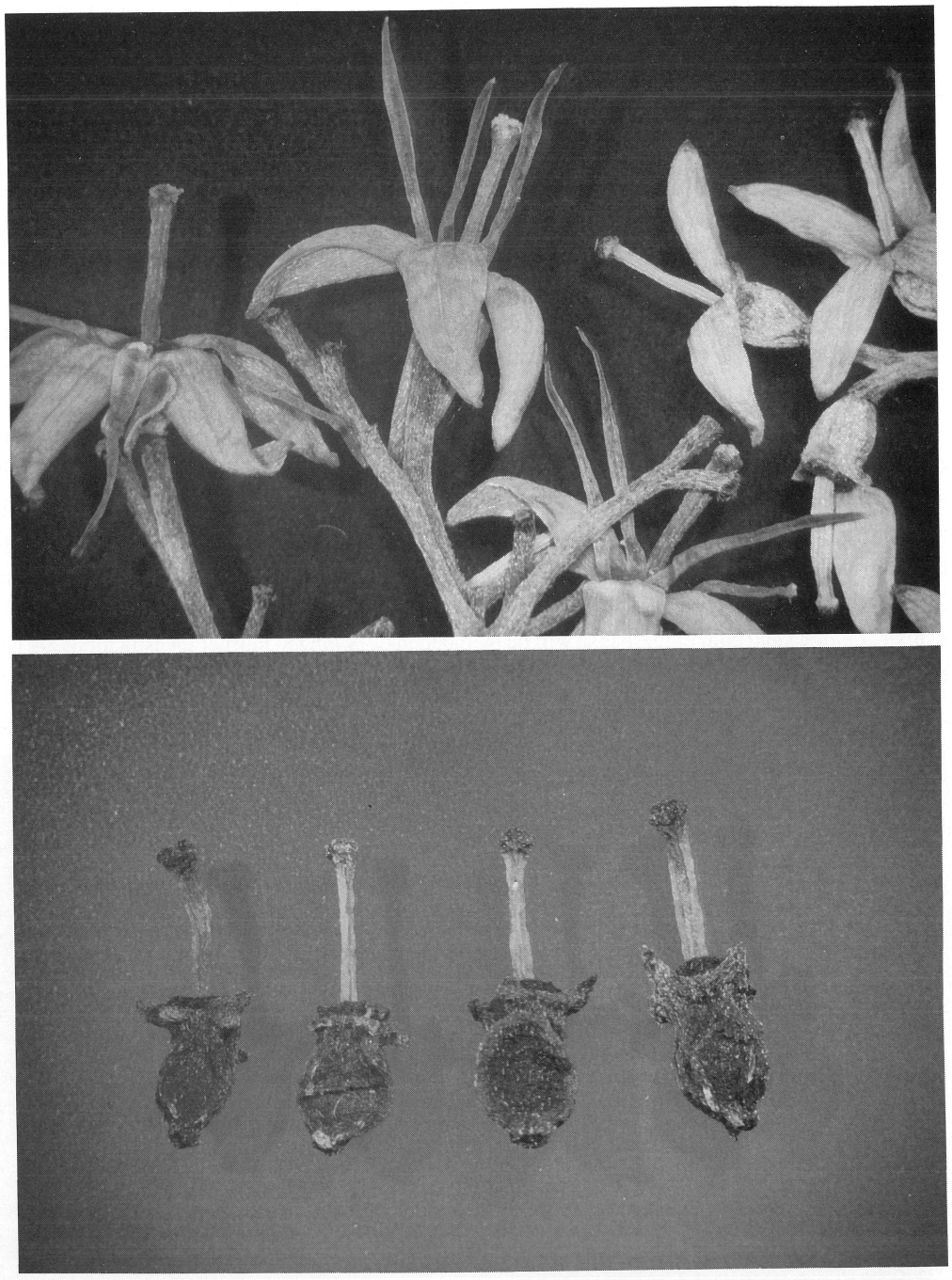

Fig. 1. Styles of *Cornus brachypoda* (upper; collected in Hakone, Japan) and *C. macrophylla* (lower; collected in Nepal).

(1) Distribution range

It goes from Rawalpindi, Pakistan (Ghazanfar 1975) via north India (Bor 1938), Nepal, and northern Burma to Sichuan, Yunnan (Hu and Soong 1983), Thailand and Vietnam (Tardieu-Blot 1968)

(2) Number of carpels

The most important character of this species is the presence of 3(–4) loculi. Only this species regularly has more than two-chambered fruits in *Cornus* (Fig. 2). *Cornus oblonga* is a very important species for understanding ancestral lines in *Cornus* as Eyde (1988) confidently judged that one or two-locular ovaries are derived from ancestors with plurilocular ovaries.

Zhu (1984) makes a new genus *Yinquania* based on the following characteristics of *C. oblonga*: ovary with 3(–4) loculi; the tip of stigma is scantily split 3(–4) (Fig. 3); stones are commonly 3(–4)-chambered; 3-seeded fruits, and evergreen habit.

He moved *C. oblonga* to *Y. oblonga* and added another species (*Y. muchuanensis*) to the new genus. According to Zhu (1984), the above two species can be distinguished by the following: *oblonga* is a small tree, 6–10m tall; drupes are ovate-elliptical; stone are elliptical, minutely apressed on both sides, and there is no ridged markings on the surface. On the other hand, *muchuanensis* is a shrub (2–4m tall), has orbicular drupes, has ovate-orbicular stones, and there is ridged markings on the surface. Although Zhu (1984) make this new genus and separates a new species, we think that his *Y. muchuanensis* is close to his *Y. oblonga* and both of these taxa will be included in *C. oblonga*. Further investigations are need to verify this opinion.

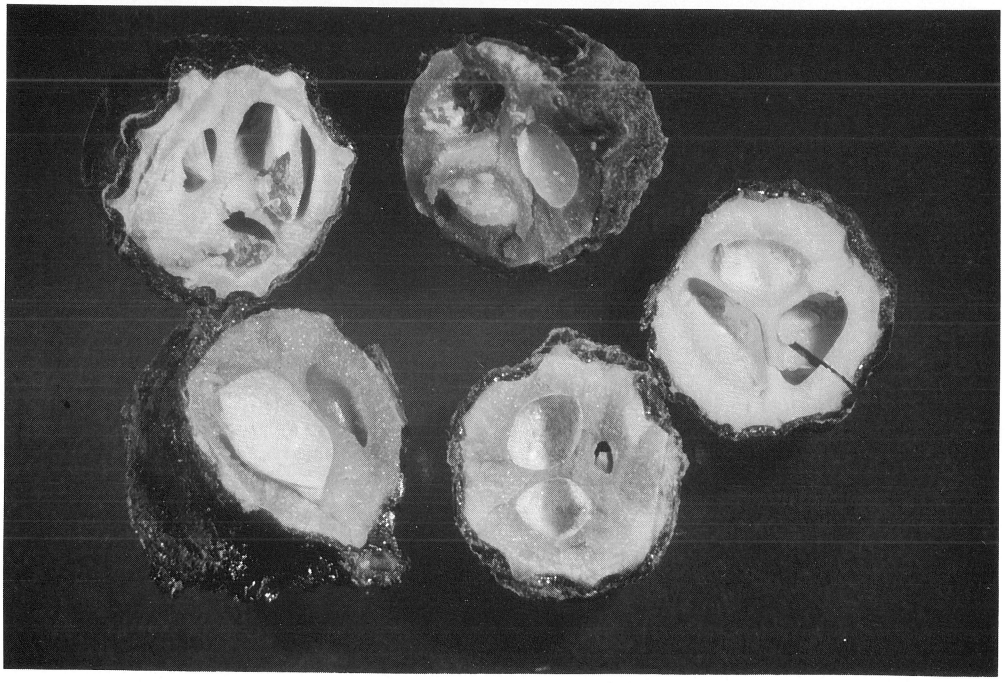

Fig. 2. *C. oblonga* regularly has 3(–4)-chambered fruits.

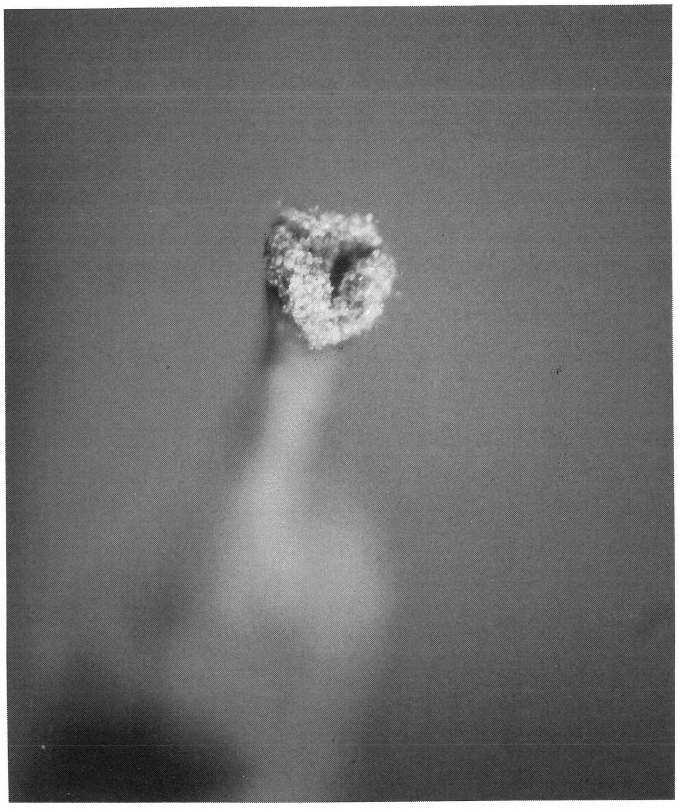

Fig. 3. Scantily split stigma of *C. oblonga*.

(3) Evergreen species – *C. oblonga* is a only evergreen species in subgenus *Kraniopsis*, and even within the whole genus *Cornus*, evergreen trees are certainly in the minority.

(4) Unique flowering and fruiting cycle – Trees of *Cornus oblonga* which were collected on 14 Aug. at the altitude 1470m, had young inflorescences. It was in distinct contrast to *C. macrophylla* of which fruits were ripening at nearly the same place and season (Fig. 4). Many herbarium specimens of *C. oblonga* showed that it only among *Cornus* species bears flowers in autumn, and fruits in spring (Fig. 5). It seems that fruits ripene rapidly in spring although they scarcely grow over winter.

According to Yamada (1988), even in the coldest month, temperature does not fall below 0°C in Kathmandu. Here there may be scarcely rain from Nov. to April. Elsewhere, the snowline in winter descends to about 2800m in eastern Nepal and to about 2000m in western Nepal. The growing areas of *Cornus* species in Nepal do not exceed the border of these snowlines.

The phenological characters and climate mentioned above are correlated with the *C. oblonga*'s leathery, and overwintering foliage. We think that this is related to the longer winter days in Nepal (27–30°N; similar to the Nansei Islands of Japan) as compared to central Japan. Also the year-round photosynthesis of evergreen leaves makes spring fruiting easy.

(5) Persistent bract – The species of subgenus *Kraniopsis* normally have no bract or the bracts fall

Fig. 4. Comparison of phenological events between *C. oblonga* (left) and *C. macrophylla* (right). *C. oblonga* has young inflorescence but the other's is already fruiting. Both species are collected at nearly the same place in Nepal on the same day (14, Aug. 1991).

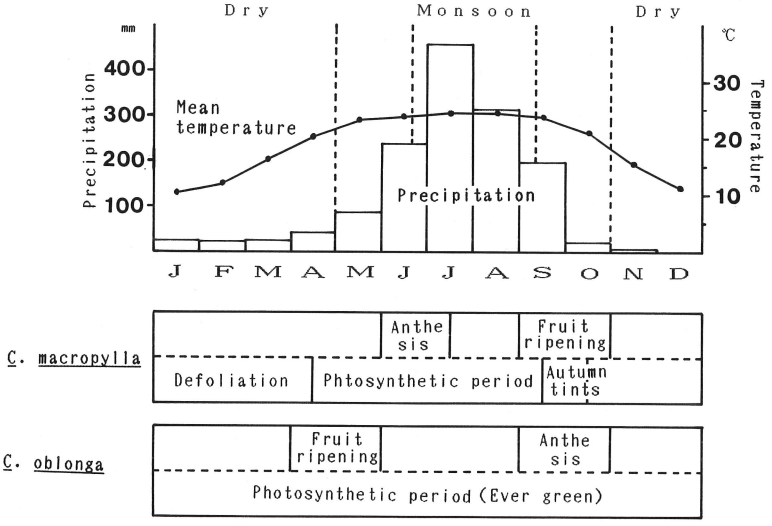

Fig. 5. Climatic data of the Kathmandu Valley (upper) and the comparison of phenology between *C. macrophylla* and *C. oblonga*.

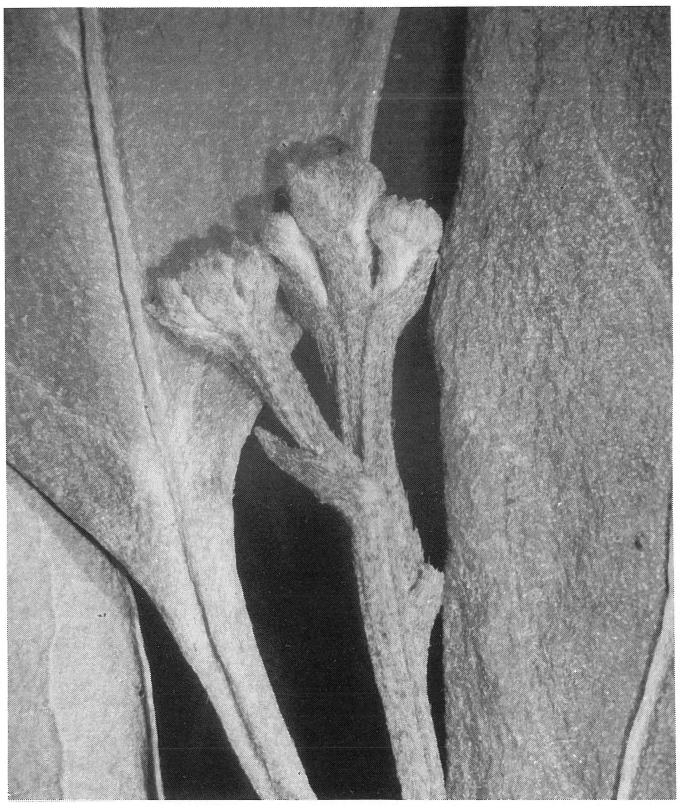

Fig. 6. *C. oblonga* has constant and persistent inflorescence-bracts.

away in early stages of growth. *C. oblonga* is the only one species with constant and persistent inflorescence-bract (Fig. 6).

C. *Cornus capitata*

(1) Taxonomical position – Among Asia's big bracted *Cornus*, new species are found even now. These additions make more complexity by the fact that many species have been added to the segregated genera *Cynoxylon* and *Dendrobenthamia* Hutch. rather than to *Cornus* L. (Fang 1953). Hu & Soong (1981) described ten species and four varieties of *Dendrobenthamia* including five new ones (one species and four varieties) which all are endemic to relatively small areas in China. Hu (1984) took a somewhat more conservative view. We observed the winter habits and bud structure of this taxa and found several evergreen and deciduous species which made us question the taxonomy of Hu & Soon (1981).

At nearly the same time, Xiang (1987) had similar ideas and reduced 19 species of the subgenus into four species, 12 subspecies and three varieties, and returned all them into *Cornus*. In Xiang's system which makes agree with our opinion, *Cornus capitata* was divided into five subspecies or varieties as follows:

Cornus capitata subsp. *capitata*
C. capitata subsp. *emeiensis*
C. capitata subsp. *brevipedunculata*

C. capitata subsp. *angustata* var. *angustata*

C. capitata subsp. *angustata* var. *mollis*

(2) Distribution and habitat – *C. capitata* is an evergreen tree which is distributes widely from China to Himalaya and grows around 2000m in altitude. The author observed it in the western and central regions in Nepal. It was especially abundant from Dhunche to Syabru in the Langtang Valley. Most plants were small trees with a few exceptions which were 20 m in height at the edge of *Alnus nepalensis* forest in western region. *Cornus capitata* are tall fundamentally trees, but they can change tree form and height corresponding to circumstances, especially the height of adjacent trees.

(3) Characteristics of inflorescence

○Flower bud – The number of florets is about 100 per inflorescence, and is much more than other *Cynoxylon* species (about 30). These florets are not covered with scale leaves but only surrounded by involucular bracts.

○Process of peduncle elongation

Flower shoots of a tree, which was grown from seed collected in Nepal, were observed phenologically in Tsukuba Botanical Garden. Young flower buds grew through summer into autumn. The peduncle also elongated about one-third of full length before winter. The peduncle expanded to its final length (3–4cm) in next early summer and was accompanied with the expansion of involucular bracts (Fig. 7).

These phenological events of *C. capitata* in Nepal were nearly the same as the ones for plants

Fig. 7. A ripen fruit and a young inflorescence of *C. capitata*.

Table 1. Comparison of winter bud among four *Cornus* species

Species	Number of florets per inflorescence	Florets through winter	Elongation of peduncle	Formation of axillary bud
C. capitata (S.W. China-Hymalaya)	ca.100	Exposed, surrounded with bracts	About 1/3 elongate in fall	At the axil of foliage leaf
C. kousa (Japan-Korean Peninsula)	ca.35	Covered with four scales+ four bracts	Not elongate till spring	At the axil of inner scale
C. florida (Eastern side of N. America)	ca.30	Covered with four bracts	Elongate a little in fall	At the axil of inner scale
C. nuttallii (British Colombia to California)	ca.100	Exposed, surrounded with bracts	about 1/3 elongate in fall	At the axil of foliage leaf

grown in Japan. When young fruits and flower buds observed by us in Nepal (July to August) their timing of growth was similar to the plants in Japan. Thus, phenological process are simultaneous in Japan and Nepal under the similar monsoon conditions.

On the other hand, the inflorescences of *Cornus kousa* of the same subgenus covered with two pairs of scale leaves, have two pairs of involucral bracts, and have a peduncle that elongates only from April to June (Hatta 1979, 1983).

Deciduous *C. kousa* should be considered as a species that is adapted to the cool-temperate zone. The evergreen *C. capitata* is adapted to grow in a warmer zone. It is a very interesting that the same relationship between *Cornus capitata* and *C. kousa* is also observed between *C. florida* and *C. nuttallii* of North America.

Cornus nuttallii is distributed in western North America has 80–100 florets per inflorescence. The florets are surrounded by involcular bracts without scale leaves, and the elongation pattern of the peduncle is also similar to *C. capitata*. *Cornus florida* is distributed in eastern North America has about 30 florets per inflorescence. The florets are covered by two pairs of involcular bracts, the peduncle elongates a little before winter, and the two pairs of scale leaves do not cover the florets. It is significant that two pairs of species, a widely separated geographically, but they have very similar in relationship of features within each pair, can this be an example of parallel evolution. Some characteristics of these four species are compared in Table 1.

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Summary

Three *Cornus* species: *C. macrophylla*, *C. oblonga* and *C. capitata* are collected at warm temperate region about 2000m above sea level in Nepal.

(1) *C. macrophylla* has been discussed whether this is the same species as *C. brachypoda* which is distributed in Japan and the Korean Peninsula for long time. The main difference between these plants is the shape of the style which is either club-shaped (*C. macrophylla*) or cylindric (*C. brachypoda*). The authors observed live plants of *C. macrophylla* in Nepal, Yunnan and Sichuan Provinces of China, and *C. brachypoda* in Taiwan, Korea and Japan, but we could not find the difference between them. Our opinion also agreed with Rehder that *C. brachypoda* has to be a synonym of *C. macrophylla*.

(2) The most important character of *C. oblonga* is the presence of 3(–4) loculi. Only this species regularly has more than two-chambered fruits in *Cornus*. This species has unique flowering and fruiting cycle. Many herbarium specimens of *C. oblonga* showed that it only among *Cornus* species bears flowers in autumn and fruits in spring.

(3) Another *C. capitata* is of interest because it has quite different characteristics of winter buds from that of Japanese *C. kousa* in spite of being the same group. Deciduous *C. kousa* should be considered as a species that is adapted to the cool-temperate zone. The evergreen *C. capitata* is adapted to grow in a warmer zone.

摘　　要

標高 2,000m 前後の暖温帯域で，ネパール産ミズキ属として現在認識されている 3 種，*Cornus macrophylla*（クマノミズキ），*C. oblonga*, *C. capitata*（ヒマラヤヤマボウシ）を採集し，日本産近縁種と比較検討した。

（1）*C. macrophylla* は日本～朝鮮半島に分布する *C. brachypoda* と同種とみなすか否か，主として雌蕊が棍棒状を呈するか（*C. macrophylla*），それとも円柱形でその先端，柱頭部だけが頭状に肥厚するか（*C. brachypoda*）について議論されてきた。筆者らは多くの標本を調べ *C. brachypoda* は *C. macrophylla* の種内変異と判断した。また中国雲南省北西部，四川省峨眉山および台湾でも本種を観察したが，花柱の形態以外の外部形態では日本産個体群との区別は困難であった。

（2）*C. oblonga* の分類学上最も重要な点は本種が安定して 4～3 室の子房を有することである。これはミズキ属の他の全ての種群が 2 室であるに対し，きわめて特異的である。またポストモンスーンから乾期に当たる 10～11 月に開花し冬季間を通して果実が生長し，乾期の終わり頃の春（3～4 月）に熟果期を迎えるというミズキ属としては特異の開花結実サイクルを持つ。

（3）*C. capitata* は暖温帯～亜熱帯域に分布し，冷温帯域に分布の中心を持つヤマボウシとの比較が興味深い。即ち冬芽は芽鱗を持たず，小花群は小さな弁状の総苞片に囲まれるだけで裸出したまま越冬する。これに対しヤマボウシの小花群は内外 2 対の芽鱗片に包まれ，さらに 2 対の総苞片に抱かれる。また *C. capitata* の花梗が成熟時のおよそ 1／3 を年内に伸長する点も後者と異なる。

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