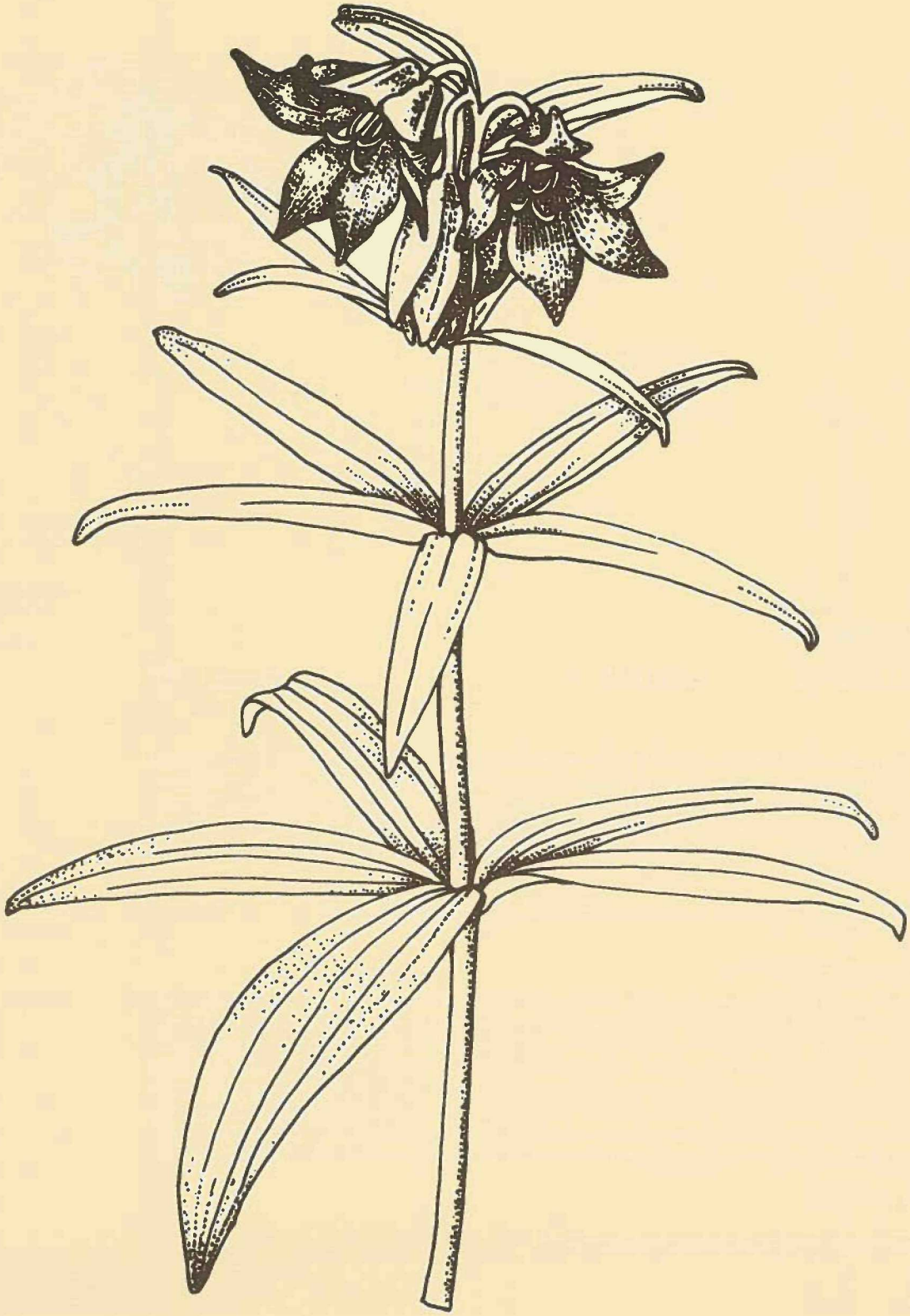
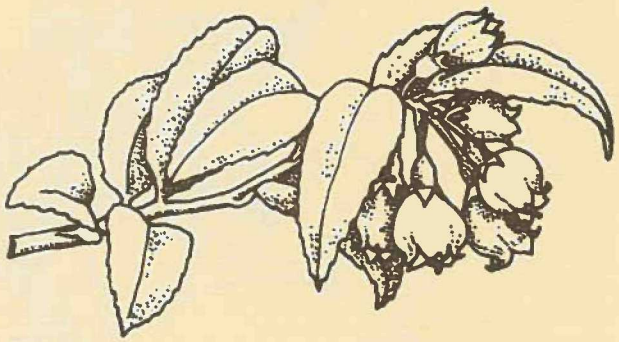
DAVIDSONIA

VOLUME 12 NUMBER 1 Spring 1981



Cover:

Fritillaria camschatcensis **var. *camschatcensis*, Riceroot Fritillary, in flower.**



***Vaccinium ovatum*, Evergreen Huckleberry, is common in coastal British Columbia.**

DAVIDSONIA

VOLUME 12 *NUMBER 1* *Spring 1981*

Davidsonia is published quarterly by The Botanical Garden of The University of British Columbia, Vancouver, British Columbia, Canada V6T 1W5. Annual subscription, ten dollars. Single numbers, two dollars and fifty cents, except for special issues. All information concerning subscriptions should be addressed to the Director of The Botanical Garden. Potential contributors are invited to submit articles and/or illustrative material for review by the Editorial Board.

© 1981 by The Botanical Garden, The University of British Columbia.

Acknowledgements

The pen and ink illustrations are by Mrs. Lesley Bohm. The photographs for Figures 1 to 3 were taken by Mr. Robert D. Turner, and that for Figure 4 by Ms. Dorothy I.D. Kennedy of the B.C. Indian Project, from the collections of the Smithsonian Institution, Washington, D.C. The photographs on page 26 were provided by Mr. Joseph A. Witt, Curator of Plant Collections, University of Washington Arboretum, Seattle, and those on pages 27 and 28 were taken by Raeff Miles, Photographer, Vancouver. The map on page 16 was prepared by Mr. Pierre Caritey, a draughtsman in the Faculty of Education at UBC. Mrs. Sylvia Taylor researched the sections on propagation, culture and ethnobotany for the *Fritillaria* article.

ISSN 0045-9739

Second Class Mail Registration Number 3313

Indian Use of *Shepherdia canadensis*, Soapberry, in Western North America

NANCY J. TURNER*

Introduction

Shepherdia canadensis (L.) Nutt., a member of the Elaeagnaceae or Oleaster Family, is well known to Indian peoples in northwestern North America as the source of a popular confection, called "Indian ice cream", which is made from the fruits of this plant whipped with water into a light foam. Many of the local or common names for this shrub, including "Soapberry", are derived from the foaming properties of the fruits. Another term, used by many Native people, is "soapolallie", or "soopolallie " [sopə,lali] (Avis *et al.*, 1967), a word meaning "soap berry" in Chinook Jargon, the Northwest trade language. Some Indian people simply call it "ice cream bush", and others "foamberry". "Hooshum", one of the local names used by European Canadians, is derived from an Interior Salishan name, sx̣ʷúsəm, which is a nominalized form derived from the root x̣ʷus- "foam" (cf. Thompson *et al.*, 1974). The name used by French Canadian traders and voyageurs was "brue", or "le brue", from the French Canadian term, *broue* 'froth', as on beer (Avis *et al.*, 1967). The plant is also called Canadian, or Russet, Buffaloberry, after its closest botanical relative, *Shepherdia argentea* (Pursh) Nutt., the Buffaloberry, or Silver or Thorny Buffaloberry of the Great Plains region. The term "buffaloberry" for this latter species is apparently because, among Indians and White traders and settlers, the berries were a customary garnish for buffalo meat (Saunders 1976; Medsger, 1972). One other common name for *S. canadensis* fruits, "slave berry", was used by the Stoney Indians of Alberta, reportedly because the berries were believed to be the only ones available to, and used by, the Piegan Blackfoot women in southern Alberta. The Stoneys understood that the Piegan women were ill-treated by their husbands and so called them slave women. Another name used by the Stoney, "butterfly bush", is a translation of the name for this shrub in their own language (Scott-Brown, 1977).

From an ethnobotanical perspective, Soapberry has many interesting and intriguing features, and since its use centred here in British Columbia, it seems appropriate to discuss these in *Davidsonia*. In the following sections, some of the ethnobotanical aspects of the plant will be treated in detail. Firstly, however, some of its botanical features will be presented.

Botanical Features

Only two genera of Elaeagnaceae occur naturally in Canada: *Shepherdia* and *Elaeagnus*. *Shepherdia canadensis* and *S. argentea* are the only species in the first genus represented in Canada, and *Elaeagnus commutata* Bernh., known as Silverberry, "wolf willow", or "silver willow", is the only *Elaeagnus* species. All three are shrubs, and all were used by Native peoples in western Canada — the first two mainly for their edible fruits, but also as sources of medicine, and the third mainly for its tough, fibrous bark, which was used in weaving and rope making (cf. Turner, 1979). Its silvery fruits were also used for necklace beads (Hellson and Gadd, 1974).

Shepherdia canadensis is a dioecious (sexes separate), unarmed, deciduous shrub up to 4 m tall, but usually under 2 m. The chromosome count is N=11. The leaves are opposite and short-petioled, with entire, ovate to ovate-lanceolate blades, 1.5 to 6 cm long and 1 to 3 cm wide. The upper surface of the leaves is green and white-scurfy, whereas the lower leaf surfaces and the

* Nancy J. Turner, Research Associate, British Columbia Provincial Museum, Victoria, B.C.

young twigs are conspicuously covered with reddish-brown scurf. This surface texture is produced by peltate scales on the outer leaf surfaces. The flowers are borne 1-several in the leaf axils and appear with or before the leaves. The staminate flowers are brownish, each with 4 spreading or reflexed calyx lobes 1 to 2 mm long, and 8 stamens. The pistillate flowers each have 4 short, usually erect calyx lobes. There are some hermaphroditic flowers, often produced as the last flowers of the season. The hypanthium becomes very fleshy after fertilization, forming an ellipsoid, berry-like fruit 4 to 6 mm long, which for purposes of this discussion will be called a berry (Figure 1). The fruits are usually reddish-orange and translucent. Ripening is from July through September, depending on elevation. Occasionally, a yellow-fruited phase, which has been called f. *xanthocarpa* Rehd., can be found (Hitchcock *et al.*, 1969). Synonyms for *S. canadensis* include *Lepargyraea canadensis* Greene, and *Elaeagnus canadensis* A. Nels., both of which occur occasionally in the earlier ethnobotanical literature.

Shepherdia canadensis grows in open woods and thickets, on rocky bluffs and along shorelines, from near sea level to elevations of 1200 m or more. It grows well in dry or alkaline positions and will tolerate the poorest of soils. It has been observed to grow on limestone soils, especially at the top of the Malahat Pass on Vancouver Island, which is pure limestone. It is locally common across British Columbia, but does not occur on the Queen Charlotte Islands (Calder and Taylor, 1968)[1], and is sporadic on Vancouver Island, on the Lower Mainland and along the immediate coastline. It ranges from Alaska, the Yukon and the District of Mackenzie east to Newfoundland, being present in all provinces of Canada except Prince Edward Island, and extends southwards to New England in the eastern United States and to New Mexico in the Southwest (Scoggan, 1979). A distribution map can be seen in Hultén (1968).

[1] Interestingly, however, a Skidegate myth recorded by Swanton (1905) noted that some soapberries made by some supernatural beings "looked like Peninsula Point soapberries, yet they were different". Peninsula Point is now called Spit Point and is at the southeast entrance to Skidegate Inlet. If soapberries did exist there, they may have been eliminated by the construction of the airport at Sandspit.

FIGURE 1. *Shepherdia canadensis* in fruit.

Food Use

The soft, fleshy berries have a decidedly bitter taste; it would be difficult to eat voluntarily more than one in its whole, raw state. The bitterness, and also the previously mentioned foaming properties, of the berries is due to the presence of saponins in relatively high quantities. One source (Havard, 1895) quotes a figure of 0.74% saponin in the berries. Saponins are natural detergents, which, when taken in excess, irritate the digestive system and cause nausea, vomiting and diarrhoea. They are found in trace quantities in many foods, including various types of beans, spinach, beets, alfalfa, and yams (Wertheim, 1974). Their toxicity is apparently not well known, but it would be fair to assume that soapberries contain enough saponins to be harmful if consumed in large, or even moderate, quantities. Fortunately, and perhaps quite logically, the form in which they are normally prepared, namely as a light whip or froth, does not allow one to consume inordinate amounts without feeling excessively bloated due to the ingestion of air.

Although there are many local variations, the basic method of harvesting and preparing soapberries for "Indian ice cream" is the same throughout the area of its use. The berries fall off the branches easily when ripe, and as they are too small and soft to pick by hand, the usual method of gathering them is to lay a mat or hold a large basket or bucket beneath a berry-laden branch and, holding the end of the branch firmly, flail the branch near its base with a stick. The Kootenay Indian name for the berries translates as 'flailed', or 'thrashed', after this harvesting method (Hart *et al.*, 1980). This process is continued, the harvester moving from bush to bush, until as many berries as are required have been harvested. In a good year, one can pick several litres an hour by this method, but, as with many berry crops, the soapberries vary in abundance from year to year. The berries are then taken home and cleaned of leaves, twigs and other foreign matter, sometimes by rolling the harvest down a wet, slanting board. The leaves and twigs tend to stick to the board, and the berries roll down into a container below.

The harvested berries can be used fresh to make "Indian ice cream", but usually most are further processed for storage. Traditionally, the berries were dried for storage, either being mashed and spread out in a cake to dry in the sun or over a slow fire, or simply being dried loose, like raisins. For the first method they were sometimes partially cooked to a jam-like consistency, using red-hot rocks, before being dried. In some areas, such as among the Interior Salish Thompson and Shuswap, the berries were dried directly on layers of matted "timbergrass" (as yet not positively identified, but possibly *Calamagrostis rubescens* Buckl.). The grass was then stored together with the dried berries and was later used in mixing and whipping them. The eater of the whip would simply discard any grass he encountered while eating (Palmer, 1975; Annie York, personal communication).

Nowadays, the berries are usually canned (Figure 2), using a recipe similar to the following:

Canned Soopolallie Berries

1. Wash and drain the berries.
2. Add a small amount of water but no sugar.
3. Boil the berries until they break and juice forms.
4. Pack hot into hot jars, leaving ½ inch head space.
5. Adjust caps.
6. Process pints 10 minutes and quarts 15 minutes.
   (from: Medical Services, Pacific Region, 1971)

Some people prefer to add sugar when canning the berries. Soapberries can also be easily frozen.

To make the "ice cream", about 2 tbsp. canned berries (or a slightly larger amount of fresh berries) are placed in a container with about 4 tbsp. (or more — up to 8 tbsp.) water, and the mixture is whipped vigorously until it attains the consistency of beaten egg whites (Figure 3). This quantity produces four to six servings. If dried berries are used, they are usually soaked overnight in cold water, or for a short while in warm water, to rehydrate them. Nowadays, sugar is added to the foam after it begins to stiffen; 4 to 8 tbsp. sugar would be used for the given quantities of berries and water, but according to one Kwakiutl woman, too much sugar spoils the flavor. A little lemon juice or vanilla is sometimes used by the modern chef. The writer has successfully used

FIGURE 2. Canned soapberries photographed at Massett, Queen Charlotte Islands. The soapberries were obtained from the Hazelton area.

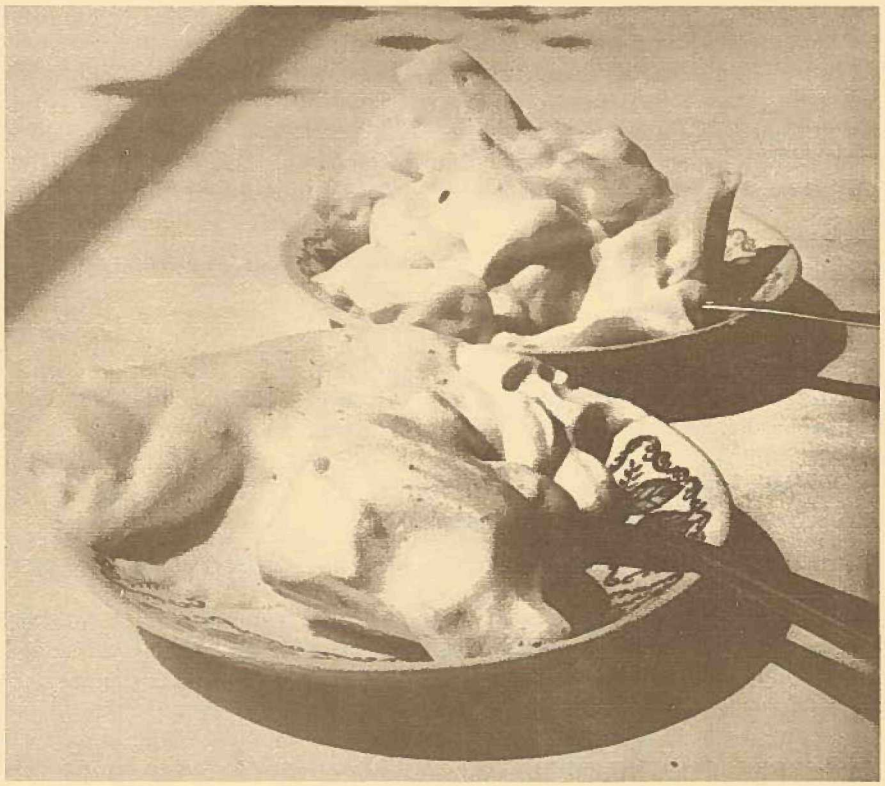


FIGURE 3. "Indian ice-cream" made from whipped soapberries.

unsweetened apple juice in place of water and sugar in making the "ice cream". Of course, originally, only indigenous sweeteners were used to temper the bitterness of the soapberries. Depending on the group and region, these consisted of such foods as Salal berries, Saskatoon berries, Hemlock cambium, Alder cambium, or edible Camas bulbs. Containers for whipping the foam varied from special cedarwood boxes, used by coastal groups, to coiled baskets of split cedar-root and vessels of birch-bark and spruce-bark, used in the interior (Turner, 1975, 1978; Turner *et al.*, 1980; Morice, 1893). Nowadays, a metal, glass, or porcelain bowl is the usual whip container.

The whipping can be accomplished using bare hands, and this method was used in the past in many areas. Whipping was also done, depending on the region, with Salal or Huckleberry branches, Cedar boughs, bunches of Maple or Thimbleberry leaves, bundles of the inner bark of Rocky Mountain Maple, or a loose mass of "timbergrass", dried with the berries, as described earlier. The latter would be swished around by hand. Some Interior Salish people used a mop-like beating implement consisting of a bunch of Rocky Mountain Maple bark tied on a stick (Turner, 1979). The Flathead, according to Blankinship (1905), tied the berries in a cloth bag and rubbed this in the water until foaming occurred. The Nespelem (Okanagan) reportedly used a corncob to beat the berries and felt that this was the proper implement (D. French, personal communication). The modern whipping implement is, of course, an egg beater or electric mixer (Turner, 1975, 1978).

One important restriction, known to all who make "Indian ice cream", is that at no time should the berries be allowed to come in contact with oil or grease. If they do, they will not foam. Hence, it is essential that hands, containers, and implements be perfectly clean and grease-free. Since grease often adheres to plastic, most people will not use plastic containers for harvesting or whipping the berries. Some people have also noted that tobacco odor and smoke of any kind will prevent the berries from foaming (Hart *et al.*, 1980). Despite this, the Bella Coola, at least, were known to eat the whip with salmon roe (Anderson, 1925; Turner, 1973). In any case, the foam does not hold for any length of time and will eventually revert to a liquid. A Haida woman from Masset told the story of a number of native women who were in the hospital at Prince Rupert. The nurses there had obtained some soapberries and wanted to surprise their patients with a real native treat. They whipped up the berries and served the "ice cream" into dishes, which were left on a tray for distribution. Hospital food service being what it is, however, by the time the women got their "treat", it was just so many scant servings of pinkish liquid.

The making of soapberry whip was invariably an occasion for festivity and merriment. Children and adults alike enjoyed playing with the foam, sometimes throwing it at each other and even turning bowls of it over each other's heads, as evidenced by a word in the Haida vocabulary meaning 'smeared with soapberries'. Today, "Indian ice cream" is often made at parties and family gatherings among native communities. Traditionally, it was often served at large feasts and potlatches. Special bowls and eating implements were associated with its use. The Southern Okanagan Interior Salish, for example, eat it with special horn spoons, and the Mainland Halkomelem Coast Salish, and some other coastal groups, with special paddle-like spoons (Turner *et al.*, 1980; Brent Galloway, personal communication) (Figure 4). Among the Thompson, each member of a family had his own individual soapberry spoon, which was carefully washed and hung up after every use (Annie York, personal communication).

Eating large quantities of soapberry foam can cause one discomfort due to the ingestion of so much air. This is to some extent alleviated by drinking water, as evidenced by the following quotation: "Indians will sup of this until they are ready to burst, then waddle to the water, the drinking of which seems to allay the distension." (Brown, 1868).

As well as being used as a whipped confection, the berries were also boiled down to make juice. This was used, at least by the Lillooet and Shuswap, as a type of concentrate to make a refreshing "lemonade" drink. The extracted juice was canned, and later mixed with sugar and water. This beverage was, at least as of ten years ago, a common sight in a household refrigerator and was especially popular in the summertime (cf. Palmer, 1975).

Chamberlain (1892) noted that the Kootenay made a tea beverage from soapberry leaves. There are, in addition, some reports of the berries being fermented to make an alcoholic beverage:

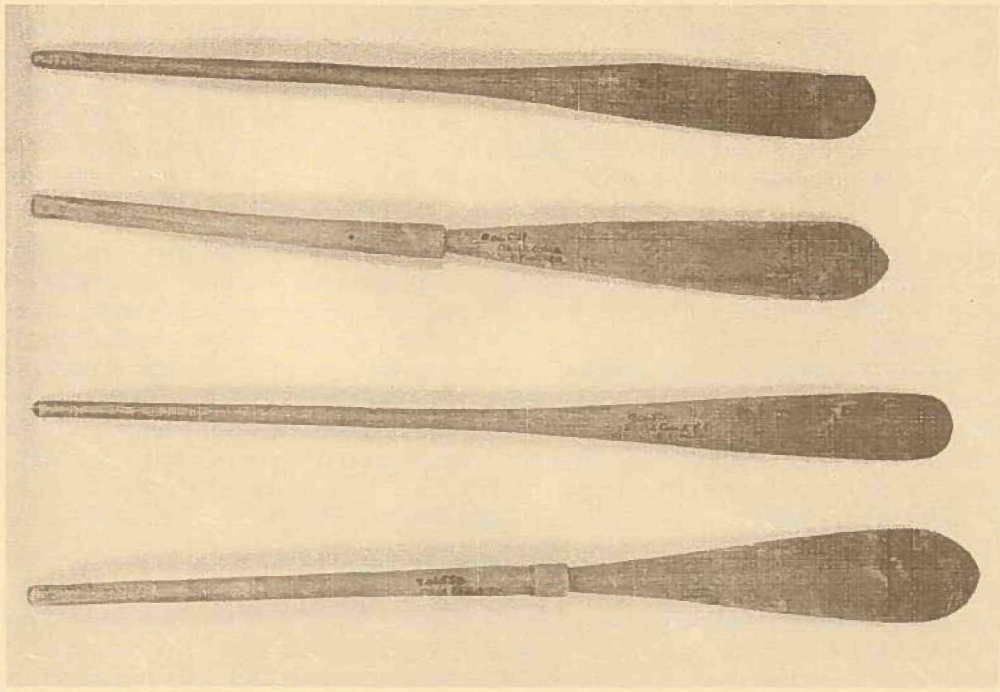


FIGURE 4. Bella Coola soapberry spoons, averaging about 45 cm in length (now in the Smithsonian Institution, Washington, D.C.). The designs on these spoons were burned into the wood. Other soapberry spoons had elaborate designs carved on them. Examples of this latter type, of Haida design, may be seen in the Ethnology Gallery at the British Columbia Provincial Museum in Victoria.

" . . . the berries were allowed to ferment, and a highly intoxicating liquor was the result, but the effect was not nearly so lasting or so injurious as bad whiskey." (Wilson, 1916).

Little is known of the nutritional value of soapberries. Sam Mitchell, a Lillooet Indian, was told by a non-Indian pharmacist that soapberries are rich in iron, but the original source of this information is unknown. In one study (Hamer *et al.*, 1977), a sample of the ripe fruits was analyzed during the course of research on grizzly bear foods (see Appendix 1), and was found to contain comparatively high protein and fat components, but it seems likely that these were concentrated in the seeds, which would be largely indigestible to humans. The berries were described as "an important forage item [for grizzlies] in late summer" (op. cit.).

The berries are apparently eaten by other forms of wildlife besides grizzly bears. According to Martin *et al.* (1961), fruits of the genus *Shepherdia* have been reported as food for quail, some songbirds, black bear, chipmunk, and ground squirrel, although the actual species of fruit was not indicated. In addition, in at least one study (McLean and Tisdale, 1960), soapberry plants were included as potential forage for browsing livestock, although in another study, they were found to be unpalatable to deer (Gastler *et al.*, 1951). In both studies, chemical analyses of the shrub were done, and the results are given in Appendix 1.

Medicinal Uses

Shepherdia canadensis had, and still has, a wide variety of medicinal applications amongst Native peoples. Unfortunately, the chemical composition of this plant (other than the basic nutrients) has not been well studied, so that it is difficult to ascertain the possible effectiveness of the various herbal uses. Certainly, the saponins must play a medicinal role, and perhaps the carotene and mineral content (see Appendix 1) have some healing effects in some cases.

The juice from the berries, used, as previously noted, in some areas as a beverage, was believed

as well to have medicinal value. Sam Mitchell was told that it was a good cure for acne and boils, and recalled that a non-Indian woman near Lillooet used it successfully to eliminate gallstones. The Shuswap believed that about half a cup of the juice was a good stomach tonic (Palmer, 1975). Among the Thompson, one herbal specialist, Annie York, maintained that the berries (presumably in their whipped form) could be eaten as a cure for "cancer of the stomach" and high blood pressure (see also Appendix 2). The Squamish considered soapberry whip a particularly good food for Indian dancers (Bouchard and Turner, 1976).

The many medicinal uses of the other parts of the plant are summarized in Appendix 2. Aside from the strictly physical medicinal applications listed in the appendix, the Northern Okanagan, at least, used soapberry in a more spiritual way. A person who is having bad luck, attributed to a spell placed on him by another person, can make a decoction of the branches of soapberry and wild raspberry and drink this to change his luck. The "medicine" must be made and taken in complete secrecy. It should be prepared at about 4:00 in the morning, and drunk at 9:00 or 10:00 in the following evening, and then every morning and evening thereafter for four to eight days. One can also bathe in the solution or wash his hair in it to give him similar protection. During the treatment, he should talk to the medicine, asking it to help cleanse him and bring him luck (Turner *et al.*, 1980). The fact that the soapberry was used in death rites by the Shuswap (Ray, 1942) may also be an indication of extra-natural properties attributed to it.

One Northern Okanagan man noted yet another use of soapberry. If a deer was wounded by a hunter, but escaped, the hunter would chew up some soapberry leaves and spit them out on a drop of the deer's blood, to cause the blood still in the deer to foam up like soapberries and thus stop the animal from running further (Turner *et al.*, 1980).

The Origin of the Use of Soapberry

Although the range of *Shepherdia canadensis* is transcontinental, the use of the fruit in making "Indian ice cream" is apparently largely confined to western North America and seems to be centred among the Salishan and Athapaskan peoples of British Columbia. Medicinal use of the plant, too, seems to predominate in this area, although medicinal uses are recorded for the Slave (Athapaskan) and Algonquin (Algonquian) of central and eastern Canada (see Appendix 2). "Indian ice cream" is made by the Tlingit and Interior Athapaskan in Alaska (Krause, 1956; Heller, 1966), and to some extent by the Cree and Stoney (Kerik, ca. 1975; Scott-Brown, 1977). The Blackfoot, Beaver, and Stoney ate the berries in times of scarcity, but apparently did not usually whip them (Hellson and Gadd, 1974; Kerik, ca. 1975; Scott-Brown, 1977). The southern extent of the use of the berries as food on the Northwest Coast appears to be Vancouver Island and the Olympic Peninsula in Washington (Turner, 1975; Gunther, 1973; Fleischer, 1980). In the western Interior the boundary appears to be around Yakima, Washington, since the Warm Springs Sahaptin and Wasco-Wishram peoples of Oregon knew them only from Yakima or further north (D. French, personal communication). In the central part of the continent, however, they may have been used as far south as Wyoming and Utah (Yanovsky, 1936; Scott-Brown, 1977)[2]. These areas of usage in western North America correspond roughly with the distribution of the species as shown by Hulten (1968). The various names for soapberry in western North American Indian languages are being compiled in a separate study, but a selected few are given in Appendix 3.

As well as indicating the extent of the use of soapberries, Indian names give evidence for the widespread trading of soapberries that took place in the past and still exists to some degree. A number of the Interior Salish names are identical (see Appendix 3), and many Coast Salish language names, as well as Bella Coola (a Salish isolate) and Nitinaht, Nootka, Southern Kwakiutl, and Carrier, are cognate forms. Linguistic evidence seems to point to the diffusion of the name, and probably, therefore, of the use of the food itself, from the Interior Salish to the Coast Salish

[2] These reports, however, appear to have been based on slight evidence. Chamberlin (1909, 1911) provides names for *S. canadensis* in the Ute and Gosiute languages, but in neither case is the use of the berries as food mentioned, although such use is noted specifically for other fruits. In the Gosiute language, one of the names given for *S. canadensis* is similar to or identical with the name for *Ceanothus velutinus* D. Dougl. ex Hook. (Snowbush), a shrub with dry, inedible fruits.

groups (Thompson *et al.*, 1974). The other language groups probably acquired the name and use of the food from their Salishan neighbors.

On the Queen Charlotte Islands, the Masset and Skidegate dialect forms are different (see Appendix 3), indicating possible different trading routes for the berries. The Skidegate form is cognate with that in the Tsimshian languages, and the Masset is apparently derived from a trade name used by Alaskan Indians [3]. Most modern Haida get their soapberries from the Hazelton area. According to McNeary (1976), soapberries were an important component in trade between the Niska and Athapaskan peoples, as they were very rare in the territory of the former, although they were considered "chief's food".

There are many other modern trading lines that may well indicate traditional trade routes. The Sechelt and Squamish usually obtain their supply from the Mount Currie Lillooet (Turner, 1972; Bouchard and Turner, 1976). The Southern Kwakiutl at Alert Bay get theirs from the Coast Salish at Comox and Parksville and from the Kwakiutl at Campbell River (Turner and Bell, 1973). The Nitinaht and Nootka apparently got theirs from the Halkomelem of Vancouver Island and the Fraser Valley (Turner and Efrat, 1980; J. Thomas, personal communication).

It is difficult to say when this food began to be traded in quantity. It is likely that its use was learned of, and adopted by, many Indian people during trips to the Fraser Valley in the late 1800's and early 1900's. Here, large numbers of Indian people from many different parts of the Province congregated as migrant farm and cannery workers, living in large camps and, no doubt, exchanging many ideas about foods, both traditional and modern. Annie York, a Thompson woman from Spuzzum, recalls that her people used to take dried cakes of soapberries down to the hop-yards at Agassiz and sell them for a very good price: "That is very expensive, that x̱ʷəsm". At the turn of the century, about half a dried soapberry cake, perhaps 2 cm by 30 cm by 30 cm, could be exchanged for one salmon. Alice Paul, a Hesquiat woman from the west coast of Vancouver Island, used to go to Chilliwack and Agassiz to work as a hop-picker. She and the other farm workers used to stay in shacks that were built in long rows. She said that three or four elderly Indian women used to walk up and down these rows, carrying baskets of fresh soapberries, and calling out "sup?ulali· — sup?ulali·!". The Native farm workers would then come out and buy the berries (Turner and Efrat, 1980). Almost all of the older Native people of southern British Columbia know the Chinook jargon name for soapberries, as well as the name in their own language. As of about 10 years ago, soapberries were being sold amongst Indian people for $6.00 per gallon.

The Kootenay may have acquired the use of "Indian ice cream" only recently; Chamberlain (1892) reports that soapberries were little used at that time, although they have been popular within the recent past. Nevertheless, at least some trading of soapberries, especially between the Interior and the Northwest Coast, must have occurred well back in pre-contact times.

In Bella Coola mythology, the origin of soapberry whip is recounted as follows:

> "Long, long ago, *Slhaxlhakwaylhx*, a mountain in Carrier country above Burnt Bridge, was a chief, possessing human characteristics. Buffalo berries flourished on his slopes, and he wanted to keep these for food for his guests. On one occasion, he invited all the animals and birds, including Raven, to feast and dance. His house was the interior of the Mountain and when all had assembled, he carefully closed every opening so that none of the berries could escape. Raven determined to obtain some of this food for the Bella Coola, and accordingly used his power to force one of the guests to go outside. As soon as a door was opened to let him out, Raven seized some of the whip and flew away, scattering drops of it in his flight. Berries grew wherever the drops fell, and since that time everybody has been able to make this luxury. *Slhaxlhakwaylhx* was very angry, but could do nothing." (McIlwraith, 1948).

[3] The origin of the Masset name (see Appendix 3) may be explained in the following passage by Gorman (1896): "I did not find this shrub on any of my excursions, but secured specimens of the pressed berries . . . [The berry is] gathered in large quantities by the natives, who press it into cakes about nine inches square and one inch thick; it is then dried and smoked and becomes an article of barter between the various tribes [of Alaska] under the name Hock-Thleigh." The Tlingit name, given as "hoklen" (Krause, 1956) appears to be linguistically related to this name, and hence to the Masset Haida name.

Conclusions

Few non-Indian people enjoy the bitter-sour taste of "Indian ice cream", even with the addition of sugar, the first time they taste it. Gorman (1896) described it as "... certainly the most villainous-tasting of any of the native foods which I have tried". However, as with many of the foods we enjoy, the taste can be acquired and most people find they like this dish after having tried it on several different occasions. Most western Native people, even today, relish this food and consider it a real treat, or dessert. Although the plant is widespread in British Columbia and across Canada and in parts of the United States, the crop yield varies markedly from year to year, and this factor seems to make the berries all the more desirable in places where they are used when they do occur. The chemical and pharmacological properties of the soapberry plant and the nutritional value of the berries are not well known; these factors definitely require further investigation.

This shrub is an attractive one, especially when in fruit, and its rich history of esculent and medicinal use should give it added appeal to the horticulturist. Unfortunately, like the yews (*Taxus* spp.) and Holly (*Ilex aquifolium*), it is dioecious, and therefore male and female plants must be grown together in order to produce fruits. Additionally, the fruits, when they do occur, may differ in abundance from year to year. Nevertheless, this plant can be considered one of our most intriguing native shrubs, and growing it would be well worth the trouble. *Shepherdia canadensis* is easily grown in a sunny open position in ordinary moist, well-drained soil, although it will tolerate even very poor soils, and will withstand extremes of cold and drought. The shrub may be propagated from seeds stratified as soon as they are ripe at 5°C for 60–90 days. The seed coat is hard, and acid treatment for 20–30 minutes prior to stratification is often beneficial. Alternatively, the seeds may be sown outside in the fall, thus allowing natural stratification. Root cuttings have also been successful. Known sexes are sometimes grafted on to seedlings of the species or on to *Elaeagnus* understock. It is hoped the information included here will stimulate interest and further research on this species.

Acknowledgements

I would like to thank the following people for their contributions to this paper: Randy Bouchard, of the British Columbia Indian Language Project, Victoria, and Dr. Robert T. Ogilvie, Botany Division, British Columbia Provincial Museum, Victoria, both of whom critically reviewed the manuscript and offered many useful suggestions; Dr. Roy L. Taylor, Botanical Garden, UBC, for editorial advice; Dr. Robert D. Levine, Linguistics Division, British Columbia Provincial Museum, who reviewed the table in Appendix 3; Dr. Harriet V. Kuhnlein, School of Home Economics, Human Nutrition Division, UBC; Dr. Neil Towers, Department of Botany, UBC; Dr. Laurence C. Thompson, Department of Linguistics, University of Hawaii, Honolulu; Dr. Brent Galloway, linguist, of Chilliwack, B.C.; Dr. David French, Department of Anthropology, Reed College, Portland; Joan Scott-Brown of Calgary; Jan Timmers and Jan van Eijk, linguists, of Holland; Henk Nater, linguist, of Ross River, Yukon Territory; Priscilla Russell Kari, of Fairbanks, Alaska; Annie York (Native Thompson speaker), of Spuzzum, B.C.; Sam Mitchell (Native Lillooet speaker), of Lillooet, B.C.; John Thomas (Native Nitinaht speaker) and Alice Paul (Native Hesquiat speaker), both of Victoria, B.C.; and, Mrs. Sylvia Taylor of the Botanical Garden, UBC for editorial advice and additional notes on propagation of Soapberry.

REFERENCES

Anderson, J.R. 1925. Trees and Shrubs, Food, Medicinal, and Poisonous Plants of British Columbia. Kings's Printers, Victoria, B.C.

Arnason, T., R.J. Hebda, and T. Johns. 1981. Use of Plants for Food and Medicine by the Native Peoples of Eastern Canada. Canad. J. Bot., in press.

Avis, W.S., C. Crate, P. Drysdale, D. Leechman, M.H. Scargill, and C.J. Lovell. 1967. A Dictionary of Canadianisms on Historical Principles. W.J. Gage Ltd., Toronto, Ont.

Black, M.J. 1980. Algonquin Ethnobotany: an Interpretation of Aboriginal Adaptation in South Western Quebec. National Museum of Man, Mercury Series, National Museums of Canada. In press.

Blankinship, J.W. 1905. Native Economic Plants of Montana. Montana Agric. Exp. Sta. Bull. No. 56. Bozeman, Mont.

Boas, F. 1902. Tsimshian Texts. Bur. Amer. Ethnology Bull. No. 27, Washington, D.C.

Brown, R. 1868. On the Vegetable Products Used by the Northwest American Indians, as Food and Medicine, in the Arts, and in Superstitious Rites. Trans. Bot. Soc. Edinburgh (1866-68) 9: 378-396.

Bouchard, R., and N.J. Turner. 1974. Shuswap Ethnobotany — Chase Dialect. Unpubl. Ms., B.C Indian Language Project, Victoria.

_____. 1976. Squamish Ethnobotany. Unpubl. Ms., B.C. Indian Language Project, Victoria.

Calder, J.A., and R.L. Taylor. 1968. Flora of the Queen Charlotte Islands, Part 1. Canada Department of Agriculture, Research Branch, Monograph No. 4, Ottawa, Ont.

Chamberlain, A.F. 1892. Report on the Kootenay Indians of Southeastern British Columbia. Eighth Report on the Northwestern Tribes of Canada. Brit. Assoc. Advancem. Sci., Edinburgh Meeting, pp. 5-71.

Chamberlin, R.V. 1909. Some Plant Names of the Ute Indians. Amer. Anthropologist, 11 (1): 27-40.

_____. 1911. The Ethnobotany of the Gosiute Indians of Utah. Amer. Anthropol. Assoc. Memoirs, 2 (pt. 5): 329-405.

Fleischer, M.S. 1980. The Ethnobotany of the Clallam Indians of Western Washington. Northw. Anthropol. Res. Notes, 14 (2): 192-210.

Gastler, F.G., A.L. Moxon, and W.T. McKean. 1951. Composition of Some Plants Eaten by Deer in the Black Hills of South Dakota. J. Wildlife Management, 15 (4): 352-357.

Gorman, M.W. 1896. Economic Botany of Southeastern Alaska. Pittonia III, Pt. 14, pp. 64-85.

Gunther, E. 1973. The Ethnobotany of Western Washington. Univ. of Wash. Publs. in Anthropol., Vol. 10, No. 1, University of Washington Press, Seattle.

Hamer, D., S. Herrero, and R.T. Ogilvie. 1977. Ecological Studies of the Banff National Park Grizzly Bear, Cuthead/Wigmore Region 1976. Report No. WR 34-76, Parks Canada, Western Region, Calgary, Alta.

Hart, J.A. 1976. Montana — Native Plants and Early Peoples. The Montana Historical Society and The Montana Bicentennial Administration, Helena, Mont.

Hart, J.A., N.J. Turner, and L.R. Morgan. 1980. The Ethnobotany of the Kootenai Indians of Western North America. Unpublished Ms., Botanical Museum, Harvard University, Cambridge, Mass.

Havard, V. 1895. Food Plants of the North American Indians. Bull. Torrey Bot. Club 22, pp. 98-123.

Heller, C.A. 1966. Wild Edible and Poisonous Plants of Alaska. Univ. Alaska Coop. Ext. Serv. Publ. No. 28. College, Alaska.

Hellson, J.C., and M. Gadd. 1974. Ethnobotany of the Blackfoot Indians. National Museum of Man, Mercury Series, Canadian Ethnology Service Paper No. 19, National Museums of Canada, Ottawa.

Hindle, L., and B. Rigsby. 1973. A Short Practical Dictionary of the Gitksan Language. Northw. Anthropol. Res. Notes, 7 (1): (repr. - 60 pp.). Moscow, Idaho.

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1955-69. Vascular Plants of the Pacific Northwest. 5 pts. University of Washington Press, Seattle, Wa.

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, Ca.

Kari, Priscilla. 1977. Dena'ena K'et'una. Tanaiana Plantlore. Adult Literary Lab., Anchorage, Alaska.

Kerik, J. ca. 1975. Living with the Land: Use of Plants by the Native Peoples of Alberta. Circulating Exhibits Program, Provincial Museum of Alberta, Edmonton, Alta.

Krause, A. 1956. The Tlingit Indians. Translated by E. Gunther. University of Washington Press, Seattle, Wa.

'Ksan, People of. 1980. Gathering what the Great Nature provided. Douglas & McIntyre, Vancouver, B.C. (Note: A photograph of a Gitksan Chief eating soapberries appears on the front cover.)

Lamont, S.M. 1977. The Fisherman Lake Slave and Their Environment — a Story of Floral and Faunal Resources. Unpubl. MSc. Dissertation, University of Saskatchewan, Saskatoon.

Martin, A.C., H.S. Zim, and A.L. Nelson. 1961. American Wildlife and Plants. Dover Books Inc., New York, N.Y.

McIlwraith, T.F. 1948. The Bella Coola Indians. 2 Vols. University of Toronto Press, Toronto, Ont.

McLean, A., and E.W. Tisdale. 1960. Chemical Compositions of Native Forage Plants in British Columbia in Relation to Grazing Practices. Canad. J. Pl. Sci. 40: 405-423.

McNeary, S. 1976. Where Fire Came Down. Social and Economic Life of the Niska. Unpublished Ph.D. Thesis, Bryn Mawr College, Bryn Mawr, Pa.

Medical Services, Pacific Region. 1971. Indian Food. Health and Welfare Canada, Ottawa, Ont.

Medsger, O.P. 1972. Edible Wild Plants. Collier-Macmillan, Ltd., New York, N.Y.

Morice, Rev. Father A.G. 1893. Notes Archaeological, Industrial, and Sociological on the Western Dénés. Trans. Roy. Canad. Inst., Session 1892-93.

Palmer, G. 1975. Shuswap Indian Ethnobotany. Syesis, 8: 29-81.

Ray, V.F. 1942. Culture Element Distribution. XXII Plateau. Anthropol. Records, 8 (2): 99-262.

Saunders, C.F. 1976. Edible and Useful Wild Plants of the United States and Canada. Dover Books Inc., New York. (Orig. pub. 1934).

Scoggan, H.J. 1978-79. Flora of Canada. 4 pts. Publications in Botany No. 7. National Museum of Natural Sciences, National Museums of Canada, Ottawa, Ont.

Scott-Brown, J. 1977. The Ethnobotany of the Stoney Indians. Chapter V. Unpubl. M.A. Thesis, University of Calgary, Calgary, Alta.

Smith, H.I. 1929. Materia Medica of the Bella Coola and Neighbouring Tribes of British Columbia. Nat. Mus. Canada. Ann. Report for 1927. Bull. No. 56: 47-68.

Steedman, E.V., Ed. 1930. The Ethnobotany of the Thompson Indians of British Columbia (based on the notes of J. Teit). *In* 45th Annual Report, Bureau of American Ethnology, 1927-28, pp. 441-552.

Swanton, J. 1905. Contributions to the Ethnology of the Haida. Amer. Mus. Nat. Hist., Memoir No. 8, Pt. 1; Jesup North Pacific Expedition, Vol. 5, Pt. 1.

Thompson, L.C., M.T. Thompson, and B.S. Efrat. 1974. Some Phonological Developments in Straits Salish. Int. J. Amer. Linguistics, 40 (3): 182-196.

Turner, N.J. 1972a. Sechelt Plant Names. Unpublished Ms., Botanical Garden, University of British Columbia, Vancouver.

_____. 1972b. Lillooet Ethnobotany (Fountain Dialect). Unpublished Ms., Botanical Garden, University of British Columbia, Vancouver.

_____. 1973. The Ethnobotany of the Bella Coola Indians of British Columbia. Syesis, 6: 193-220.

_____. 1975. Food Plants of British Columbia Indians. Pt. 1. Coastal Peoples. Handbook No. 34, British Columbia Provincial Museum, Victoria, B.C.

_____. 1978. Food Plants of British Columbia Indians. Pt. 2. Interior Peoples. Handbook No. 36, British Columbia Provincial Museum, Victoria, B.C.

_____. 1979. Plants in British Columbia Indian Technology. Handbook No. 38, British Columbia Provincial Museum, Victoria, B.C.

_____ and M.A.M. Bell. 1973. The Ethnobotany of the Southern Kwakiutl Indians of British Columbia. Econ. Bot., 27 (3): 257-310.

_____, R. Bouchard, and D.I.D. Kennedy. 1980. Ethnobotany of the Okanagan-Colville Indians of British Columbia and Washington. No. 21, Occasional Paper Series, British Columbia Provincial Museum, Victoria, B.C.

_____ and B.S. Efrat. 1980. The Ethnobotany of the Hesquiat Indians of Vancouver Island. Unpublished Ms., British Columbia Provincial Museum, Victoria, B.C.

Wertheim, A.H. 1974. Natural Poisons in Natural Foods. Lyle Stuart Inc., Secaucus, N.J.

Wilson, T. 1916. The Use of Wild Plants as Food by Indians. Ottawa Naturalist, 30: 17-21.

Yanovsky, E. 1936. Food Plants of the North American Indians. U.S.D.A., Misc. Publ. No. 237, Washington, D.C.

APPENDIX 1. Composition Data for *Shepherdia canadensis**

	Hamer *et al.* 1977	McLean & Tisdale 1960	McLean & Tisdale 1960	Gastler *et al.* 1951	Gastler *et al.* 1951	Gastler *et al.* 1951	Gastler *et al.* 1951	Gastler *et al.* 1951
Region of Study	Banff Nat. Park Alta.	Southern Interior B.C.	Southern Interior B.C.	South Dakota	South Dakota	South Dakota	South Dakota	South Dakota
Part Analyzed	ripe fruits[1]	flowers	seed[2]	twigs	twigs	twigs	twigs	leaves
Collection Date	—	Jul. 7	Jul. 24	Oct. 1	Jan. 1	Apr. 1	Jul. 1	Jul. 1
No. of Samples	1	2	3	1	1	1	1	1
Moisture Content	dried	dried	dried	47.7	41.9	37.6	64.5	73.1
Crude Protein	12.9	17.8	13.4	8.1	9.6	9.5	4.8	5.8
Crude Fibre	11.4	14.1	16.5	10.9	13.2	14.9	10.0	4.2
Crude Fat	3.4	—	—	1.7	1.5	1.4	0.9	1.6
Carotene	—	—	—	16.0	10.5	15.4	21.0	111.2
Total Ash	—	4.5	4.5	1.2	0.9	1.3	0.8	1.7
Nitrate	0.5	—	—	—	—	—	—	—
N/free Extract	—	—	—	30.4	33.0	35.4	19.1	13.1
Reducing Sugar	—	—	—	—	0.6	—	—	—
Total Sugar	—	—	—	—	2.1	—	—	—
Phosphorus	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Calcium	0.2	0.4	0.5	0.4	0.2	0.2	0.1	0.2
Iron	—	—	—	172.6	179.8	65.2	49.0	61.2
Manganese	—	—	—	12.9	16.2	12.4	7.0	16.0

* The composition figures given are percentages. In the first two studies, samples were oven-dried before analysis, whereas in the third, the figures are percentages of fresh weight. All figures are rounded off to one decimal.

[1] Presumably including seeds.

[2] The "seed" category in this study was a general one for many different reasons. It is likely that the fleshy part of the fruit in this case was also included in the analysis.

APPENDIX 2. Medicinal Uses of *Shepherdia canadensis* by North American Native Peoples.

Native Group	Part of Plant	Use	References
Okanagan-Colville	branches	decoction* taken as laxative, tonic, and stomach medicine	Turner *et al.*, 1980
Okanagan-Colville	branches	decoction of *Shepherdia, Amelanchier alnifolia*, and *Cornus stolonifera* branches drunk by women after childbirth as temporary contraceptive (to insure a 2-year gap between babies)	Turner *et al.*, 1980
Okanagan-Colville	branches	decoction used for hair shampoo	Turner *et al.*, 1980
Shuswap	roots	decoction drunk for childbirth and in death rites	Ray, 1942
Shuswap	branches, leaves	decoction (boiled slowly for 24 hours) drunk (dosage — 4 cups) after a day of fasting, as a purgative; used by young men in training	Palmer, 1975
Shuswap	branches	boiled with *Rhamnus purshianus* bark, and decoction drunk as a laxative	Bouchard and Turner, 1974
Thompson	roots	decoction drunk as physic or purgative	Steedman, 1930
Thompson	dried stems & leaves	strong decoction drunk as physic	Steedman, 1930
Thompson	bark	decoction used as stomach tonic	Steedman, 1930
Thompson	branches, berries	decoction taken (dosage — 1 cup) for "cancer of the stomach" and high blood pressure	Annie York, pers. comm.
Flathead	bark	decoction used as eyewash	Hart, 1976
Northern Carrier	roots	decoction taken internally as purgative	Smith, 1928
Gitksan	roots, leaves, & branches	decoction used as external wash for gonorrhoea	Smith, 1928
Gitksan	branches, leaves	decoction taken internally for cough	Smith, 1928
Gitksan	roots	boiled with twigs and bark of *Picea mariana*, 1 cup of strong decoction drunk 3 times daily for rheumatism	Smith, 1928
Slave (Fisherman Lake)	lower stem, root, & flowers (if present)	boiled in water about 1 hour; decoction rubbed on sore lips, rinsed through the mouth for sore tongue, especially used for babies	Lamont, 1977
Slave (Fisherman Lake)	lower stem, root, & flowers	decoction (boiled until water gets red) taken in dose of ¼–½ cup, any time, to reduce fever, especially in babies	Lamont, 1977
Slave (Fisherman Lake)	stems	decoction drunk in small amounts to relieve constipation	Lamont, 1977
Kootenay	bark	strained decoction used as an eyewash	Hart *et al.*, 1980
Algonquin	bark	medicinal tea	Black, 1980 (as quoted in Arnason *et al.*, 1981)
Algonquin	bark	softened in hot water with *Prunus pensylvanica* bark and used for plaster casts.	Black, 1980 (as above)
Stoney	leaves, berries	infusion* used as a wash for sore face and acne	Scott-Brown, 1977
Stoney	bark	infusion used as skin wash	Scott-Brown, 1977
Stoney	roots	infusion used as "medicinal tea" for the whole body and used by women having amenorrhoea and diarrhoea	Scott-Brown, 1977
Stoney	leaves, bark & stems	decoction used as a purgative or stomach wash	Scott-Brown, 1977
Tanaina (Alaska)	stem, leaves	decoction drunk for tuberculosis	Kari, 1977
Tanaina (Alaska)	stem, leaves	decoction used to wash or soak cuts and swellings	Kari, 1977
Ahtna (Alaska)	bark, stem, leaves, & berries	decoction used to wash sores	P. Kari, pers. comm.

* A decoction is made by boiling the plant material in water, whereas an infusion is obtained by steeping in hot water (usually just boiled), as in making tea.

APPENDIX 3. Selected Indian Names for *Shepherdia canadensis* berries[1,2,3]

Language Group	Language	Soapberry name	Reference(s)
Interior Salish	Okanagan-Colville, Columbian, Spokane, and Coeur d'Alene	sx̣ʷúsəm	Thompson *et al*, 1974
	Thompson, and Lillooet	sx̣ʷúx̌səm	L. Thompson, pers. comm.; Turner, 1972b
	Shuswap (Chase dialect)	sx̣ʷúsa	Bouchard & Turner, 1974
Coast Salish	Halkomelem (Cowichan dialect)	sx̣ʷésəm	Thompson *et al*, 1974
	Squamish	sx̣ʷúsum	Bouchard & Turner, 1976
	Sechelt	sx̣ʷúx̌um	Turner, 1972a
	Comox	x̣ʷúsum	R. Bouchard, pers. comm.
Salish	Bella Coola	núx̣ʷski	Turner, 1973
Wakashan	Nitinaht	x̣ú·sim	J. Thomas, pers. comm.
	Nootka (Hesquiat dialect)	muq̓ʷáskn	Turner & Efrat, 1980
	Southern Kwakiutl	neq̓ʷeskén	Turner & Bell, 1973
Athapaskan	Carrier	nòwás	H. Nater, pers. comm.
Tsimshian	Coast Tsimshian, and Niska-Gitksan	ʔis	McNeary, 1976; Boas, 1902; Hindle & Rigsby, 1973
Haida	Haida (Skidegate dialect)	ʔa·s	R. Levine, pers. comm.
	Haida (Masset dialect)	ḥəgʷəƛ̓i·t	R. Levine, pers. comm.
Kootenay	Kootenay	kupaʔtɬ (lit. 'flailed')	Hart *et al*, 1980
Algonkian	Stoney	sâwîn ta hat̲ha (cf. sâwîn, 'butterfly')	Scott-Brown, 1977

[1] Most of the terms given, if not all, are synonymous for the berries and the whipped confection made from them. An exception may be the last term in the table — the Stoney name.

[2] In all (except possibly Stoney) of these languages, the name for the bush, if recognized, is derived by the addition of a "plant" suffix, such as "-ɬp" (Thompson), or "-apt" (Nitinaht), to the berry name. In Bella Coola, reduplication is involved, hence, the bush is "nuxʷsnúx̣ʷski-ɬp".

[3] The transcriptions used here and elsewhere in the paper (except for Stoney) have been standardized to a phonemic notation used by many Northwestern linguists.

A Brief Introduction to the Chinese Species of the Genus *Pseudotsuga*

CHU CHENGDE*

The genus *Pseudotsuga* contains up to eight species distributed in western North America (two species), western China, Japan and Formosa. There has been some uncertainty in western literature about the status of several of the Chinese species. These species are not well-known in cultivation, and it has been difficult to obtain sufficient material of some of them to allow verification of the original descriptions. Some authorities (for example, Bean, 1976) consider *P. wilsoniana* to be closely related to, and possibly not distinct from, *P. forrestii*. Dallimore and Jackson (1966) consider *P. forrestii* to be a synonym of *P. wilsoniana*, and state that it is probable that *P. gaussenii* is not specifically distinct from *P. wilsoniana*. In view of the lack of western knowledge about the Chinese species of *Pseudotsuga*, it is a pleasure to be able to publish this paper by Dr. Chu[1].

There are five species of the genus *Pseudotsuga* distributed in south China. All of them require a warm, humid climate, and occur south from the Yangtze River. They are less important in the practice of silviculture than other species, such as several species of Pine and Chinese Fir (*Cunninghamia lanceolata*), because of their slower growing habits. The key to these *Pseudotsuga* species (plus two introduced species) based on morphological characteristics is as follows:-

Leaves emarginate at the apex.

Leaves narrow, 3–5.5 cm long (rarely 2.5 cm); scales in the middle part of cone suborbicular or rhombi-orbicular, no hairs outside; central prong of the bract is 6–12 mm long, lateral ones acute; seed wing twice as long as seed, seed with its wing half as long as cone scale or slightly longer ..... *Pseudotsuga forrestii* Craib

Leaves shorter than 3 cm; central prong of cone bract 2–5 mm long, lateral ones obtuse or obtuse-acute; seed with its wing over half as long as cone scale or approaching to the upper margin of cone scale.

Leaves usually 2–3 cm long.

Scales in the middle part of cone fan-shaped, rhomboid, two lateral bases emarginate, with short hairs outside; seed wing usually longer than seed itself ..... *Pseudotsuga sinensis* Dode

Scales in the middle part of cone reniform or transversally elliptico-reniform; no hairs or nearly so outside; seed wing nearly as long as seed itself.

Stomata bands beneath leaves white, with conspicuous greenish margin; lateral basis of cone scale not emarginate ..... *Pseudotsuga gaussenii* Flous

* Dr. Chu Chengde, Teaching and Research Group of Dendrology, Department of Forestry, Nanking Technological College of Forest Products, Nanking.

[1] This paper was prepared in consultation with Dr. Oscar Sziklai of the Faculty of Forestry at UBC during Dr. Sziklai's recent trip to China.

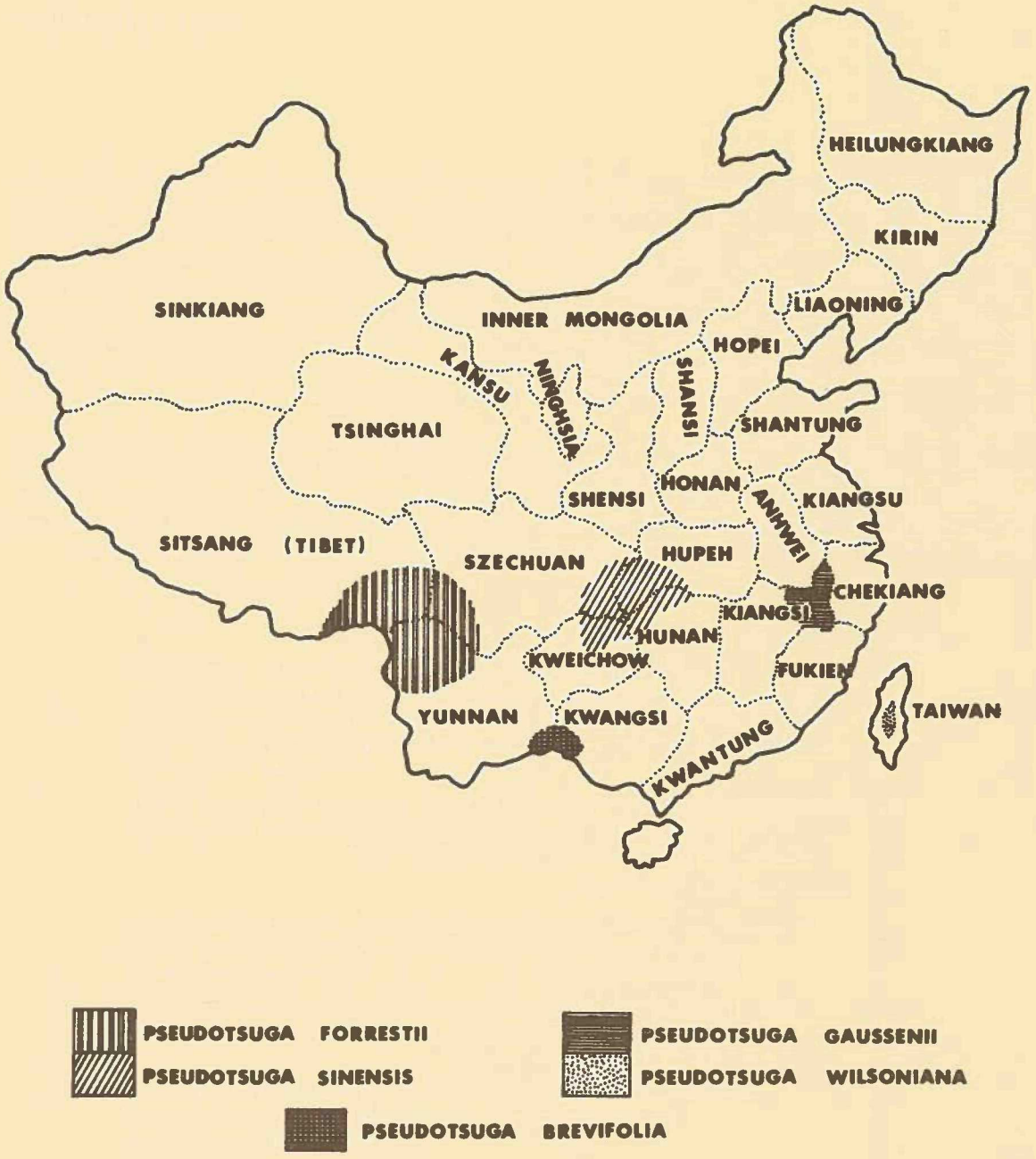


FIGURE 5. A map of China showing the distribution of the native species of *Pseudotsuga*.

Stomata bands beneath leaves greyish-green, without conspicuous greenish margin; lateral basis of cone scale emarginate . . . . . *Pseudotsuga wilsoniana* Hayata

Leaves usually 0.7–1.5 cm long; scale in the middle part of cone transversally elliptico-rhomboid, nearly no hairs outside; seed wing nearly as long as seed . . . . . *Pseudotsuga brevifolia* Cheng et L.K. Fu

Leaves obtuse or acute at apex, not emarginate.

Stomata bands beneath leaves greyish-green, without conspicuous greenish margin; cone about 8 cm long, length of cone scale larger than width, nearly rhomboid, bract longer than cone scale, central prong long-acuminate . . . . . *Pseudotsuga menziesii* (Mirb.) Franco

Stomata bands beneath leaves white, with conspicuous greenish margin; cone 12–15 cm long, length of cone scale shorter than width, rhombi-reniform, or transversally elliptico-reniform, bract nearly as long as cone scale, central lobe shorter . . . . . *Pseudotsuga macrocarpa* (Torr.) Mayr

Distribution of the Species

Pseudotsuga forrestii Craib, Lantsang Pseudotsuga or Mekong Pseudotsuga — Tree up to 40 m high and 80 cm in diameter. Endemic to China, situated in northwest Yunnan, southeast Tibet and southwest Sichuan at an elevation of 2400–3300 m, growing in the coniferous forests. Rarely cultivated.

Pseudotsuga sinensis Dode, Chinese Pseudotsuga — Large tree up to 50 m high and 1 m in diameter. Widely scattered in west Hupeh, northwest and south Hunan, northeast Kweichow and southeast Sichuan at an elevation of 800–1200 m. In southwest Sichuan, central and northeast Yunnan, it occurs at 1500–2800 m altitude. This species is often mixed with coniferous and broadleaved forests, and is also seldom cultivated.

Pseudotsuga gaussenii Flous, East China Pseudotsuga — Large tree up to 40 m high and 1 m in diameter. Only scattered in south Anhuei and west and south Shekiang at 600–1500 m altitude. The large trees are very few in natural forests, but are now cultivated in Mt. Huangshan Arboretum and Hangchow Botanical Garden. Plantations of this species under careful management grow much better, but it is difficult to propagate either by cuttings or seeds. For this reason, grafting is often used.

Pseudotsuga wilsoniana Hayata, Taiwan Pseudotsuga — Large tree up to 50 m high and 2 m in diameter. Native in the Central Sierra of Taiwan Province at 800–1500 m altitude.

Pseudotsuga brevifolia Cheng et L.K. Fu, Short Leaf Pseudotsuga — Limited distribution in Longchow and Jingxi counties of southwest Kwangsi. Also found in the Autonomous Region at about 1250 m altitude. Very rare.

Pseudotsuga menziesii (Mirb.) Franco, Douglas Fir — Introduced and cultivated in Lushan Botanical Garden in northern Kianshi Province, and grows rather slowly there.

Pseudotsuga macrocarpa (Torr.) Mayr, Big-cone Douglas Fir — Same as above.

Pseudotsuga japonica (Shiras.) Beissn., Japanese Douglas Fir — This has never been introduced to China.

REFERENCES

Bean, W.J. 1976. 8th ed. rev. Trees and Shrubs Hardy in the British Isles. Volume 3. N - Rh. John Murray (Publishers) Ltd., London, in collaboration with The Royal Horticultural Society.

Dallimore, W. and A.B. Jackson. 1966. 4th ed. rev. A Handbook of Coniferae and Gingkoaceae. Revised by S.G. Harrison. Edward Arnold (Publishers) Ltd., London.

The Genus *Fritillaria* in British Columbia*

Member of the Family Liliaceae

Fritillaria camschatcensis (L.) Ker-Gawler var. *camschatcensis*
Riceroot Fritillary

Fritillaria lanceolata Pursh
Chocolate Lily, Mission Bells

Fritillaria pudica (Pursh) K.P.J. Sprengel
Yellowbell Fritillary

Natural Distribution and Habitat

The genus *Fritillaria* consists of approximately 100 species in the Northern Hemisphere, distributed from North America through Asia and the Middle East to western Europe. In North America there are about 17 native species distributed through the west from southern California to Alaska and east to North and South Dakota. The three species occurring in Canada are limited to the provinces of British Columbia and Alberta. In British Columbia the species occupy different habitats with limited or no overlap in ecological preference.

Fritillaria camschatcensis var. *camschatcensis* is restricted to areas of high rainfall near the coast, and occurs in the Fraser River delta, Burrard Inlet, on the east and northwest coasts of Vancouver Island, the Queen Charlotte Islands, and northwards to Alaska. Its distribution eastward is restricted by the rain-shadowing Coast Range towards the south, where it reaches Squamish, Pemberton and Bella Coola, but in the north it extends much further east, as far as Babine Lake and Aleza Lake. In the south, the species ranges from sea level to relatively low elevations, and is found in moist grassy areas from coastal bluffs, dune edges, margins of inlets, and the upper edges of tidal flats. In the north, it sometimes occurs in mountain meadows up to 1500 m. Populations are often partly in the shade of shrubs, but this frequently appears to be due to invasion by the bushes, particularly on the upper margins of tidal flats.

Fritillaria lanceolata, the most widespread species in western North America, occurs from the coast and offshore islands of the Lower Mainland and eastern and central-southern Vancouver Island along the Fraser Valley hillsides through the Fraser Canyon as far east as the Okanagan Valley, and northward to the Lytton, Kamloops and Vernon areas. The species occurs from sea level up to 1550 m. It requires well-drained soils on open slopes, in aspen parkland or lightly wooded terrain, and requires a dry soil in summer for ripening the bulbs. The plant will grow on open rock ledges wherever the soil is deep enough to protect the bulbs from severe summer baking.

Fritillaria pudica requires drier habitats than either of the foregoing species. The distribution follows the low rainfall regions of mainland southern British Columbia, extending from the Manning Park and Princeton areas, north to Merritt and Kamloops, up the Okanagan Valley to Vernon, Lumby and Sicamous, and through Osoyoos and Rossland to the East Kootenays. It occurs from relatively low elevations (500 m) to as high as 2200 m in the Cathedral Mountains east of the Cascade Range. The species can be found in fine-particled soils on flat Ponderosa Pine grasslands or sagebrush slopes, or in open alpine meadows on free-draining slopes.

* By Christopher J. Marchant, The Botanical Garden, The University of British Columbia, Vancouver, B.C.

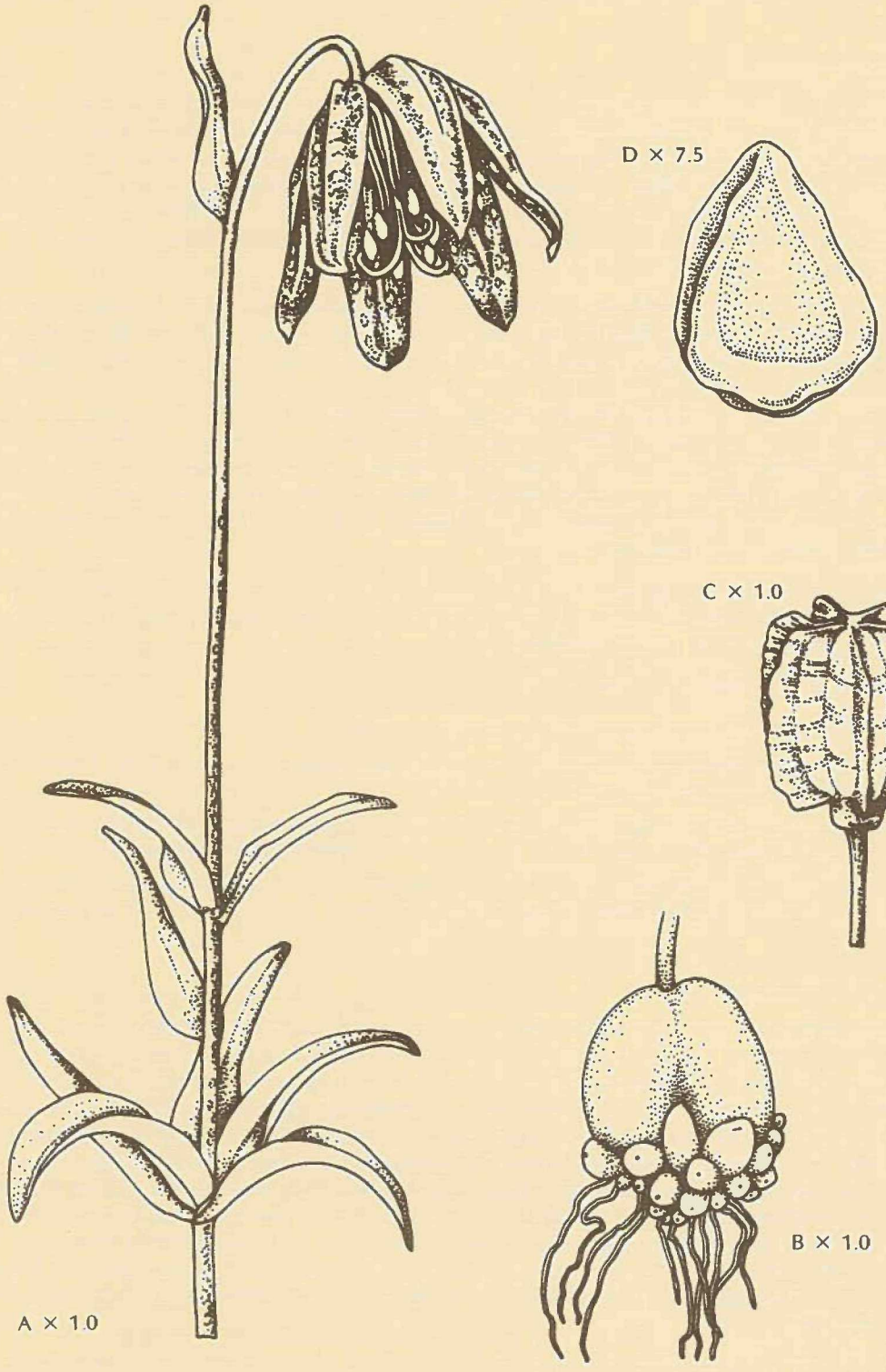


FIGURE 6. *Fritillaria lanceolata*. A. Habit, B. bulb and "rice-grains", C. seed capsule, D. seed.

Fritillaria atropurpurea Nuttall occurs in northern Idaho, but has never been reported from British Columbia.

Description of the Genus

Fritillaria is a genus of erect, herbaceous plants growing from perennial subterranean bulbs (corms). The bulbs of many North American species give rise to adventitious bulblets, resembling rice grains, on the lower surfaces. The stems and leaves are glabrous and often glaucous. The leaves are sessile, entire, lanceolate to linear, and arranged either alternately or in whorls. In most species not all mature bulbs flower every year. Instead, in the non-flowering year, each produces a solitary, very large, petiolate, ovate-lanceolate leaf, which allows re-growth of the depleted bulb to flowering size.

The stem is slender to moderately stout, and bears either a solitary flower or 2-several in a loose raceme on short pedicels, subtended by leafy bracts. The flowers are campanulate, usually nodding, yellow, brownish, greenish or purplish in the British Columbian species, often mottled in variable patterns, and are sweet-scented to foul-smelling (in fly-pollinated species). The flowers are hypogynous, perfect or staminate. The perianth segments (also known as tepals) are in two whorls of three, and bear distinct or indistinct nectaries on the inner surface above the base. The nectaries often secrete copious nectar. There are 6 stamens, inserted on the base of the perianth segments, and shorter than or almost equalling the perianth. The anthers are not versatile. The style is either entire with a discoid stigma, or trifid nearly to the base with narrow stigmatic tips. There are many ovules in a superior ovary.

The capsule is erect, membraneous, loculicidal, indistinctly 6-angled or sharply winged with a flattish top, and is dehiscent into three loculi. The seeds are many, flat, brownish, about 4 mm diameter, obovate in outline, and sometimes winged.

Key to the Species in British Columbia

Flowers yellow, fading to red or purplish; style one, stigma discoid ..... *F. pudica*

Flowers dark, brownish-purple, greenish, or sometimes pale yellow; styles deeply trifid; stamens about one-half length of perianth segments.

Perianth not mottled; filaments scarcely twice as long as anthers; nectar glands not obvious; capsule not winged ..... *F. camschatcensis* var. *camschatcensis*

Perianth yellow-mottled or -spotted; filaments usually more than twice as long as anthers; nectar glands prominent; capsule strongly winged ..... *F. lanceolata*

Description of the Species

Fritillaria camschatcensis var. *camschatcensis* — stems sturdy, unbranched, 20–50(–60) cm tall, from a bulb consisting of several large fleshy scales and numerous rice-grain bulblets. Leaves bright glossy green, entire, in 1–3 whorls of 5–10 each, lanceolate, 4–10 cm long, 0.5–2.5 cm wide, the veins prominent. Flowers (1)2–7(–8), spreading to nodding, narrowly campanulate but with spreading segments when fully open, foul-smelling (fly-pollinated), short-pedicelled, dark greenish-bronze to brownish (chocolate) purple, sometimes streaked or spotted with yellow and, rarely, pale greenish-yellow. The tepals are ridged lengthwise on the inner surface along the veins, oblong, elliptic to elliptic-ovate, 20–30 mm long, 7–12 mm broad, and each has an indistinct nectary above the base. The stamens are included in the perianth, and have slender filaments. The anthers are 3–5 mm long. The style is deeply cleft and has 3 slender, free segments, each 6–8 mm long, with narrow stigmatic tips. The capsule is cylindric-ovoid, 20–25(–35) mm long, and is not winged. Flowers April to July.

Fritillaria lanceolata — stems slender to stout, 15–100 cm tall, from a flattish bulb composed of a single or few large scales and numerous rice-grain bulblets. The leaves are dull green, entire, in 1–2 wide-spaced whorls of 3–6, linear to ovate-lanceolate, 5–15 cm long, and 0.3–2.5 cm broad (rarely, if ever, more than 10 times as long as broad). The veins are not visible on the surface. There are 1–7 flowers, often single, which are short- to medium-pedicelled, nodding, broadly cam-

panulate, and purplish with faintly to strongly brownish, greenish, or yellow mottling, rarely pale yellow. There is an unpleasant odor. The tepals are oblong-lanceolate to oblong, 20–30(–40) mm long, and each has a prominent elongate nectary on the inner surface above the base that produces copious nectar. The filaments are slender, and the anthers are 4–5 mm long. The styles are connate at the base with 3 free, slender segments, each 6–9 mm long, with stigmatic tips. The capsule is obovate to oblong, about 2 cm long, and is broadly winged on the angles. Flowers April to June.

Fritillaria pudica — stem moderately slender, 10–20(–30) cm tall from a bulb having a few fleshy scales and many rice-grain bulblets. There are 2–8 leaves on the lower half of the stem, opposite, whorled or alternate, linear to lanceolate, greyish-green, 3–6 cm long and 0.2–1.2 cm wide, and glabrous. Flowers 1–2, narrowly campanulate, nodding, bright yellow to orange, often purplish or brownish streaked near the base, and fading to brick red. The tepals are oblong-lanceolate to lanceolate, 12–26 mm long, 4–10 mm wide, and rounded. The stamens are half as long to as long as the corolla, and the anthers are 3–6 mm long. The style is single, about as long as the perianth, and the stigma is discoid. The capsule is cylindric-ovoid to ovoid to globose-ovoid, and 18–30 mm long. Flowering April to May.

Varieties and Ornamental Cultivars

There are no varieties of the species in British Columbia. However, there is a variant of *Fritillaria lanceolata* that occurs in coastal and near-coastal California. This variant is known as var. *tristulis* Grant in Jepson, and its color range parallels that of the species, but includes some very dark specimens. Studies have shown that it is a sterile triploid variant of the diploid species, with specimens ranging from relatively dwarf to very robust, and it apparently propagates entirely vegetatively by bulblets. Other varieties of *F. camschatcensis* are known from Japan.

Fritillaria camschatcensis cv. Black Knight is a cultivated form that is as close as possible to a black flower.

Propagation

The seeds of the British Columbian species of *Fritillaria* may be sown as soon as ripe in August in 10–12.5 cm clay pots kept in a frame or greenhouse. Alternatively, they may be stored until spring either dry or at 2–5°C in a moist mixture of peat, soil and vermiculite in a sealed plastic bag. They should be examined frequently for drying out and precocious germination. The seed mix should consist of equal parts of moss peat, John Innes Mix #3, very coarse sand, and small chips. The mix should be rather porous, as the seedlings are subject to damping off in a heavier soil.

The seedlings may be kept in the pots for two to three years before transplanting, although they may need several applications of a liquid fertilizer or a top dressing of bone meal during the third year. They may then be transplanted into larger pots or to their permanent location outside. Plants grown from seed will take 4–6 years to reach flowering size.

Fritillaria camschatcensis, F. lanceolata and *F. pudica* all produce small surface bulblets or "rice-grains" from their bulbs, and may be propagated from these. The bulblets should be separated from the bulbs in early summer after the foliage has died down, and planted immediately, being treated as seed. The plants will take 3–6 years to flower.

The native species, except perhaps *F. pudica*, will all gradually increase by offsets formed from the bulblets if left to naturalize. It may, therefore, be necessary to lift and divide the plants after the foliage has died down about every three years to prevent overcrowding. The bulblets may be separated and planted at this time.

Transplanting

Fritillaria bulbs are fleshy and fragile, therefore they should be handled with care. They are easily damaged and will shrivel if left out of the ground for any length of time. They are generally best left undisturbed, being lifted and divided only when they become so crowded that they produce fewer or smaller blossoms.

Fritillaria camschatcensis, F. lanceolata, and *F. pudica* all tend to occur in nature in small populations, and are fast disappearing from much of their range. Bulbs should not be taken from the wild, otherwise populations may be eliminated. *Fritillaria pudica* is becoming rare in the wild partly because of thoughtless collecting over much of its range, but mainly because of cultivation, irrigation and residential development in the dry Interior regions of British Columbia.

Conditions for Cultivation

The North American species, especially those native to California and the Pacific coast, are often considered difficult plants to cultivate. This may be because the conditions necessary for their growth are imperfectly understood. However, *Fritillaria camschatcensis* and *F. lanceolata* are among the easiest to grow in the whole genus. Cultivation can be successful in the ground, in clay pots of sufficient depth, and in raised beds with good drainage.

In general, all *Fritillaria* species do best in a well-drained, porous soil containing some humus and with a pH of 6.0–7.5. The bulbs should be planted in early fall, 7.5–10 cm deep and 7.5–10 cm apart. A light dusting of 5-1-5 fertilizer may be applied when new growth starts in the spring. The plants should be watered sparingly and the leaves allowed to grow for as long as possible after flowering. When the leaves begin to yellow, the plants should be allowed to gradually dry out and to remain dry until late fall. Pots should be plunged in a sand bed to keep the bulbs cool and prevent excessive desiccation.

Fritillaries are best left undisturbed where they can survive the winter outdoors, except in the rare event that they are becoming overcrowded. A cluster of rice-grain plants may develop in one spot if the main bulb should die. Overcrowded plants may be dug up in early summer after the foliage dies down, separated, and replanted immediately.

The bulbs sometimes rest for a year or more after planting or after flowering, producing only a vegetative leaf.

Fritillaria camschatcensis var. *camschatcensis* is hardy and grows well in a cool, rich soil that is moist in spring but well-drained and dryish in summer, and contains some leaf mold to give acidity and moisture retention. A peat bed is ideal. The species is usually at its best when grown in half-shade, especially during the hottest part of the day. It is probably not easy to cultivate in a hot climate area as it prefers cool situations.

Fritillaria lanceolata is the easiest of the native species and will grow successfully in a well-drained light soil that is rich in leaf mold. It will grow in sun or shade, but prefers shade during the hottest part of the day. This species is often grown in pots buried in the ground outside, the pots being lifted and dried out in the summer.

Fritillaria pudica is a hardy species that will grow well in a freely-drained, light, loose soil or sandy loam, rich in leaf mold, although it is the most difficult of the three native species. It will grow in situations from sun to considerable shade, but generally prefers sun for most of the day. The species is difficult to grow in regions with mild wet winters, preferring drier conditions with much cooler temperatures. It probably cannot be grown with success west of the Cascades unless the soil is well-drained, because of the high rainfall. However, specimens have bloomed every year since 1975 in the Native Garden component of UBC Botanical Garden. It is a fairly easy pot plant in the alpine house.

All three native species may be grown in pots or pans in an alpine house or frame if desired, although it is not usual to so grow *F. camschatcensis* or *F. lanceolata*. They should be planted in October in a gritty loam that contains some peat or leaf mold. The pots should then be placed in the open, preferably plunged in damp sand, for several weeks until the roots form, and then moved into a cold greenhouse or frame early in December. They should be watered when planted, then not until root growth starts, and sparingly in cold weather. The pots should be allowed to become almost dry between waterings. The bulbs should be allowed to gradually dry off after flowering, and the pots moved outside and plunged during the summer. Annual repotting is not necessary, but an annual top dressing of bone meal is beneficial. Repot every two or three years, using a well-drained compost that is not too rich in nitrogenous fertilizers.

Landscape Value

Fritillarias in general are unusual plants that are little known as garden plants. The local species are attractive in native gardens. Fritillarias may be planted in open woodland, naturalized in short grass, or planted in borders in filtered shade, in a rock garden or in an alpine house.

Fritillaria camschatcensis is perhaps one of the choicest (after the European *F. meleagris*) of the purple species. Alpine garden enthusiasts consider some specimens (especially cv. Black Knight) to be the nearest to a black flower that is available. This species may also be grown in a peat garden.

Fritillaria lanceolata is useful for growing in shady and sunny situations or among grass. It provides an interesting feature of unusual color when planted in clusters along a border or the edges of a shrubbery.

Fritillaria pudica is very hardy, but is more suitable for growing on a steep scree slope in a sunny rock garden or trough garden as it is small and low-growing. It may also be grown under the overhanging eaves of the house on the south side for maximum sun and drying out in summer and protection from excessive winter rainfall. This species is often grown in pots in an alpine house. William Robinson once described it as *"one of the most charming of hardy bulbs"*.

Availability

The species are available only from specialist nurseries in Oregon and Washington, and in Britain.

Ethnobotany

The rice-like bulblets of *Fritillaria camschatcensis* var. *camschatcensis* were eaten by all coastal Indian tribes of British Columbia, except the Salish of Vancouver Island and the Lower Mainland, and by the Interior Niska, Gitksan and, probably, the Carrier and Chilcotin tribes. The bulbs contain sugar and starch, and formed a staple food for many peoples, although they had a bitter taste, even after cooking. In most areas, the bulbs have not been eaten for at least 50 years, although some of the Niska still use them.

The Kwakiutl Indians dug the bulbs with a yew-wood spade and then spread them to sun-dry for about a week before storing them in cedar boxes, covered with their own leaves, in a cool corner of the house. For a ceremonial winter feast, the bulbs were steamed for about 30 minutes, grease was then poured over them, and they were eaten with spoons. For normal use, the bulbs were boiled for a short time and then mashed.

The Haidas dug the bulbs in July and either boiled them in water or roasted them in the embers of a fire. The Niska removed the bulblets, boiled them without salt, and then ate them with hemlock cambium cakes and eulachon grease. Sugar is now added to them.

The native peoples of the Kamchatka Peninsula apparently made puddings by mixing the berries of Crowberry (*Empetrum nigrum*) with the cooked bulbs of *F. camschatcensis*.

Fritillaria lanceolata bulbs were eaten by the Salish Indians of the southwestern coast of British Columbia, and by all the Interior Salish groups, except the Okanagan and Northern Shuswap. They were usually steamed in pits or boiled, and were said to be tender and delicate, resembling true rice, except for a slightly bitter taste. The Shuswap Indians also ate the stem portion of the plant.

Fritillaria pudica bulbs were eaten by the Thompson, Okanagan and Shuswap tribes when they were available, and also by some of the early explorers. They could be eaten raw, boiled, or steamed, and were sometimes stored for winter use by the Shuswap. They were said to have a slightly sweet taste if boiled when fresh, and to be very glutinous.

Diseases and Problems of Cultivation

Fritillarias in general are often considered difficult to cultivate, and many western North

American species are very difficult, possibly because the long drying out period in the summer and the soil types are hard to duplicate. The bulbs are delicate and the scales are easily damaged.

Slugs eat the bulbs and, sometimes, the stems and flowers, and birds may eat the flowers, leaves and, sometimes, the bulbs. *Fritillaria pudica* is the most susceptible to slugs.

Fritillaria camschatcensis var. *camschatcensis* is a popular food for animals in the wild. Rodents and deer love the bulbs of *F. lanceolata*, while small mammals eat those of *F. pudica*.

Toms (1964) has reported *Uromyces miurae* Syd., Rust, on *F. camschatcensis* var. *camschatcensis* and *F. lanceolata*, and *Botrytis cinerea* Pers. ex Fr., Blossom Blight, on *F. camschatcensis* var. *camschatcensis*.

Origin of the Name

The generic name *Fritillaria* is derived from the Latin *fritillus*, a dice-box, believed variously to be an allusion to the chequered markings on the flowers of some species or to the shape of the flower or of the seed capsule. It is believed to have been applied to *F. meleagris*, a European species, by its discoverer Noel Caperon, an apothecary of New Orleans in France. Bulbs of the plant were sent to the English herbalist John Gerard in 1575 by Jean Robin, a herbalist in Paris.

The specific and varietal name *camschatcensis* means 'from Kamchatka', a peninsula on the Siberian coast of Russia. The specific epithet *lanceolata* means 'lance-like' or 'spear-shaped', and *pudica* means 'bashful', possibly because of the drooping flowers.

The type locality for *Fritillaria camschatcensis* is "Habitat in Canada, Camschatca". The species was first described by Linnaeus as *Lilium camschatcensis* in 1753, possibly from a collection made in 1741 on Kayak Island in the Gulf of Alaska by Georg Wilhelm Steller. Steller (1709–1746) was a German naturalist who travelled to Siberia and Alaska with the expedition led by Vitus Jonassen Bering, who discovered Alaska. Steller was the first person to collect in Alaska. The plant was renamed *Fritillaria camschatcensis* in 1809 by John Ker Bellenden, also known prior to 1804 as John Gawler, a British botanist.

The type locality of *Fritillaria lanceolata* is "Brand Is., at foot of Cascades, Columbia River", where it was collected in 1806 by Meriwether Lewis. The locality is, in fact, often cited as "On the headwaters of the Missouri and Columbia", but the specimen in the Philadelphia Academy of Science apparently is from Brand (or Brant) Island at the foot of the Cascades. The Missouri location is outside the known range of the plant. The species was described by Fredrick Traugott Pursh (1774–1820) in 1814 in his book "Flora Americae Septentrionalis".

The type locality of *Fritillaria pudica* is "Plains of Columbia near the Kooskooskee" [Clearwater River, Idaho], where it was collected in 1806 by Meriwether Lewis. The locality is often cited as "On the headwaters of the Missouri", but this may be a mistake as the specimen in Philadelphia is from the Kooskooskee. The species was described as *Lilium pudicum* in 1814 by Pursh, but was renamed in 1825 by Kurt Polycarp Joachim Sprengel (1766–1833), a German botanist and physician.

Fritillaria pudica was introduced to cultivation in Great Britain by David Douglas, who collected bulbs in April, 1827, on the Columbia River near Fort Colville on the Kettle Falls.

There is an interesting legend as to why *Fritillaria* flowers hang down. The flowers of *F. imperialis*, Crown Imperial, were once white and turned upwards. It grew in the Garden of Gethsemane, but was too arrogant to bow its head in humility when Christ passed by. Christ turned and rebuked the plant, whereupon it hung its head, blushed a rosy-red, and tears came into its eyes. The white unshed "tears" can still be seen on the nectary at the base of the flower. The Crown Imperial is, in fact, one of the oldest known cultivated plants, being introduced into Europe in 1576 by Charles de l'Ecluse (Clusius), who had been employed by Emperor Maximilian II of Austria to collect bulbs. It is believed that Clusius sent specimens to Sir Francis Drake in 1580 on the latter's return from his circumnavigation of the world. Very shortly afterwards, the Crown Imperial could be found in every important garden in London.

While this article was in preparation, we received information that the name *Fritillaria lanceolata* has recently been declared invalid, and the correct name, *F. affinis*, is apparently in the process of publication. Unfortunately, there is no further information as yet.

REFERENCES

Abrams, L. 1940 (slightly revised). Illustrated Flora of the Pacific States, Washington, Oregon and California. Vol. I. Ophioglossaceae to Aristolochiaceae. Stanford University Press, Stanford, California.

Beck, C. 1953. Fritillaries. A Gardener's Introduction to the Genus Fritillaria. Faber and Faber Ltd., London.

Beetle, D.E. 1944. A monograph of the North American species of *Fritillaria*. Madrono 7:133-159.

Clark, L.J. 1973. Wild Flowers of British Columbia. Gray's Publishing Ltd., Sidney, B.C.

Genders, R. 1973. Bulbs. A Complete Handbook of Bulbs, Corms and Tubers. Robert Hales and Co., London.

Hitchcock, C.L. *et al*. 1969. Vascular Plants of the Pacific Northwest. Part 1. Vascular Cryptogams, Gymosperms and Monocotyledons. University of Washington Press, Seattle.

Hultén, E. 1968. Flora of Alaska and Neighboring Territories. Stanford University Press, Stanford, California.

Matthews, B. 1973. Dwarf Bulbs. B.T. Batsford, London, in association with The Royal Horticultural Society, London.

Miles, B. 1977. The Complete Guide to Bulbs. Octopus Books, London.

R.H.S. 1978-79. Lilies 1978-79 and Other Liliaceae. The Royal Horticultural Society, London.

Smith, A.W. 1972. A Gardener's Dictionary of Plant Names. Revised and enlarged by W.T. Stearn. Cassell and Co., Ltd., London.

Synge, P.M. 1971. 2nd ed. Collins Guide to Bulbs. Collins, London.

Taylor, R.L. and B. MacBryde. 1977. Vascular Plants of British Columbia: A descriptive resource inventory. Technical Bulletin No. 4, The Botanical Garden of the University of British Columbia. University of British Columbia Press, Vancouver, B.C.

Toms, H.N.W. 1964. Plant Diseases of Southern British Columbia. A Host Index. Reprinted from: Canadian Plant Dieseases Survey 46:143-225. Canada Department of Agriculture, Ottawa.

Turner, N.J. 1975. Food Plants of British Columbia Indians. Part 1. Coastal Peoples. Handbook #34. British Columbia Provincial Museum, Victoria.

_____ 1978. Food Plants of British Columbia Indians. Part 2. Interior Peoples. Handbook #36. British Columbia Provincial Museum, Victoria, B.C.

Botanical Garden News and Notes

Two members of The Botanical Garden staff received their North American Certificate in Gardening at the Western Regional Meeting of the American Association of Botanical Gardens and Arboreta (AABGA) in Seattle last fall. The North American Certificate in Gardening represents a successful completion of the written and practical examinations of the North American Diploma in Horticulture (NADH) Program plus review by the NADH Certification Committee, certifying competence as a professional gardener. The NADH Program, which is sponsored by the AABGA, is a four-step program leading to the Diploma, which is a recognition of superior proficiency in all facets of horticulture and possession of the skills and knowledge needed for management positions in horticultural institutions and industry. Both written and practical examinations were taken by Mr. Alex Downie and Mr. Kenneth Hadley to successfully complete Level 2 of the Certification Program.

FIGURE 7 (left). Mr. Alex Downie (right) receives his North American Certificate in Gardening from Mr. Joseph A. Witt, Curator of Plant Collections at the University of Washington Arboretum, at a ceremony held on October 8, 1980, at the Bloedel Reserve, Bainbridge Island, Washington.

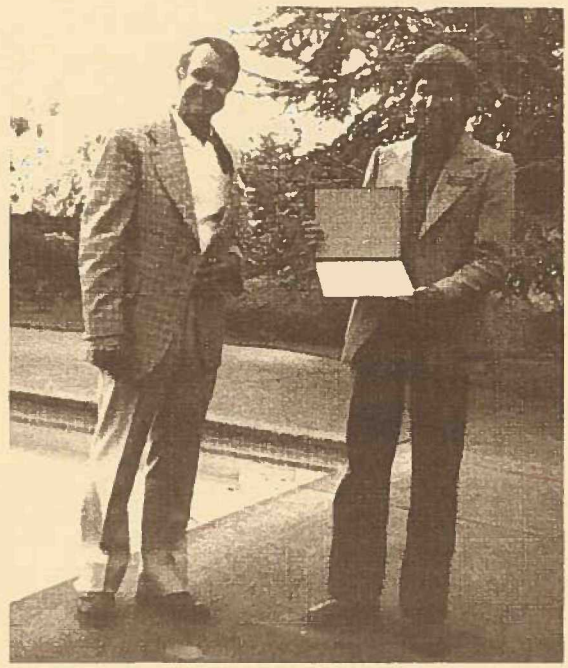


FIGURE 8 (right). Mr. Ken Hadley (right) receives his North American Certificate in Gardening from Mr. Witt at the same ceremony.

Cloud Flowers: Rhododendrons East and West

Cloud Flowers: Rhododendrons East and West is an exhibition developed by The Botanical Garden through the dedication of the Friends of the Garden and supported by an Exhibitions Assistance Programme grant from the National Museums of Canada. It will open on May 5, 1981, at the Fine Arts Gallery at UBC. The art work shown represents selected watercolour-based paintings from ten contemporary Canadian artists from the Vancouver, Victoria, Edmonton and Toronto areas. The subject of the show are *Rhododendron* species drawn to life-size. They represent a small selection of the nearly 400 species grown in the Asian Garden of the UBC Botanical Garden in Vancouver. The exhibition will travel to a number of Canadian centres and also to the Hunt Institute for Botanical Documentation in Pittsburgh, Pennsylvania, in 1982. A catalogue accompanying this exhibition can be obtained for a small cost by writing to The Botanical Garden Office.

Rhododendron tsangpoense var. *pruniflorum*
Marilyn Scott Noble
40.5 × 56 cm, watercolour 1980

Rhododendron smirnowii
Harriet Manore Carter
58.5 × 63.5 cm, watercolour 1980

Climatological Summary*

Data 1981	JANUARY	FEBRUARY	MARCH
Average maximum temperature	8.5°C	7.9°C	11.4°C
Average minimum temperature	3.6°C	2.7°C	4.8°C
Highest maximum temperature	16.4°C	12.4°C	16.9°C
Lowest minimum temperature	0.0°C	−5.7°C	0.6°C
Lowest grass minimum temperature	−2.7°C	−10.3°C	−4.0°C
Rainfall/no. days with rain	72.2 mm/25	135.0 mm/15	135.5 mm/13
Total rainfall since January 1, 1981	72.2 mm	207.2 mm	342.7 mm
Snowfall/no. days with snowfall	0	3.0 cm/1	0
Total snowfall since October 1, 1980	26.3 cm	29.3 cm	29.3 cm
Hours bright sunshine/possible	58.7/265.3	88.3/278.2	179.4/361.1
Ave. daily sunshine/no. days total overcast	1.9 hr/10	3.1 hr/9	5.8 hr/6

*Site: The University of British Columbia, Vancouver, B.C., Canada V6T 1W5
Position: lat. 49° 15′ 29″ N; long. 123° 14′ 58″ W. Elevation: 104.4 m

Sisyrinchium douglasii, Douglas' Blue-eyed-grass or Satinflower, is one of the most elegant early spring flowers of the Garry Oak — Arbutus association in British Columbia.

Editorial Board

Roy L. Taylor, Vancouver, British Columbia. (Editor)

Sylvia Taylor, Vancouver, British Columbia. (Associate Editor)

Fred R. Ganders, Vancouver, British Columbia. (Reproductive Biology)

Arthur R. Kruckeberg, Seattle, Washington. (Systematics, Ecology)

Gerald A. Mulligan, Ottawa, Ontario. (Cytology, Weed Science)

Frances Perry, Enfield, Middlesex, England. (Horticulture)

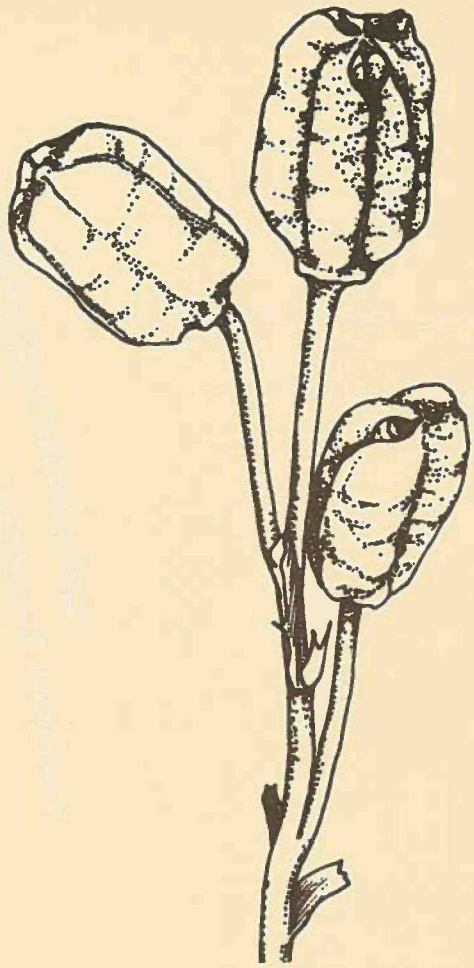
Douglas B.O. Savile, Ottawa, Ontario. (Mycology, Phytogeography)

Janet R. Stein, Vancouver, British Columbia. (Phycology)

Oscar Sziklai, Vancouver, British Columbia. (Forestry)

Nancy J. Turner, Victoria, British Columbia. (Ethnobotany)

Fritillaria camschatcensis var. *camschatcensis* capsules.



DAVIDSONIA

Volume 12 Number 1 *Spring 1981*

Contents

Indian Use of *Shepherdia canadensis*, Soapberry, in Western North America 1

A Brief Introduction to the Chinese Species of the Genus *Pseudotsuga* 15

The Genus *Fritillaria* in British Columbia 18

Botanical Garden News and Notes 26

Cloud Flowers: Rhododendrons East and West 27

Climatological Summary 28