

CRONARTIUM COMANDRAE IN CANADA, ITS DISTRIBUTION AND HOSTS

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Abstract

Distribution maps and reports of *Cronartium comandrae* Pk. on the coniferous hosts *Pinus banksiana*, *P. contorta*, *P. ponderosa*, *P. sylvestris*, and the alternate hosts *Comandra umbellata* ssp. *umbellata*, *C. u.* ssp. *pallida*, and *Geocaulon lividum* are presented for Canada. *C. comandrae* occurs in all provinces and territories except Newfoundland, Nova Scotia, and Prince Edward Island, although native or introduced hosts do occur in these areas. New records of *C. comandrae* on *P. contorta* in Saskatchewan, on *C. umbellata* ssp. *umbellata* in Saskatchewan and Manitoba, and on *G. lividum* in Ontario and Saskatchewan, are reported. There is doubt about an earlier record of the rust on *C. umbellata* from the Northwest Territories.

Introduction

Comandra blister rust caused by *Cronartium comandrae* Pk. has been reported on one introduced and eleven native hard pine species in North America (8,15), ranging from New Brunswick to the Yukon and southward to Tennessee, Alabama, Mississippi, New Mexico, and California. It has not been found in Alaska or Mexico although susceptible pines occur there. The uredial and telial stages of the rust have been recorded over a similar range on the alternate hosts, *Comandra* and *Geocaulon* of the family Santalaceae. A generalized distribution map for *C. comandrae* on *Pinus* spp. and *Comandra* spp. in North America was recently published by Krebill (13). Information on the hosts and distribution of *C. comandrae* in Canada is scattered. To date, the rust has been reported on three native and one introduced hard pine species, and on both alternate host genera in Canada. This paper attempts to bring together the information and to report recent collections which have extended the known distribution of the rust in Canada.

Materials and methods

Arthur's Manual of the rusts in the United States and Canada (2) has been used as the base reference for information on distribution and hosts in Canada. More recent references on distribution have been gathered from the literature.

All the *Cronartium comandrae* materials have been seen or information on them obtained from the following herbaria (Herbarium codes follow Lanjou and Stafleu [14]): ALTA, BPI, CFB, DAOM, DAVFP, FFB, MFB, MONT, NY, PUR, QFB, QMP, SASK, UBC, WIN, WINF(M), WSP, MacDonald College, (Ste. Anne de Bellevue, Que.) and many of the regional laboratories of the United States Forest Service, some of which contain Canadian

material. Information from the Forest Insect and Disease Surveys, Canadian Forestry Service, have also been used extensively for compilation of the distribution maps, especially in the Prairie and British Columbia Regions, where such surveys have been quite thorough. Intensive surveys were also carried out by the author in Alberta and southwestern Saskatchewan. The alternate host genus *Comandra* has recently been modified by Piehl (17) to include four subspecies of one species (*C. umbellata*) instead of five species, while he confirms Fernald's (11) study of separating *Geocaulon lividum* from the genus *Comandra*. I attempted to follow Piehl's arrangement of the sub-species by using his distribution map, but this was not totally satisfactory as he indicates large intermediate zones between some of the subspecies, e.g. a wide band across the Prairies between ssp. *pallida* and ssp. *umbellata*.

Hosts and distribution

REPORTS OF THE RUST ON ITS VARIOUS HOSTS IN CANADA

Pinus banksiana Lamb.

Arthur (2) reported that *C. comandrae* occurred on this host in Alberta and Saskatchewan. It has also been reported from New Brunswick (10), Quebec (18), Ontario (7), Manitoba (22), and the Northwest Territories (4).

Pinus contorta Dougl.

Reported in Alberta (2), British Columbia (25) and the Yukon (16).

Pinus ponderosa Laws.

Arthur (2) reported it from British Columbia.

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Pinus sylvestris L.

The rust has been reported on this introduced pine from Manitoba (24), Saskatchewan (12) and Alberta (21).

Comandra umbellata (L.) Nutt. ssp. umbellata Piehl (C. umbellata; C. richardsiana).

Arthur (2) reported that the rust occurred on this host in Ontario and Quebec.

Comandra umbellata (L.) Nutt. ssp. pallida (A. DC.) Piehl (C. pallida).

Arthur (2) reported it from Alberta, British Columbia, Saskatchewan, and the Northwest Territories. Bisby (5) reported its occurrence in Manitoba, and Connors (7) in Ontario.

Geocaulon lividum (Richardson) Fernald.

Arthur (2) gave the distribution on this host (cited as Comandra livida) as Manitoba and Quebec. Ziller and Molnar (26) reported its occurrence in British Columbia, Molnar (16) in the Yukon, and Baranyay et al. (4) in Alberta. Baranyay and Bouchier (3) collected it in 1962 in the Northwest Territories, although the host was reported as Comandra.

DISTRIBUTION OF THE RUST IN CANADA, INCLUDING NEW RECORDS

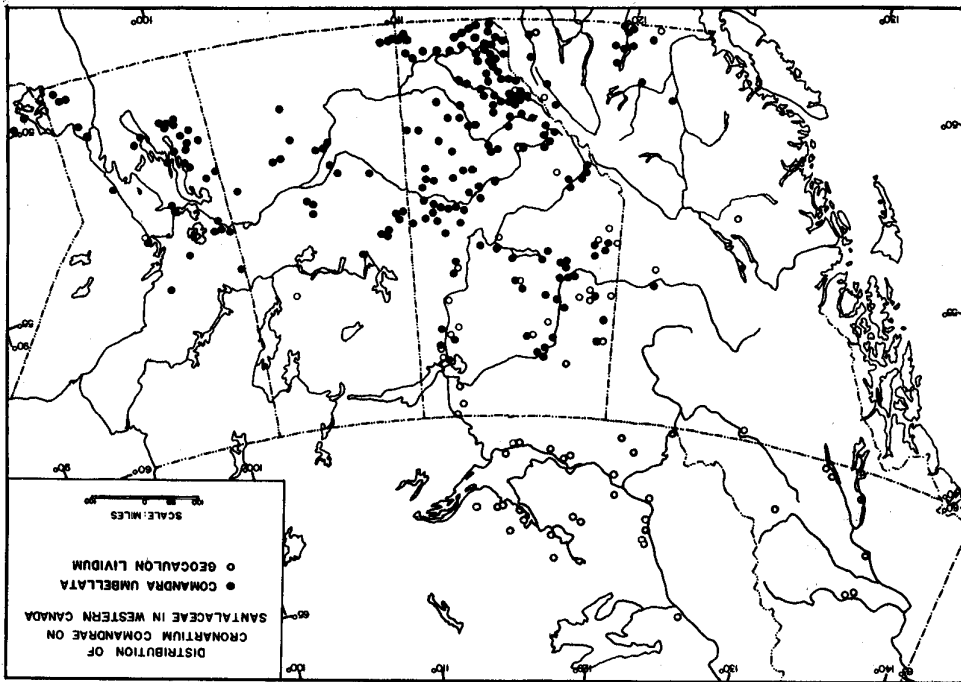
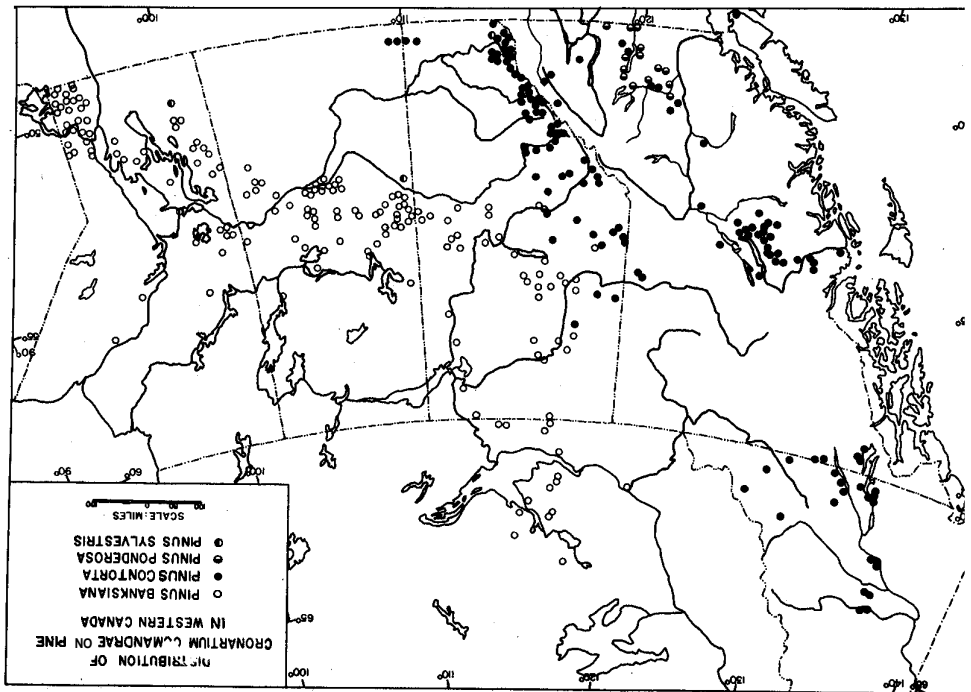
Figures 1 and 3 show the distribution of C. comandrae on Pinus spp., and Figures 2 and its distribution on Comandra and Geocaulon in western and eastern Canada. C. comandrae would appear to be more prevalent in western Canada, where the distribution of the hosts is more continuous. Surveys have also been more extensive in western Canada, especially in southern Alberta where the author has been studying various aspects of the aerobiology of the rust since 1964 (20). Generally, the northern distribution line for Canada on Krebill's map (13) does not extend far enough north, especially in the Yukon and Northwest Territories, and in Manitoba and Quebec. The collections from Great Whale River on G. lividum have been incorrectly placed in Ontario instead of Quebec. Sutton (23) gives a generalized distribution for Saskatchewan from reports for the years 1965-67. Figure 1 of this paper indicates that the distribution on pine is more continuous across Saskatchewan, and that the rust has been recorded farther north on this host.

The rust can be found in most young and mature stands of Pinus contorta and P. banksiana in western Canada, often reaching local epidemic proportions when the pine is close to stands of Comandra umbellata ssp. pallida in southern areas or Geocaulon lividum in northern areas. In western Canada, its distribution extends to the pine limits in the Yukon and Northwest Territories, but should be found farther

north in Saskatchewan and Manitoba than present collections indicate (Fig. 1). The rust extends across the Prairie grassland areas on C. umbellata ssp. pallida through infections of the repetitive uredial state. Infections were often found more than one hundred miles from the nearest pine source (Figs. 1 and 2). In eastern Canada, intensive surveys seem to be lacking and this probably accounts for much of the non-continuous distribution. Local epidemics have been reported and in one case a plantation suffered considerable damage (9). Only one collection of the rust has been made in the Maritimes, despite considerable examination of pines and searching for the alternate host (G.A. Van Sickle, 1969, personal communication). There are no records from Newfoundland or along the north shore of the Gulf of St. Lawrence, east of latitude 65°. Natural stands of the pine host are absent in this area (6), but Comandra does occur (17) and susceptible pines have been introduced.

New provincial distribution records for the rust include two specimens (CFB 8406,8407) collected in 1968 on P. contorta in the Cypress Hills, Saskatchewan. Two collections on C. richardsiana from Manitoba and Saskatchewan are in UBC (82625 and 86877), and two others in WINF(M) (1746,3712) on C. richardsiana or C. umbellata are probably on true C. umbellata ssp. umbellata or an intermediate-between ssp. umbellata and ssp. pallida. A collection made in 1937 by D.V. Baxter (DAOM 5558 and PUR 48514) from Great Slave Lake, Northwest Territories, and labelled Comandra sp. proved to be G. lividum, which is the earliest collection on this host from that area. An unreported specimen on G. lividum from Ontario is in DAOM (76368), and a specimen was collected from Deception Lake, Saskatchewan, in 1969 (WINF(M) 12039). This host has a northern distribution and only just enters the United States where infected specimens have been collected only in Wisconsin (2), Idaho (BPI, NY, and Pacific Northwest Forest & Ra. Exp. Sta., Portland, Oregon), and Washington (BPI, DAOM).

There is doubt about location of the collection of Comandra upon which Arthur (2) based his Northwest Territories record. J.A. Parmelee (personal communication, 1966) believed this record was based on the DAOM specimen, No. 1861, from near Martin Cabin, Slave Lake, Alberta, collected in 1929, and that Arthur interpreted 'Slave Lake' as Great Slave Lake, Northwest Territories, instead of Lesser Slave Lake, Alberta. However, Arthur (4) included the Northwest Territories in his distribution list prior to the collection of the above DAOM specimen. There is no record of Comandra from the Northwest Territories or the Yukon in the DAO or CAN herbaria, or more regional herbaria (ALTA, CAFB, UAC, UBC), and it has not been collected north of about 59° N latitude in Alberta. Porsild and Cody (19), in their checklist of vascular plants in continental Northwest Territories,



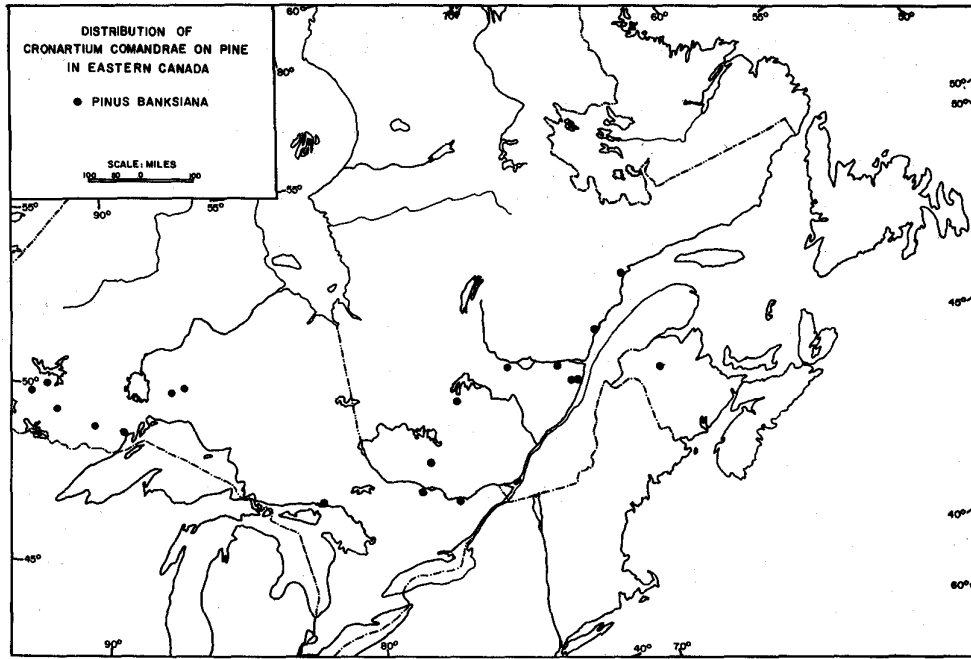


Figure 3. Distribution of Cronartium comandrae on pine in Eastern Canada.

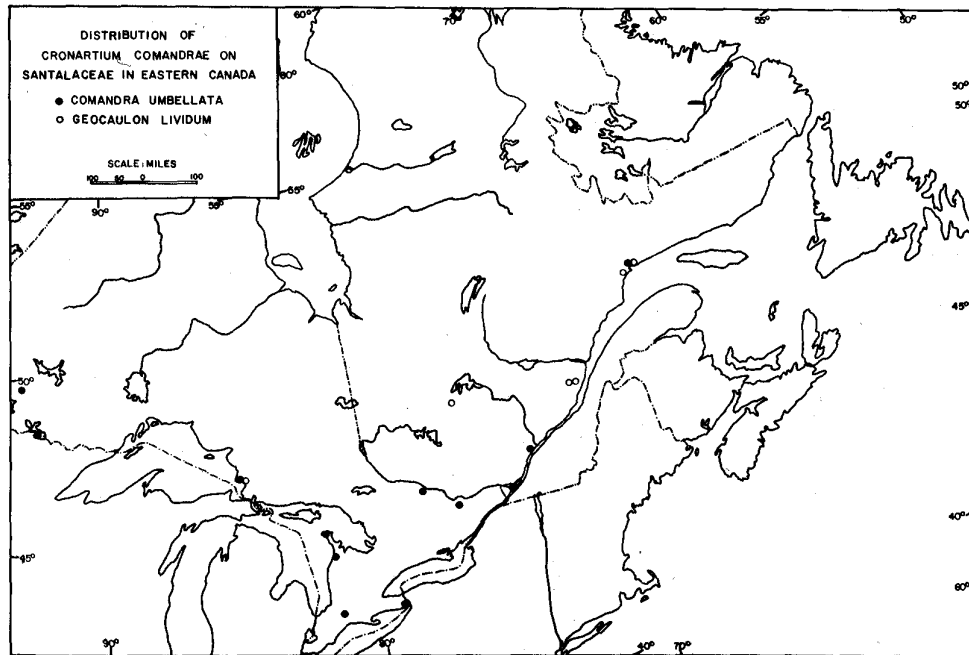


Figure 4. Distribution of Cronartium comandrae on Santalaceae in Eastern Canada.

indicated that *C. pallida* was expected to occur, but at present there is no record from the area. Piehl (17) also does not indicate its presence north of 60°N latitude.

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