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COW-PARSNIP (*HERACLEUM LANATUM* MICHX.): AN INDIGENOUS VEGETABLE OF NATIVE PEOPLE OF NORTHWESTERN NORTH AMERICA

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ABSTRACT.—Cow-parsnip (*Heracleum lanatum* Michx.), a green vegetable used universally by native people in western North America, is especially fascinating when considering its nutrient potential in native diets, its toxicity, and processing techniques developed by native people to transform the plant to a food by reducing its toxic components. Botanical characteristics, extent of use by native Indian groups, decline in use by the Nuxalk people during this century, and the contents of nutrients and furanocoumarins of the plant are reported.

INTRODUCTION

At least seven species of *Heracleum* have been reported to be edible (Hedrick 1972). The common North American cow-parsnip, *H. lanatum* Michx., is no exception, having been used as a green vegetable by native peoples throughout much of its range (Chesnut 1902; Yanovsky 1936; Hellson and Gadd 1974; Turner 1975, 1978; Heller 1976; Kari 1977; Lamont 1977; Turner *et al.* 1980; 'Ksan, People of 1980; Norton 1981; Arnason *et al.* 1981). In northwestern North America it was one of the most important of all indigenous green vegetables, in terms of the cultural and geographical extent of its use and the quantities consumed.

Heracleum species, in common with certain other plants in the same family (e.g., garden parsnip), contain furanocoumarins, compounds which, in the presence of light of 350-370 nm (i.e., the ultraviolet component of ordinary sunlight) form complexes with thymine residues of DNA in human epidermis when the plant is handled. This phototoxic effect results in blistering and hyperpigmentation of the skin (Camm *et al.* 1976; Mitchell and Rook 1979; Scheel 1973). Native people were certainly aware of the irritant properties of *Heracleum lanatum*, as shown by the caution with which they gathered and prepared it for use. Only the young leafstalks and budstalks were used as greens, and these were always carefully peeled before being eaten (Chesnut 1902; Lamont 1977; Kari 1977; Hart 1979; Turner *et al.* 1980; Norton 1981; Turner *et al.* 1983).

Despite the widespread use of cow-parsnip as food, its nutritional contribution to the traditional native diet and its potential toxicity have received little attention in published literature. Biochemical studies relating to its furanocoumarin content (Camm *et al.* 1976; Mitchell and Rook 1979) have concentrated on the plant as a whole, rather

than on its younger growth stages or edible portions as native people traditionally prepare them. The goals of this study were to provide a botanical description of *Heracleum lanatum*, summarize its past and present use as food in northwestern North America, assess its nutritional contribution and discuss the effect of its phototoxins in determining traditional preparation techniques.

BOTANICAL DESCRIPTION

Heracleum lanatum Michx., (Fig. 1) the common cow-parsnip, a robust perennial herb of the celery or umbel family (Apiaceae, or Umbelliferae), is the only one of 60 species of *Heracleum* native to North America. Growing from a stout taproot or cluster of fibrous roots, it can attain a height of 3 m at maturity but averages 1.5-2.0 m. The leaves are compound, in three segments, with broad, petiolate, coarsely toothed and palmately lobed leaflets usually 10-30 cm long. The terminal leaflet is usually as wide as it is long; the two lateral ones are narrower and often asymmetrical. The stems and lower leaf surfaces are usually sparsely to densely hairy. The leaf petioles are sheathing and conspicuously expanded. The inflorescence is large, of compound umbels on terminal and auxillary peduncles. The terminal umbel can exceed 20 cm across. The flowers are small and white. Flowering time is from June to August, depending on latitude and elevation. The dry, whitish fruits are oval, flattened, and winged (Hitchcock *et al.* 1969).

FIG. 1.—Cow-parsnip *(Heracleum lanatum)*, in flower.

The entire plant, especially when mature, has a strong, pungent odor, belying the mild, sweet flavor and aroma of the young peeled stalks.

Cow-parsnip grows, often in dense patches, along streambanks, and roadsides and in moist meadows, thickets, and clearings from sea level to subalpine habitats. It ranges from Alaska to Newfoundland, southwards to California, Arizona and Georgia. It also occurs in Siberia and the Kurile Islands (Hitchcock *et al.* 1969, Pt. 3:535), and the Aleutians. Hulten (1968) provides a distribution map.

EXTENT OF USE BY NATIVE INDIAN GROUPS

Cow-parsnip was enjoyed by virtually all native people throughout northwestern North America (Table 1). Today, it is often called "wild, or Indian rhubarb" ('Ksan, People 1980), or "Indian celery" (Norton 1981). It was gathered in spring, from early April to late June, depending on the area, but always before flowering had occurred (Fig. 2). Once the budding inflorescence, enclosed within a sheathing leafstalk, began to swell and elongate, the plant was no longer considered suitable for eating. It becomes "bitter, tough and no good" ('Ksan, People of 1980). Some native people have noted that plants growing in the shade remain at the edible stage longer into the season than those growing in the sun, and are also more tender (Turner *et al.* 1976, 1983).

Since the spring season was the only time that cow-parsnip and other green vegetables (including salmonberry and thimbleberry sprouts, fireweed shoots, and horsetail shoots) were available, they were much sought after and gathered in considerable quantities during this time. Gorman (1896), for example, notes that cow-parsnip was " . . . preeminently the fresh vegetable of the [Alaskan] natives, who gather and eat the succulent leaf-stalks and young stems in enormous quantities, the ***Kloochmen*** [Chinook jargon for women] and children gathering it most of the day when it is in the proper condition . . ." People often traveled long distances (50 miles or more) to get cow-parsnip shoots. For example, Sechelt people made special trips to Narrows Arm, Vancouver Bay, and many other places (Bouchard 1977). Within the last century some Okanagan-Colville families made the

Table 1.—Indian groups in British Columbia and Neighboring Areas Known to have eaten *Heracleum lanatum*.

Indian group (dialect) (Language Family)	Native name[a]	Reference
Tanaina (all dialects) (Athapaskan)	***ggis***	Kari, 1977:83
Tlingit (Athapaskan)	***yon-a-eth***	Gorman, 1896:76
Haida (Kaigani) (Haida)	***hlk'iit***	Norton, 1981:444
Haida (Masset, Skidegate) (Haida)	***ɬkit***	Turner and Levine, 1972a: 10, 1972b:10
Coast Tsimshian (Tsimshian)	? ***peyintz***	Gorman, 1896:76
Nass-Gitksan (Nisgha) (Tsimshian)	***hamook***	McNeary, 1974:40

Table 1.—Indian groups in British Columbia and Neighboring Areas Known to have eaten *Heracleum lanatum*. (continued)

Indian group (dialect) (Language Family)	Native name[a]	Reference
Nass-Gitksan (Gitksan) (Tsimshian)	***gatl'okwots*** (another name also exists)	People of 'Ksan, 1980:86
Nuxalk/Bella Coola (Salish)	***xwik'***	Turner, 1973:201; Nuxalk Food and Nutrition Program, 1984:36
Southern Kwakiutl (Wakashan)	ls: ***gistem*** bs: ***k'umaki'i***	Turner and Bell, 1973:276
Nootka (Hesquiat) (Wakashan)	ls: ***qiɬcu·p*** bs: ***huma·q*** pl: ***qiɬcmapt***	Turner and Efrat, 1982:60
Nootka (Manhousat) (Wakashan)	ls: ***kilhtsuup*** bs: ***humaak***	Turner, Ellis and Bouchard, 1976:7
Nitinaht (Wakashan)	ls: ***quistu·p*** bs: ***hu·ba·q*** pl: ***quistu·papt***	Turner et al., 1983:91
Makah (Wakashan)	***kīstop***	Gunther, 1973:42
Comox (Mainland) (Salish)	ls: ***ɬtútamishúma*** bs: ***mēn7úma*** pl: ***xākwu***	Bouchard, 1973:7; Bouchard, 1975:1,2
Sechelt (Salish)	***yālup***	Turner et al., 1972b:8
Halkomelem (Cowichan) (Salish)	***sa·q̓^{w}***	Turner and Bell, 1971:89
Halkomelem (Upriver) (Salish)	"sprout": ***sóqw'*** pl: ***yó:lē, yōle***	Galloway, 1979:6
Straits (Saanich)	***sa·q̓^{w}*** ("not peppery");	Turner and Bell, 1971:89
(Salish)	OR ***yōle7*** ("peppery")	Turner and Bouchard, 1972:6
Clallam (Salish)	***sx^{w}mek^{w}usnen*** ***[s(u)mkwoosung]***	Fleischer, 1980:209; Turner, 1974:8
Squamish (Salish)	***yúla7***	Bouchard and Turner, 1976:65
Quinault (Salish)	***waká*** ("kills the pain")	Gunther, 1973:42

Table 1.—Indian groups in British Columbia and Neighboring Areas Known to have eaten *Heracleum lanatum*. (continued)

Indian group (dialect) (Language Family)	Native name[a]	Reference
Quileute (Chimakuan)	***tl'ó·pit***	Gunther, 1973:52
Lillooet (Pemberton) (Salish)	ls: ***nk̲ayxwxn*** ('man-foot') bs: ***yāk̲saxn*** ('woman-foot') pl: ***hákwa7***	Turner et al., 1972a:12
Lillooet (Fraser River) (Salish)	ls, pl: same as above; bs: ***nmulhatsxn*** ('woman-foot')	Turner et al., 1972a:12
Thompson (Salish)	***hēk^{w}uɬ***	Turner et al., 1984
Shuswap (Salish)	***x̲wtalhp***	Palmer, 1975:56
Okanagan-Colville (Salish)	***x̲wux̲wtílhp***	Turner et al., 1980:62
Flathead-Kalispel	***hoxtáɬp; x̲wte***	Teit, 1973:344; Hart, 1979: 293
Coeur d'Alene (Salish)	***x̣ó̓x̣ɬp***	Teit, 1973:91
Chilcotin (Athapaskan)	***sol***	Tyhurst, pers. comm., 1975.
Carrier (Athapaskan)	***gwas***	Carrier Linguistic Committee, 1973:82
Slave (Athapaskan)	no name given, but note of use	Honigmann, 1946:35
Kootenay (Kootenay)	***wumɬaɬ***	Hart et al., 1981:46
Stoney (Algonkian)	***yazobi***	Scott-Brown, 1977:71
Blackfoot (Algonkian)	***po-kint-somo***	Johnston, 1970:316

[a]Orthographies used are those given in original references. Note: ls = leafstalks; bs = budstalks; pl = whole plant; unless otherwise indicated, name refers to whole plant.

FIG. 2.—Cow-parsnip at young (pre-flowering) stage, when stalks are harvested for eating.

gathering of cow-parsnip an occasion for Sunday picnics (Turner *et al.* 1980). Some native people have noted, and the authors have also observed, that certain cow-parsnip populations yield better-tasting shoots than others. Formerly, people had special patches where they went each year to get the best shoots (Turner and Efrat 1982; McNeary 1974). Furthermore, some people felt that the local plants "need to be picked, as it is remembered that when the plants were regularly harvested they grew much taller" (Norton 1981).

Almost all native people distinguished between the leafstalks (petioles) and inflorescence bud stems of cow-parsnip when gathering and eating the plants. Although both were considered edible, they were treated almost as two different foods. Usually the distinction was marked linguistically, the two types being called by different, linguistically unrelated names (Table 1). Some groups such as Lillooet, Thompson and Mainland Comox, made a "sexual" differentiation: the petioles were associated with females [e.g., in Lillooet, "woman stalks" (lit. 'woman-foot')], and the budstems were associated with males [cf. Lillooet, "man stalks" (lit. 'man-foot')(Turner *et al.* 1972a)]. This type of differentiation is also reported for more eastern groups, such as Blackfoot (Johnston 1970), Stoney (Scott-Brown 1977), and Fisherman Lake Slave (Lamont 1977). The budstalks are sometimes described as having a "lump" on the side (referring to the inflorescence bud encased in its leaf sheath) (Bouchard 1975).

Native people invariably warn one that if all the outer skin (epidermis plus fibrous tissue underlying the epidermal cells) is not removed, it will cause one to get an "itchy mouth" (Bouchard 1977), or sores and discoloration of the skin around the mouth (Turner *et al.* 1976; Turner 1971; Turner *et al.* 1983), or "burned" mouth and skin (Kari 1977; Norton 1981). A Manhousat man noted that he always stuck the stalks with a stick before gathering them (Turner *et al.* 1976). Apparently this was to release the irritant particles from the outer skin of the plant. The authors, on following this procedure, noticed a fine cloud of dust-like particles fell from the leaves and stalks when the plants were struck. Further investigation would be required to determine if this dust does indeed contain high concentrations of furanocoumarins.

Methods of peeling were different for petioles and budstalks. Petioles were often split longitudinally with the thumbnail, and the inner edible portion pulled from the fibrous outer skin by bending it backwards near the bottom until it broke, then grasping the broken end and pulling it downwards. Sometimes, the fibrous part was held in the teeth while this operation was carried out, but care was taken never to let it touch the lips (Turner *et al.* 1972a). The main inflorescence stalks, which are cylindrical with a large central hollow space, were broken off and peeled by separating the skin from the edible portion at the bottom and pulling it upwards in several pieces (Fig. 3). Sometimes the stems were twisted as they were peeled, facilitating the removal of the skin (Turner *et al.* 1976).

After peeling cow-parsnip was usually eaten raw (Turner 1971; Turner and Bell 1971; Turner *et al.* 1972b; Turner and Bell 1973; Turner *et al.* 1976; Turner and Efrat 1982; Bouchard 1973; Galloway 1979; Kari 1977; Heller 1976; 'Ksan, People of 1980; and R. Tyhurst, pers. comm., unpublished notes on Chilcotin plant names). Sometimes, as noted by Morice (1893), the stalks were first heated in the fire before being peeled: "It (cow-parsnip) is often used while fresh and unprepared save by the stripping of its fibrous envelope. But if a fire is at hand, a Carrier (Indian) will generally treat it to a slight roasting through the flames previously to peeling off the stalk" (Morice 1893). Other groups that sometimes roasted the stalks included the Gitksan, Kootenay, Blackfoot, and Stoney ('Ksan, People of 1980; Hart *et al.* 1981; Johnston 1970; Scott-Brown 1977). The stalks could also be cooked by boiling (Turner and Bell 1971; Turner *et al.* 1972a; Kari 1977; 'Ksan, People of 1980). Kari (1977) notes that the Tanaina chopped, then cooked them in stew or soup. Traditionally, the stalks, like many vegetable foods, were served with a dressing of seal or whale oil (Gunther 1973; Turner *et al.* 1983; Heller 1976) or ooligan (eulachon) grease (Turner 1971, 1973; Kari 1977; Nuxalk Food and Nutrition Program Staff 1984). More recently, the stalks have been dipped in sugar or honey, with or without the oil or grease (Turner 1971; Turner *et al.* 1983; McNeary 1974). Some people stew them with sugar to make a dessert (Scott-Brown 1977). Others serve them with fried onions and salt pork ('Ksan, People of 1980).

FIG. 3.—Cow-parsnip budstalks, partially peeled.

Although cow-parsnip stalks were usually eaten fresh, at least some groups also stored them for later use. The Kaigani Haida, for example, picked and peeled the stems, then packed them away in grease for winter. Norton (1981) notes that they were "stored in quantity." The Gitksan dried the stems for storage: 'Wild rhubarb was split into strips before the end of June and air dried in the sun. 'We used to store it away in boxes for winter or just left it in bundles in our house. I can remember seeing it hanging over fences and verandah rails to dry.' " ('Ksan, People of 1980). Some contemporary Lillooet people freeze the peeled stalks for storage (Turner *et al.* 1972a). Today some people of the Pemberton Lillooet in Mount Currie, B.C., cut the stalks in thin strips, in the manner of French-cut green beans, then blanch and freeze them, to be used later in soups and stews.

Among the Nootka and Nitinaht people, pregnant women were warned not to eat the flower bud stalks. One Nitinaht man stated that to do so would cause the woman's child to become epileptic (Turner *et al.* 1983). A Manhousat man said that it would cause the baby, when it was born, to lose its breath when it cried and choke (Turner *et al.* 1976). A Hesquiat woman stated that the Nootka name for the bud stalks, "humaak", is related to the term, "humakshitl", for "when a baby cries so much that it almost loses its breath and chokes." When a child cried this hard, the elders at Hesquiat would say, "It must have been eating humaak." (A. Paul, pers. comm., to R. Bouchard, pers. comm., 1982).

OTHER USES OF COW-PARSNIP

Several miscellaneous uses of cow-parsnip have been reported. The Sechelt saved the fruits of cow-parsnip to use as flavoring in winter cooking (Bouchard 1977). Chesnut (1902) was told that the native people of Round Valley, California used the basal portion of cow-parsnip as a substitute for salt. It was dried in short cylinders and eaten either in a dry state with other food or cooked with foods to be flavored. Quileute and Makah girls used to make baskets from the large mature inflorescent umbels, by twining the rays with seaweed. They filled the basket with shells for playing (Gunther 1973). Nitinhat children sometimes made toy animals with the swollen leaf sheaths being used as the body (Turner *et al.* 1983). Cow-parsnip had a wide variety of medicinal uses, many of which are listed by Moerman (1977). At least seven native groups in North America used the plant as a dermatological aid, despite its known irritant properties.

EXTENT OF USE OF COW-PARSNIP BY THE NUXALK PEOPLE

The extent of use of cow-parsnip was examined in detail by an interview study of three generations of women of the Nuxalk Nation of Bella Coola, British Columbia. Data on use and taste appreciation of this vegetable were collected along with that of 70 species of traditional foods during 1983 (Kuhnlein 1986). The women interviewed were 61 in number, 20 with birthdates for 1904-30, 20 with birthdates 1931-50, and 21 with birthdates from 1951-63. They were asked to recall their use of cow-parsnip during two (younger women) or three (older women) decades of their lifespan, and to assign a taste appreciation score.

In all, 45 of the 61 women reported using cow-parsnip as food. Since the 1920s there has been a steady decline in use of cow-parsnip (Fig. 4), and this vegetable has been used only fresh in season by Nuxalk women, (ie. it has never been preserved for later use). At this time, use of cow-parsnip is only occasional. It is only rarely harvested and prepared for family mealtimes, being used instead as a "treat" when walking through the village or country side.

Taste scores on a 5-point hedonic scale for this vegetable are given in Table 2. Generally, it is considered from "fair to good", with an overall mean score of 3.6 out

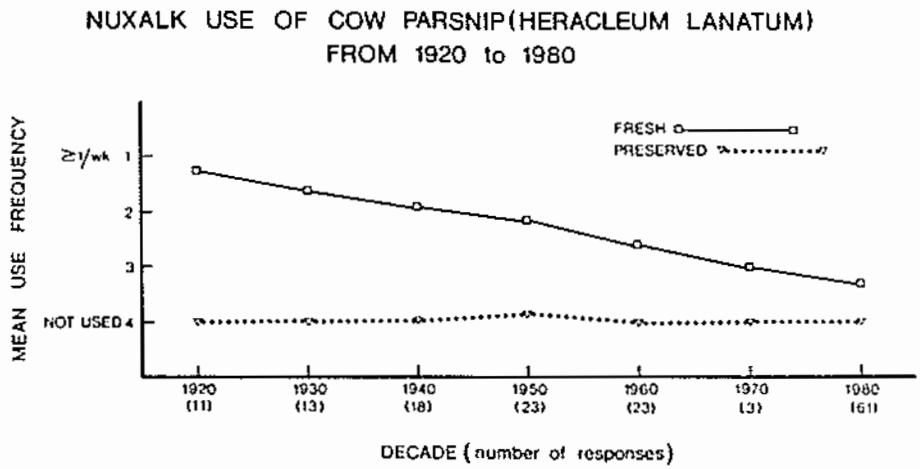

FIG. 4.—Nuxalk use of cow-parsnip *(Heracleum lanatum)* from 1920-1980. Use frequency scores were: 1—used at least once per week in season, 2—used less than once per week, but more often than once per month, 3—used only occasionally, and 4—not used. Number in ( ) below the decade is the number (n) of women recalling use at this time. Points on the graph are mean scores for n women.

Table 2.—Taste scores* for cow-parsnip *(Heracleum lanatum)* by Nuxalk women.

Birthdate	No.	Mean Score + S.D.
1904-30	17	3.8 ± 0.5**
1931-50	15	3.6 ± 1.0
1951-63	13	3.2 ± 0.9**
	Overall Mean	3.6

*Hedonic taste appreciation scale:

5 = Best; no improvement possible
4 = Good; enjoy it
3 = Fair; could eat it, it's OK
2 = Poor; edible, but that's all
1 = Terrible; inedible, definitely don't like it
0 = Inedible

**Significantly different with Student's t-test at p = 0.04

of 5. Scores given by the older women were significantly higher (p = 0.04) at 3.8 ±0.5 than those of the youngest women at 3.2 ±0.9 with middle-aged women have intermediate scores at 3.6 ±1.0.

It can be concluded that this vegetable is used less often today than in earlier decades of this century, and that in general, older women like it and use it more often than younger women.

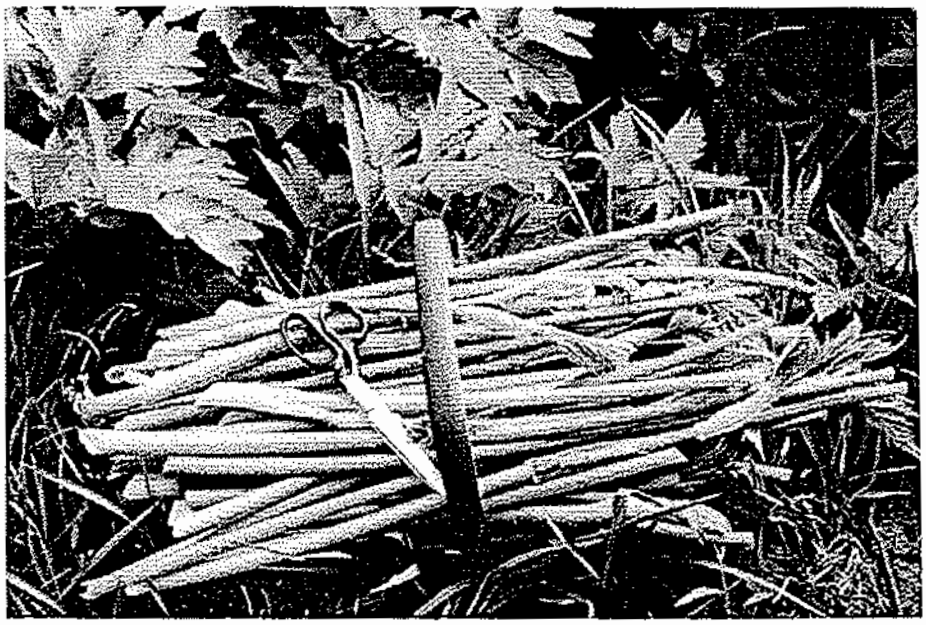

FIG. 5.—Cow-parsnip stalks, collected for nutrient analysis, before peeling.

NUTRIENT CONTENT OF COW-PARSNIP

Samples of cow-parsnip were harvested from the Victoria area of Vancouver Island and from reserved lands of the Nuxalk Nation in Bella Coola, B.C. Both the leafstalks and inflorescence bud stems were harvested using scissors (Fig. 5). The stems were peeled with the aid of sharp, stainless steel knife and frozen in plastic bags until analysis.

A profile of nutrient contents of *Heracleum lanatum* is given in Table 3. In general, this vegetable is similar in composition to other green vegetables, such as celery, as reflected in a moisture value of more than 90%, and lipids, ash and protein less than 1.0%. As one of the first fresh plant foods of the spring in traditional diets, cow-parsnip would be likely to provide meaningful amounts of folate and ascorbate in the total diet of coastal peoples who had winter diets of dried fish, preserved berries and roots, and marine fats. Levels of vitamin A as carotene are low (7-8 I.U.), so that this food would not have been a major source unless eaten with ooligan grease, which has a great deal of retinol, a primary form of vitamin A (Kuhnlein *et al.* 1982).

There are a few published values for nutrients in *Heracleum lanatum* from other parts of North America. As nearly as can be determined, none of the authors reported values on the peeled stalks, but rather analysed the complete stalk. Yanovsky and Kingsbury (1938) reported a Utah sample to contain 90.1% water, 1.6% protein, 1.5% ash and 0.8% hemicellulose. Berberie (1946) reported *Heracleum lanatum* of New Brunswick to contain 0.113 mg riboflavin per 100 g samples using the microbiological assay of that era. The ascorbate value for one sample of cow-parsnip reported by Norton *et al.* (1984) was 60 mg/100 g whole stalk. This is quite high in comparison to our findings, but might be explained by differences in sampling, storage, geography or method of analysis.

Mineral levels in this food are modest, but would have been significant in the diet if eaten in reasonable amounts in spring when other plant sources of minerals (for example, magnesium, calcium, iron, zinc and copper) may have been lacking. Although

cow-parsnip would not have contributed much energy, protein, carbohydrate or fat in the typical coastal diet, its primary nutritional value as a spring food would have been in its contribution of the so-called "water soluble" vitamins. In addition, its value as a food would be enhanced by its pleasing texture and flavor, especially at this time of year.

Table 3.—Nutrients in raw, peeled stalks of cow-parsnip *(Heracleum lanatum).*

Nutrient per 100 g fresh weight	N	Mean level	Range
Moisture, g	5	95.02	93.2 - 96.0
Total lipids, g	4	0.24	0.13 - 0.35
Ash, g	5	0.57	0.38 - 0.59
Protein, g	3	0.40	0.20 - 0.65
Total Carbohydrate, g	4	3.77	3.11 - 5.66
Energy (approx.), kcal		20	
B-carotene, I.U.	2	7.5	7 - 8
Folacin, free, ug	2	13.4	10.2 - 16.9
total, ug	2	16.1	11.8 - 14.3
Ascorbate, mg	4	3.5	2.5 - 4.3
Calcium, mg	4	27.7	15.4 - 37.4
Phosphorus, mg	4	18.5	13.7 - 23.7
Strontium, mg	4	0.19	.18 - .20
Iron, mg	4	0.30	.23 - .46
Copper, mg	4	0.36	.02 - 1.1
Zinc, mg	4	0.38	.13 - 1.0
Magnesium, mg	4	11.7	9.5 - 15.5
Manganese, ug	4	87.5	67.6 - 135.6
Sodium, mg	4	0.54	.34 - 1.12

Nutrients determined with standard procedures: moisture, lipids, ash: using A.O.A.C., 13th ed., 1980; total kjeldahl N (TKN) method of Fukumoto and Chang, *J.A.O.A.C.* 65(5): 1076-1079, 1982 with protein = TKN x 6.25; carbohydrate by difference, B-carotene courtesy of Dr. J.N. Thompson, Health Protection Branch, Ottawa, using HPLC techniques; folacin courtesy of Dr. K. Hoppner, Health Protection Branch, Ottawa, using microbiological method; minerals by ICPAES on dry matter, ascorbate by the method of Pelletier and Brassard reported in *J. Food Sci. 42:1471-1474, 1977.*

PHOTOTOXIC COMPOUNDS IN *HERACLEUM LANATUM*

There are numerous reports of dermatitis induced by skin contact with leaves, shoots, fruits and roots of various species of *Heracleum*, especially when this contact occurs in sunlight (Mitchell and Rook, 1979). The overview of Mitchell and Rook (1979) demonstrates the wide body of literature that exists on the irritant properties of the 70 species of *Heracleum* found in north temperature regions and on tropical mountains. The chemistry of the toxin has also been studied extensively, resulting in the identification of four furanocoumarins: psoralen, xanthotoxin (8-methoxypsoralen), bergapten (5-methoxypsoralen) and angelicin. Skin damage is caused by complexing of the furanocoumarins with thymine residues of DNA, thereby interfering with normal DNA repair and inducing mutations. Extracts of *Heracleum lanatum* were shown to inhibit DNA repair in human fibroblasts irradiated with ultraviolet light (Stich *et al.* 1975; Scheel 1973).

Because none of the literature reviewed to date takes into account the Indian process of peeling the stalks before using them for food, we explored the possibility that peeling would reduce the furanocoumarin content of this vegetable. Samples of *Heracleum lanatum* were harvested and peeled as previously described. Samples of unpeeled and peeled stalks were analyzed, as were the stalk peelings. Ten-gram (fresh weight) samples were macerated and extracted overnight with hot 80% methanol. After adjusting to 60% methanol, a rotary evaporator was used to bring the sample to an aqueous residue. This was extracted overnight with an equal volume of ether. The furanocoumarin-rich ether layer was separated and evaporated, and the residue dissolved in a small amount of methanol. These were spotted on TLC silica gel sheets and developed in 100% chloroform and then hexane:pentane:ethyl acetate (35:35:30). The dried chromatograms were inspected in 360 nm light and the spots marked, scraped, and extracted into methanol. Absorbance was measured in a Beckman DB-G spectrophotometer and quantities were estimated with extinction curves prepared with standards.

As seen in Table 4, *Heracleum lanatum* at both sites of harvest contained furanocoumarins. Peeled samples from site 1 contained less than half the total furano-

Table 4.—Furanocoumarins* in peeled and unpeeled stalks of *Heracleum lanatum*.

Areas sampled/ Preparation	Xanthotoxin	Bergapten	Angelicin	Total
		mg/100 g fresh weight		
Site 1				
Unpeeled	3.8	2.2	3.6	9.6
Peelings	4.6	2.6	3.2	10.4
Peeled	2.0	.8	1.6	4.4
Site 2				
Unpeeled	18.8	9.6	26.8	35.2
Peeled	8.0	2.0	6.8	16.8

*A fourth furanocoumarin, psoralen, was not analyzed.

coumarins of the peelings. At site 2, peelings were not available, but the peeled stalks again contained close to half the total furanocoumarin content of the unpeeled stalks. In the stalks from site 1, the major agent was xanthotoxin, whereas from site 2 the major agent was angelicin.

Ivie *et al.* (1981) note that as little as 5 mg of certain psoralens taken internally in one dose of medication could cause physiological effects related to skin depigmentation. Although the quantitative effects of the compound reported here are not known, nor are their cumulative effects, it is possible that 4-16 mg of total furanocoumarins eaten in 100 g of peeled vegetable product may cause adverse effects. However it is salient to consider that 100 g of cow-parsnip represents consumption of approximately 10 peeled stalks. From our discussions with native people, only 1 or 2 stalks would be eaten at any one time, although during the season when they are ready for harvest this amount may be eaten as often as 3 or 4 times per week.

Native people were, and still are, quite aware of the harmful effects of eating peelings of cow-parsnip, or of eating too much of it, especially during pregnancy or infancy. It would appear that peeling the stalks before consumption reduced or minimized these effects.

SUMMARY

Cow-parsnip *(Heracleum lanatum)* is a fascinating vegetable used by native people of northwestern North America. It was widely used as a food by many native people, who were aware of its potential toxicity. Nutrient levels of the peeled stalks are similar to those of marketed foods in kind, particularly celery, as are the taste and texture qualities. Women of the Nuxalk Nation of Bella Coola, B.C. reported a declining use of this wild plant food during this century, and a lower taste appreciation score on the part of younger women in comparison to older women.

Analysis of furanocoumarins in the peeled stalks, in comparison to unpeeled stalks and the peelings, show that the peeled stalks contain less than half the original furanocoumarin content. Although skin contact with the leaves or peelings, or eating large quantities of the peeled stalks, could be suspected of producing dermatitis in the presence of sunlight, or other unknown effects, native people apparently moderated their exposure so that the nutritional, sensory and cultural benefits of use of this plant could be enjoyed.

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