

Conservation Evaluation of the Pacific Population of Tall Woolly-heads, *Psilocarphus elatior*, an Endangered Herb in Canada*

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In Canada, *Psilocarphus elatior* occurs in British Columbia, Alberta and Saskatchewan. This paper examines the status of the Pacific populations located on southeastern Vancouver Island in southwestern British Columbia. The Pacific population consists of 12 recorded sites of which only five have been confirmed since 1993. In British Columbia, *P. elatior* is associated with dried beds of vernal pools and other open, moist depressions at lower elevations. In British Columbia, *P. elatior* populations occur in large numbers at only two of the seven locations.

Key Words: Tall Woolly-heads, *Psilocarphus elatior*, endangered, distribution, population size, British Columbia.

Tall Woolly-heads, *Psilocarphus elatior* (A. Gray) A. Gray² [Taxonomy and nomenclature follows Douglas (1998) and Douglas et al. (1998; 1999a, c; 2001a b), is a member of a genus of five species which occur in the Americas (Cronquist 1950). It is one of three species occurring in British Columbia and Canada (Douglas 1998).

Psilocarphus elatior is a small, erect, annual plant up to 15 cm tall (Figure 1; Douglas 1995, 1998). The opposite leaves are silky-hairy, linear-oblong, entire on the margins and 1.2 to 3.5 mm long. The flowers form solitary spherical heads in the leaf axils or at the tips of the stems or leaf branches. The flowers lack involucre but have involucre-like leaves at their bases. Each of the outer (female) threadlike ray flowers has a well developed, 2.4 to 3.8 mm long receptacle bract. These bracts have a translucent appendage below the summit.

In British Columbia, *P. elatior* may be distinguished from Slender Woolly-heads (*P. tenellus* var. *tenellus*) by its erect habit, larger heads and receptacular bracts. In the field, young specimens of *P. elatior* may also be confused with young specimens of Lowland Cudweed (*Gnaphalium palustre*). Close examination will reveal

that most of the leaves of the latter are alternate and the flower heads have densely woolly involucre, broader ray flowers and a non-spherical shape.

North American and Provincial Ranges

Psilocarphus elatior ranges from southwestern British Columbia, southeastern Alberta and southwestern Saskatchewan in Canada, south through Idaho, Washington and Oregon to northern California (Cronquist 1955; Scoggan 1979; Morefield 1993; Douglas 1998). In British Columbia, it is restricted to south-eastern Vancouver Island in south-western British Columbia (Figure 2; Douglas 1998; Douglas et al. 2002).

Habitat

Psilocarphus elatior inhabits dried beds of vernal pools, ephemeral lake edges (Figure 3) and other open moist, often disturbed sites at lower elevations. The sites are often level and generally slightly depressed. *Psilocarphus elatior* is not found within particular communities and often occupies sites where other species are sparse. There does not appear to be a consistent association with other plants.

The Somenos Lake locality near Duncan supports the largest and most vigorous population of *P. elatior* (Table 1). The plants grow on the moist shoreline of the lake and appear when the lake level recedes in late spring or early summer. Major associates at this site include Slender-beaked Sedge (*Carex athrostachya*), One-sided Sedge (*C. unilateralis*), Brass Buttons (*Cotula coronopifolia*) and Skunkweed (*Navarretia squarrosa*).

At Uplands Park, in the Municipality of Uplands near Victoria, five subpopulations occur in a large ephemeral meadow. Associated species include Bentgrass (*Agrostis* sp.), California Oatgrass (*Danthonia*

* Field work for the *Psilocarphus elatior* project was funded by the British Columbia Conservation Data Centre. The results appear in the British Columbia Conservation Data Centre database and a rare plant manual (Douglas et al. 2002). These data formed the basis for a Committee on the Status of Endangered Wildlife in Canada status report (Douglas, et al. 1999b) and the subsequent assessment of *endangered* (COSEWIC 2004*) for the Pacific population. The present paper also includes more recent information from research funded by the British Columbia Conservation Data Centre.

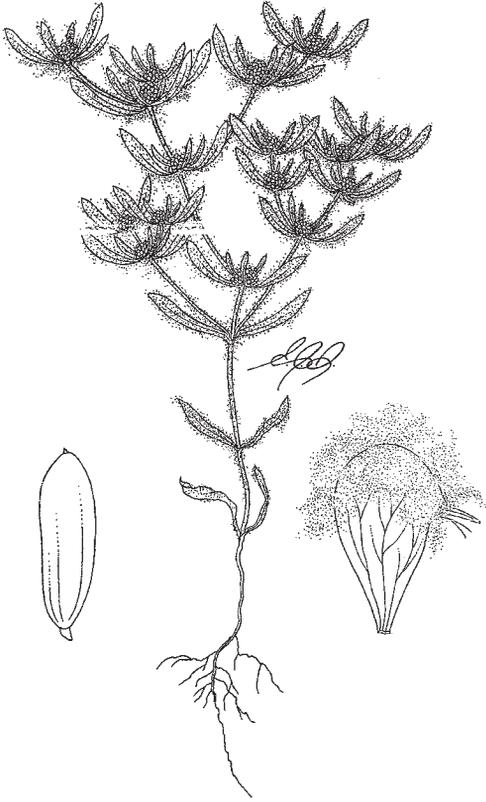


FIGURE 1. Illustration of *Psilocarphus elatior* (line drawing by Elizabeth J. Stephen in Douglas [1995, 1998]).

californica), Toad Rush (*Juncus bufonis*), Perennial Ryegrass (*Lolium perenne*) and Small Hop-clover (*Trifolium dubium*). Introduced species are more abundant here than at the Somenos Lake site and appear to be increasing yearly.

The Christmas Hill site, although smaller than the previous two sites, is in relatively good condition. Native species in this habitat include Carolina Meadow-foxtail (*Alopecurus carolinianus*), Green-sheathed Sedge (*Carex feta*), Heterocodon (*Heterocodon rariflorum*), and Scouler's Popcornflower (*Plagiobothrys scouleri*).

The two remaining populations, at Scafe Hill and Cattle Point, occur in small depressions. These populations are probably the least stable of the extant populations. The Cattle Point populations are absent during some years but the seed bank appears to remain.

Psilocarphus elatior is considered to be a vernal pool specialist (Keeley and Zedler 1998). They define vernal pools as "precipitation-filled seasonal wetlands inundated during periods when temperature is sufficient for plant growth, followed by a brief water-logged-terrestrial stage and culminating in extreme desiccating soil conditions of extended duration". The

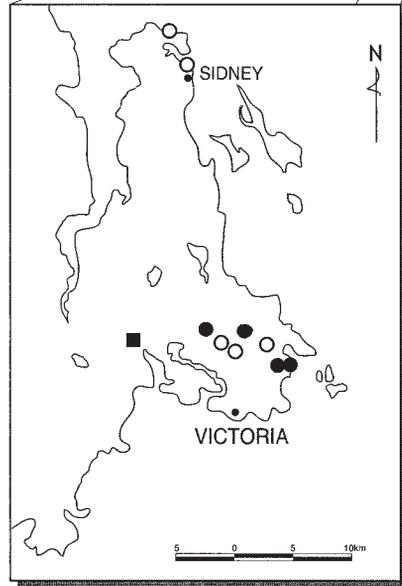
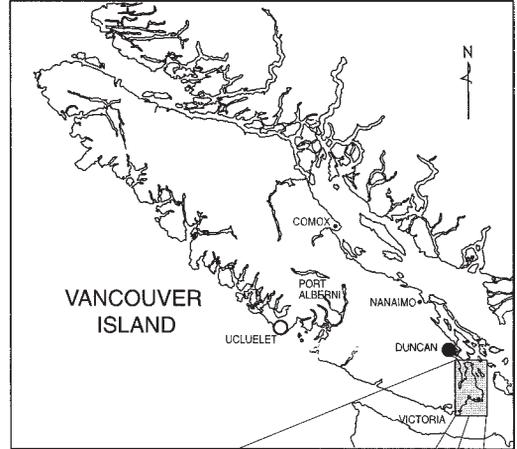


FIGURE 2. The location and status of *Psilocarphus elatior* sites in British Columbia (○ – extirpated sites, ● – recently confirmed sites, ■ – present status unknown).

species is able to outcompete grassland species due to its tolerance of inundation and aquatic/wetland species due to its tolerance of soil desiccation and heat during summer drought.

Biology

Other than general habitat information, there is little in the literature regarding the biology and ecology of *Psilocarphus elatior*. It is likely, however, that this plant shares many of the same traits that are typical of the genus.



FIGURE 3. A dense population of *Psilocarphus elatior* on the edge of Somenos Lake. The prominent sedge is *Carex athrostachya*. This site is usually submerged until late spring.

Lack of structures attractive to insects and animals, and an interpretation of the floral structure indicate these inconspicuous, woolly annuals may self-pollinate. Cronquist (1950) suggested that in the genus *Psilocarphus*, the position of the receptacular bracts, together with the position of the corolla and stigmas, effectively guide these latter structures towards the central flowers. Since it is the central flowers alone that produce pollen, and since the wool and leaves sur-

rounding the head appeared to prevent pollen loss by wind, self-pollination is indicated. It is also possible that pollen may not be essential for seed-production and that asexual reproduction may be occurring, although chromosome counts would be necessary to verify this.

Seed dispersal also appears limited. Since the achenes are much smaller than the enclosing bracts, the only obvious means of dispersal is by water or wind.

Table 1. Locations and Population Sizes for *Psilocarphus elatior* in British Columbia.

Collection Site	Last Observation	Collector/Observer	Population (no./area)
Cloverdale (Victoria)	1887	Macoun	Extirpated
Cedar Hill (Victoria)	1887	Macoun	Extirpated
Ucluelet	1909	Macoun	Extirpated
Roberts Bay (Sidney)	1913	Macoun	Extirpated
Swartz Bay (Sidney)	1931	Groh	Extirpated
Francis-King Regional Park (Victoria)	1962	Melburn	Unknown
University of Victoria (Victoria)	1966	Turner	Extirpated
Cattle Point, Uplands Park (Victoria)	1993	Ryan	200/10 m ²
Scafe Hill (Victoria)	1996	Roemer	20/? m ²
Uplands Park (Victoria)	1998	Douglas	40 000+/1 200+ m ²
Christmas Hill (Victoria)	2001	Douglas & Penny	450/72 m ²
Somenos Lake (Duncan)	2002	Douglas & Douglas	100 000+/45 m ²

The plant's habitat in vernal pools may also permit the bracts and achenes to be transferred by the muddy feet of waterfowl and other animals (Cronquist 1950).

Further studies are required to determine many aspects of the population dynamics of *P. elatior* including the average life-cycle of the species, the frequency and requirements for seed germination and survival, and its competitive ability with other species.

Population Attributes

Psilocarphus elatior has been recorded from 12 sites in southwestern British Columbia (Table 1). Five of these have been confirmed since 1993. The status of the remaining populations is unknown and many are believed extirpated. Population areas range from 10 m² to over 1200 m² while numbers of plants range from 20 to over 100 000. In the majority of cases, population trend analysis is not available because of limited demographic data.

Provincial, National and Global Ranks

Provincially, *P. elatior* is ranked S2 by the British Columbia Conservation Data Centre (Douglas et al. 2002) which indicates this species to be "imperiled because of rarity (typically 6–20 extant occurrences or few remaining individuals) or because of some factor(s) making it vulnerable to extirpation or extinction." Nationally the species is ranked N3, while globally it has a rank of G5. The latter rank indicates it is "frequent to common to very common; demonstrably secure and essentially ineradicable under present conditions".

Threats and Protection

Habitat destruction is the greatest threat to the existing populations of *Psilocarphus elatior*. Some sites occur in areas subjected to heavy pedestrian trampling or are at risk from private development. Threats to the continued survival of this species are compounded by the lack of biological and ecological information which create difficulties in site management.

Four of the *P. elatior* populations are partially protected by their location in municipal or regional parks or special protected areas (Somenos Lake). The latter probably has the greatest degree of protection since it is administered by British Columbia Parks and falls under the *Park Act*. Most of the municipal or regional parks receive little active management at the present time, at least with respect to their rare plants. Park enhancement projects, road and trail developments and heavy recreational use by humans often result in the destruction of the native vegetation and rare plant species. *Psilocarphus elatior* could be a candidate species for protection under the provincial *Wildlife Amendment Act* as it is currently Red-listed by the British Columbia Conservation Data Centre (Douglas et al. 2002).

Most of the populations contain small numbers of plants. Once a population becomes small, it becomes

more susceptible to demographic and environmental variation and loss of genetic variability. In some cases, small populations are at risk of inbreeding depression, genetic drift and loss of fitness (Primack 1998).

Evaluation

The British Columbia Conservation Data Centre considers *Psilocarphus elatior* to be threatened/ endangered in British Columbia (Douglas et al. 2002a) and the Committee on the Status of Endangered Wildlife in Canada has assessed the species as endangered (COSEWIC 2003). Most of the populations are small and not viable. With limited knowledge of the plants biological and ecological requirements, this species is vulnerable to extirpation in British Columbia. Without research on growth requirements and further demographic information, the stability of the present populations will remain unknown. Studies are also necessary to determine if the present habitats are necessary for the successful growth of *P. elatior* or if these plants are simply outcompeted elsewhere. The limited number of individuals also reduces the potential for genetic variation which may be necessary to respond to environmental changes in the future.

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