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INVESTIGATIONS OF NEW ENGLAND MARINE ALGAE VI: DISTRIBUTION OF MARINE ALGAE NEAR CAPE COD, MASSACHUSETTS

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SPIRANTHES CASEI, A NEW SPECIES
FROM NORTHEASTERN NORTH AMERICA

PAUL M. CATLING AND JAMES E. CRUISE

In 1923 Henry Mousley made a collection of *Spiranthes* orchids from the vicinity of Hatley (45° 11' N., 71° 56' W.), Stanstead Co., Quebec. He reported these plants in 1924, under the name of *Spiranthes cernua* (L.) Rich. var. *ochroleuca* (Rydberg) Ames (Can. Field-Nat. 38: 61-63, 86-88, p. 88). About 17 years later he sent these collections to Dr. D. S. Correll at Harvard University, who was then engaged in a study of the genus. Correll reported back to Mousley that the plants from Hatley represented a mixed collection of *S. cernua* (L.) Rich. var. *odorata* (Nutt.) Correll and *S. vernalis* Engelm. & Gray. This was reported by Mousley in 1941 (Can. Field-Nat. 55: 79-80, pl. 1-2), and by Correll in 1950 (p. 227). Another station of *S. vernalis* was discovered by Mousley during 1941 near Ste. Dorothée (45° 32' N., 73° 39' W.), Quebec, and described in some detail by him in 1942 (Can. Field-Nat. 56: 1-2, pl. 1-2). Gleason and Cronquist (1963) reported southeastern Quebec to be within the range of *S. vernalis*, a decision probably based on the report of Correll (1950). In recent floristic work concerning eastern Canada (e.g. Marie-Victorin, 1964; Roland & Smith, 1963-64; Boivin, 1967) no further mention has been made of *S. vernalis*, and surprisingly the reports of Mousley and Correll have not been repeated. However, Case (1964) discussed the occurrence of plants referable to *S. vernalis* in the western Great Lakes region, and Voss (1972, p. 461) has mapped the distribution of *S. vernalis* in Michigan, although both of these authors assigned their plants to *S. vernalis* with some hesitation.

Over the past three years a species of *Spiranthes* that compared favorably with Mousley's specimens from Quebec was found to be frequent and locally abundant in some parts of the Canadian Shield region of southern Ontario, and it

was listed for the province as *S. vernalis* by Whiting and Catling (1971). A survey of herbarium collections in eastern North America revealed many new localities for this "northern *S. vernalis*" in Ontario, several new stations in Quebec, Michigan, and New England, and two localities in Nova Scotia where it was previously unknown.

As specimens were examined over this wide range, it became clear that the northern plants were quite distinct and easily separated from *Spiranthes vernalis* as it occurs in the southeastern states. A series of specimens from the Coastal Plain and the gulf states, including the type of *S. vernalis* Engelm. and Gray (AMES 82967), differed consistently from the northern plants in exhibiting a light-colored and frequently more dense, non-glandular pubescence on the rachis, and a denser, less robust spike with a larger number of narrower and slightly longer flowers. Plants collected from Massachusetts, including the types of *Spiranthes* × *intermedia* Ames (AMES 2246) and *Spiranthes neglecta* Ames (AMES 2518) and the justifying specimens for *Spiranthes cernua* × *gracilis* Ames (AMES 17391), are comparable with the "southern *S. vernalis*." In his enumeration of North American orchids, Ames (1924) included *S.* × *intermedia*, *S. neglecta* and *S. cernua* × *gracilis* in synonymy with his × *S. vernalis*. A general northern limit for the "southern *vernalis*" is approximated by a line joining Massachusetts, Kentucky, and northern Missouri. The northern plants referred to *vernalis* are distributed in a broad band from Michigan to northern New England and the Canadian maritime provinces. As these northern plants are quite distinct and different from the southern plants (including the type of *S. vernalis*), and as they appear to have a discrete distribution pattern we are herewith describing them as a new species.

***Spiranthes casei* Catling et Cruise sp. nov.**

Differt a *S. vernalis* pubescentia septata et rubri-glandulosa in inflorescentia, spica robustiore et minus densa, floribus paucioribus, latioribus, brevioribus.

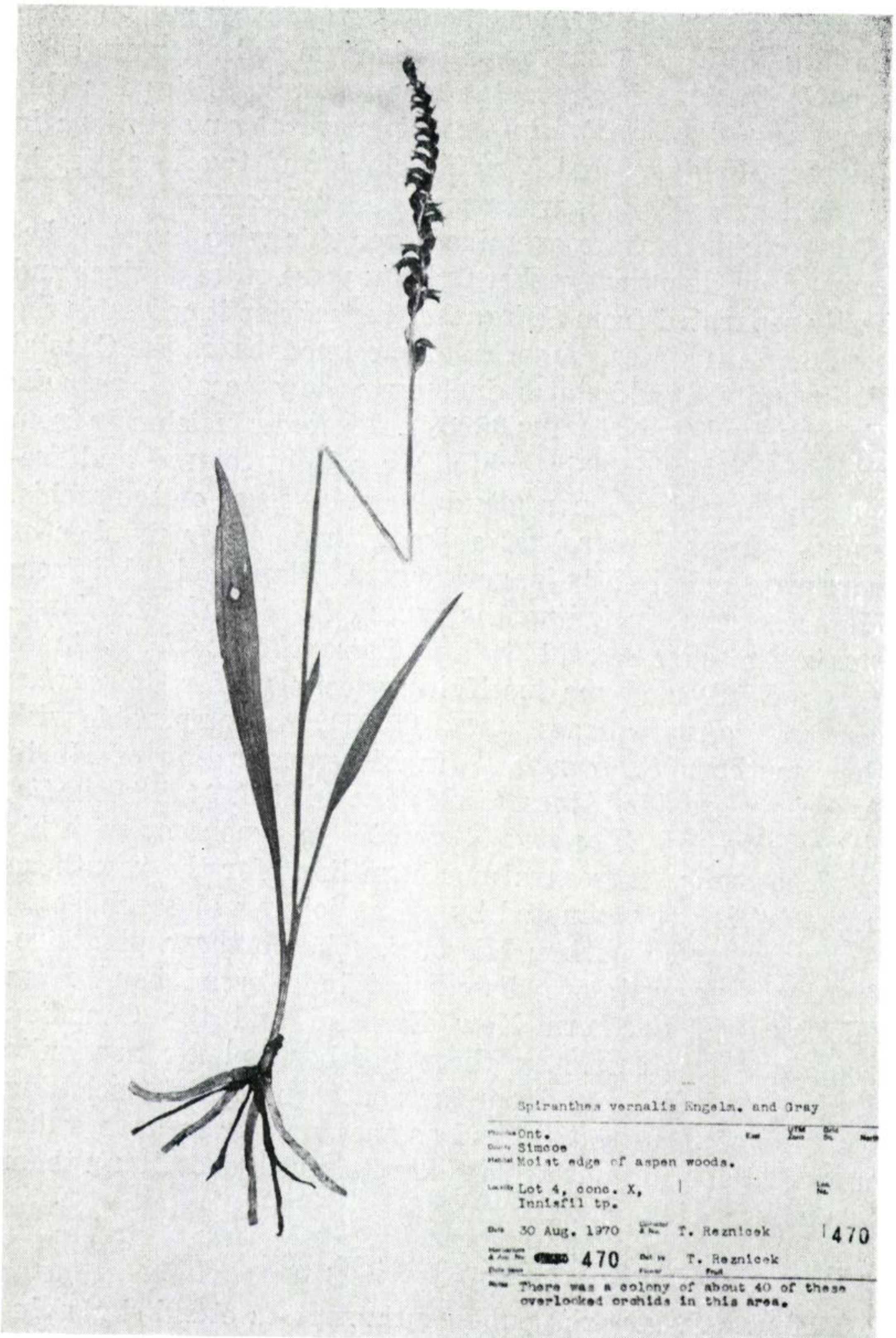


Figure 1. A typical herbarium specimen of *Spiranthes casei*. The elongate spike with flowers loosely arranged in a single spiral, the erect oblanceolate leaves, and the robust nature of the plant are characteristic. (T. Reznicek 470, Simcoe County Museum).



Figure 2. Part of a spike of *Spiranthes casei* from Dorset, Ontario. (Photograph by Dr. Erich Haber).

Plantae (13-) 27-33 (-43) cm. altae sub anthesi. *Folia* omnia laevia, saepe glauca, usque ad tertiam caulis partem assurgentia; infima ad anthesin non permanentia, ovato-lanceolata, 1-2 cm. lata, 7 cm. longa; superiora ad et nonnumquam per anthesin permanentia, oblanceolata vel lineari-lanceolata, usque ad 15 vel 20 cm. longa, plerumque minus quam 1 cm. lata, brevia, sub inflorescentia ad vaginas sine laminis reducta. *Caulis* basaliter glaber, in rachidi pilis septatis rubri-glandulosis 0.10-0.30 mm. longis pubescens. *Spica* plerumque 6-10 cm. interdum ad 15 cm. longa, floribus laxe et saepe in spiram unicam dispositis. *Bracteae florales* ovatae vel ovato-lanceolatae, longi-acuminatae, 7-12 mm. longae, basaliter plus minusve pubescentes. *Flores* cremei. *Ovarium* sub anthesi 4-6 mm. longum, supra oblique tumidum. *Pubescentia* in ovarii, sepali dorsalis, sepalorum lateralium superficie pubescentiae rachidis similis. *Sepala* lateralia 5-7 mm. longa; sepalum petalae dorsalia sursum vix curvata, 5-7 mm. longa; *petala* dorsalia pagina externa papillosa. *Labellum* florum inferiorum 6-6.5 mm., superiorum 5-6 mm. longum; calli basales crassi, 0.8-1.0 mm. longi, incurvi; labelli inferior superiorque centralis pagina et callorum regio brevi-pubescentia vel papillosa.

Different from *S. vernalis* in its septate, reddish-glandular pubescence in the inflorescence, and its less dense, more robust spike with fewer, wider and shorter flowers.

Plants (13-) 27-33 (-43) cm. tall at anthesis. Leaves glabrous, often glaucous, ascending up to 1/3 the length of the stem; lowest leaves, not persisting until anthesis, ovate-lanceolate, 1-2 cm. wide, 7 cm. long; upper leaves, persisting until and sometimes throughout flowering, oblanceolate or linear-lanceolate, to 15 or 20 cm. long, and usually less than 1 cm. wide, reduced to bladeless sheaths below the inflorescence. Stem glabrous basally, becoming pubescent in the rachis with septate, reddish-glandular hairs 0.10-0.30 mm. long. Spike usually 6-10 cm. long, occasionally to 15 cm. long, with the cream-colored flowers arranged loosely and often in a single spiral. Floral bracts ovate or ovate-lanceolate, long-acuminate, 7-12 mm. long, more or less pubescent

basally. Ovary 4-6 mm. long at anthesis, obliquely swollen on the upper side. Pubescence on the surface of the ovary, dorsal sepal, and lateral sepals, similar to that of the rachis. Lateral sepals 5-7 mm. long. Dorsal sepal and petals barely upcurved, 5-7 mm. long, the dorsal petals papillose on the outer surface. The lip 6-6.5 mm. long in the lower flowers, 5-6 mm. long in the upper flowers. Basal calli of the lip stout, 0.8-1.0 mm. long, incurved. The lower surface and central upper surface of the lip, and region of the calli short pubescent or papillose.

TYPE: CANADA: **Ontario**: MUSKOKA DISTRICT: ca. 6 mi. w. of Bracebridge along highway 118 in Monck township, (45° 02' N., 79° 29' W.), on dry hillside in full sun, *Catling & Whiting* (TRT 169205).

REPRESENTATIVE SPECIMENS

CANADA: **Nova Scotia**: SHELBURNE CO.: Hope's Lot Barrens, Clyde River, 7 Sept. 1921, *M. L. Fernald & B. Long* (AMES 85418). **Ontario**: FRONTENAC CO.: Salmon Lake, Frontenac Park, Bedford Tp., 23 Aug. 1968, *R. Hainault & I. MacDonald* (QK 97607). SIMCOE CO.: lot 4, conc. 10, Innisfill Tp., 30 Aug. 1970, *T. A. Reznicek* (Simcoe Co. Museum 470) **Quebec**: STANSTEAD CO.: Hatley, 11 Sept. 1924, *Mousley* (QFA 42012, AMES 63699). UNITED STATES: **Michigan**: MARQUETTE CO.: summit of Huron Mountain, 1-9 Sept. 1916, *C. K. Dodge* (MICH). **New Hampshire**: COOS CO.: Colebrook, 21 Aug. 1942, *A. S. Pease* 29802 (NEBC). **Vermont**: ORLEANS CO.: Sutton Rd., Willoughby, 13 Sept. 1899 (*Mrs. Bruche*) (NEBC).

We dedicate this species to Mr. Frederick W. Case II, whose book on orchids of the western Great Lakes region has been enjoyed and admired by amateurs and professionals alike. Mr. Case has indicated that the northern plants placed with *Spiranthes vernalis* differed from the southern plants, and he repeated Ames' suggestion of a hybrid origin for the northern plants (*Spiranthes lacera* × *Spiranthes cernua*) here described as *S. casei*.

While such a hybrid origin is quite possible, several characteristics of this plant suggest that it is worthy of specific status. All plants in populations studied have been found to be fertile, and many maintain themselves in the absence of one or both putative parents. There is no evidence of back-

cross-swamping of the distinctness of *Spiranthes casei*. Although *S. casei* is intermediate between *S. cernua* and *S. lacera* in many characters, certain other characters are hard to rationalize in a hybrid; for example, the flowers of *S. casei* are creamy-colored but white in both *S. cernua* and *S. lacera*.

Spiranthes casei (Figs. 1 and 2) has been much confused with other species of *Spiranthes* growing within its range, particularly with *S. cernua* (L.) Rich. and *S. lacera* (Raf.) Raf., but also with *S. romanzoffiana* Cham.

Spiranthes romanzoffiana, which also has creamy or pale yellowish-green flowers, is readily distinguished by the pandurate lip that is sharply constricted beyond the middle (distally), and also by the connivent nature of the sepals and petals which form the hood. Further, the flowers of *S. romanzoffiana* are usually larger (perianth 8-10 mm. long) and arranged in two or more rows in a compact spike. Where *S. casei* and *S. romanzoffiana* occur sympatrically, the latter reaches its peak of flowering in late July and early August, while the former is in full flower in late August and early September.

Spiranthes lacera has a singly-spiralled elongate spike like that of *S. casei*, but it differs in being less robust, in its large, oval, widely spreading leaves in a basal rosette, and its smaller flowers (perianth usually ca. 4-5 mm. long) with green colouration in the lip. *S. lacera* reaches its peak of flowering in Ontario in late July and early August. We have noticed that some plants of *S. lacera* have gone to seed by late August when the first flowers of *S. casei* are opening. *Spiranthes lacera* frequently occupies the same habitats as *S. casei*, and both species grow in close proximity.

Spiranthes cernua may be distinguished from *S. casei* by its shorter stature (20-30 cm.), usually short and compact spike (ca. 5-7 cm. long), and its larger, pure white flowers (perianth usually 9-11 mm. long). In early September we have encountered *S. casei* growing on dry sandy roadside banks only a few feet removed from moist ditches with abundant plants of *S. cernua*. On several occasions the

plants of *S. casei* were noted to be more advanced in flowering, with all of the flowers open and the lower flowers fading. The nearby plants of *S. cernua* were less advanced with the lower flowers fresh and many of the upper flowers still in bud. Although this may be a result of microclimate, it has nevertheless been a consistent observation.

Spiranthes casei shares some characteristics with *S. cernua* (L.) Rich. var. *ochroleuca* (Rydb.) Ames, particularly the cream-coloured flowers and a preference for an upland habitat. The var. *ochroleuca* is stated to differ from the typical form principally in yellowish-white flower colour, longer floral bracts, monoembryonic seeds, and preference for an upland habitat. Ames (1921, p. 78) has indicated that the only reliable means of distinguishing var. *ochroleuca* is through microscopic examination of the seeds. Apparently in other respects it is very close to typical *S. cernua*, as is obvious from the plate provided by Ames (*loc. cit. pl. 127*, Figs. 12-13), which was subsequently used in "The Orchids of North America" (Correll, 1950, *pl. 70*, 12-13). Clearly, this drawing does not illustrate *S. casei*, and the distinctive features of each make the separation of *S. casei* from either variety of *S. cernua* relatively simple.

DISTRIBUTION AND ECOLOGY

The range of *Spiranthes casei* extends from Michigan through Ontario and southern Quebec to the New England states and Canadian maritime provinces (Fig. 3). It is fairly frequent in the Muskoka-Haliburton region of Ontario, where there are 34 stations (and probably many more) separated from one another by distances of at least one mile. Here it is usually found in dry, open locations growing in coarse sandy soil in areas that have been disturbed but are not continually disturbed. Associated plants in such habitats include *Danthonia spicata* (L.) Beauv., *Pteridium aquilinum* (L.) Kuhn., and *Polytrichum* spp. The barren tops of ridges (Fig. 4) are the only naturally occurring habitats in which this orchid has been frequently encountered.

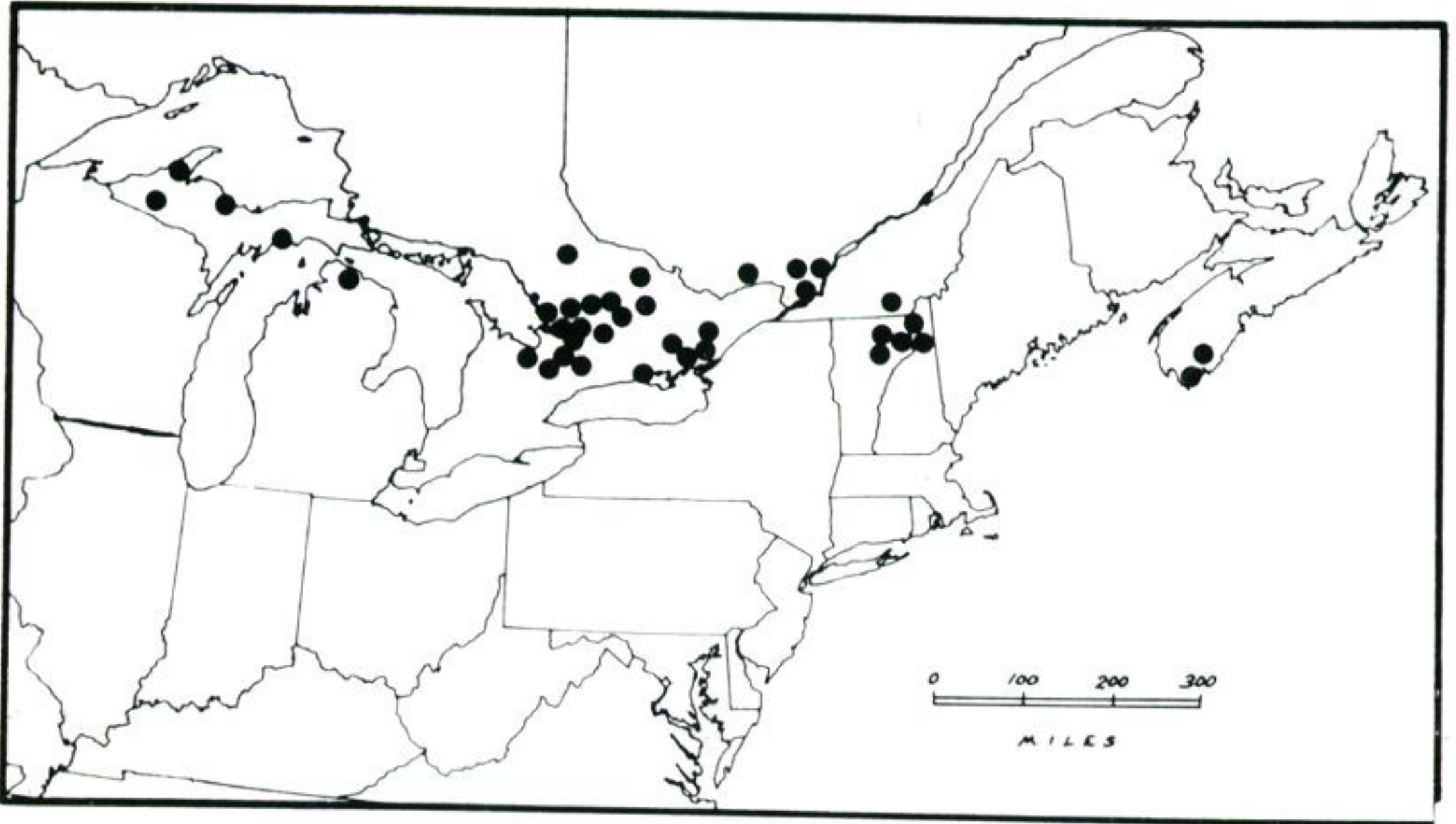


Figure 3. Distribution of *Spiranthes casei* based on specimens examined in the following herbaria: ACAD, AMES, CAN, DAO, HAM, LKHD, MICH, MTMG, NBM, NEBC, NFLD, OAC, QFA, QK, TRT, UWO.



Figure 4. Barren ridge-top on the Precambrian Shield in Matchedash Township, Simcoe County, Ontario. *Spiranthes casei* was quite frequent on this ridge, growing in coarse shallow soil in open locations.

The earliest collection of *Spiranthes casei* from Ontario was made in 1904. Prior to 1965 it had been collected only eight times in the province. However, during the period from 1965-1972 more than 25 specimens have been added to local herbaria. It is true that some of this represents our own field work, but we cannot overlook the possibility that this orchid has become more abundant in Ontario due to human activity, such as land-clearing and road-building. Of 14 collections made since 1970, 10 were from formerly disturbed habitats such as roadsides, sand pits, abandoned fields, and hydro-line transects. *Spiranthes casei* becomes apparent in these sites several years after the initial disturbance.

As with many other plants that quickly colonize habitats created by human activity, *Spiranthes casei* has proved to be at least partially apomictic. Seeds obtained from flowers, from which pollinators were excluded with cloth bags demonstrated 10-25% germination.

ACKNOWLEDGEMENTS

The authors wish to thank Dr. B. Boivin (Central Experimental Farm, Ottawa) for his helpful criticism of this manuscript and for suggesting the new name. Dr. L. A. Garay (Harvard University) was of considerable help during a visit to examine types in the Oakes Ames Orchid Herbarium, and also kindly criticized our work. Miss S. M. McKay, Mr. T. A. Reznicek and Mr. R. E. Whiting assisted with field work. We are also indebted to the herbarium curators who made specimens available for study: Dr. J. F. Alex; Dr. D. S. Christie; Dr. L. Cinq-Mars; Mr. W. J. Cody; Mr. C. E. Garton; Dr. A. E. Garwood; Dr. J. M. Gillet; Dr. O. A. Olson; Dr. J. B. Phipps; Dr. J. S. Pringle; Mr. T. A. Reznicek; Dr. E. A. Shaw; Mr. D. Strickland; Dr. S. Van der Kloet; Dr. E. G. Voss; and Dr. D. W. Woodland. Financial assistance has been provided by the National Research Council of Canada through grant no. A-2363.

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Spiranthes — Catling & Cruise

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Figure 2. Part of a spike of *Spiranthes casei* from Dorset, Ontario. (Photograph by Dr. Erich Haber).

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REPRESENTATIVE SPECIMENS

CANADA: Nova Scotia: shelburne CO.: Hope's Lot Barrens,
Clyde River, 7 Sept. 1921, M. L. Fernald & B. Long (AMES 85418).
Ontario: frontenac CO.: Salmon Lake, Frontenac Park, Bedford
Tp., 23 Aug. 1968, R. Hainault & I. MacDonald (qk 97607). simcoe
CO.: lot 4, cone. 10, Jnnisfill Tp., 30 Aug. 1970, T. A. Reznicek
(Simcoe Co. Museum 470) Quebec: stanstead co.: Hatley, 11 Sept.
1924, Mousley (qfa 42012, ames 63699). UNITED STATES: Michi-
gan: Marquette CO.: summit of Huron Mountain, 1-9 Sept. 1916,
C. K. Dodge (mich). New Hampshire: coos Co.: Colebrook, 21 Aug.
1942, A. S. Pease 29802 (nebc). Vermont: Orleans Co.: Sutton Rd.,
Willoughby, 13 Sept. 1899 (Mrs. Bruche) (nebc).

We dedicate this species to Mr. Frederick W. Case II,
whose book on orchids of the western Great Lakes region
has been enjoyed and admired by amateurs and profession-
als alike. Mr. Case has indicated that the northern plants
placed with *Spiranthes vernalis* differed from the southern
plants, and he repeated Ames' suggestion of a hybrid origin

for the northern plants {*Spiranthes lacera* X *Spiranthes cernua*) here described as *S. casei*.

While such a hybrid origin is quite possible, several characteristics of this plant suggest that it is worthy of specific status. All plants in populations studied have been found to be fertile, and many maintain themselves in the absence of one or both putative parents. There is no evidence of back-

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cross-swamping of the distinctness of *Spiranthes casei*.

Although *S. casei* is intermediate between *S. cernua* and *S. lacera* in many characters, certain other characters are

exam

creamy

S. lacera.

Spiranthes casei (Figs. 1 and 2) has been much confused with other species of *Spiranthes* growing within its range, particularly with *S. cernua* (L.) Rich, and *S. lacera* (Raf.)

Raf., but also with *S. romanzoffiana* Cham.

Spiranthes romanzoffiana, which also has creamy or pale yellowish-green flowers, is readily distinguished by the pandurate lip that is sharply constricted beyond the middle (distally), and also by the connivent nature of the sepals and petals which form the hood. Further, the flowers of *S. romanzoffiana* are usually larger (perianth 8-10 mm. long) and arranged in two or more rows in a compact spike. Where *S. casei* and *S. romanzoffiana* occur sympatrically, the latter reaches its peak of flowering in late July and early August, while the former is in full flower in late August and early September.

Spiranthes lacera has a singly-spiralled elongate spike like that of *S. casei*, but it differs in being less robust, in its large, oval, widely spreading leaves in a basal rosette, and its smaller flowers (perianth usually ca. 4-5 mm. long) with green colouration in the lip. *S. lacera* reaches its peak of flowering in Ontario in late July and early August. We have noticed that some plants of *S. lacera* have gone to seed by late August when the first flowers of *S. casei* are opening. *Spiranthes lacera* frequently occupies the same habitats as *S. casei*, and both species grow in close proximity.

Spiranthes cernua may be distinguished from *S. casei* by its shorter stature (20-30 cm.), usually short and compact spike (ca. 5-7 cm. long), and its larger, pure white flowers (perianth usually 9-11 mm. long). In early September we

have encountered *S. casei* growing on dry sandy roadside banks only a few feet removed from moist ditches with abundant plants of *S. cernua*. On several occasions the

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plants of *S. casei* were noted to be more advanced in flowering, with all of the flowers open and the lower flowers fading. The nearby plants of *S. cernua* were less advanced with the lower flowers fresh and many of the upper flowers still in bud. Although this may be a result of microclimate, it has nevertheless been a consistent observation.

Spiranthes casei shares some characteristics with *S. cernua* (L.) Rich. var. *ochroleuca* (Rydb.) Ames, particularly the cream-coloured flowers and a preference for an upland habitat. The var. *ochroleuca* is stated to differ from the typical form principally in yellowish-white flower colour, longer floral bracts, monoembryonic seeds, and preference for an upland habitat. Ames (1921, p. 78) has indicated that the only reliable means of distinguishing var. *ochroleuca* is through microscopic examination of the seeds. Apparently in other respects it is very close to typical *S. cernua*, as is obvious from the plate provided by Ames (loc. cit. pi. 127, Figs. 12-13), which was subsequently used in "The Orchids of North America" (Correll, 1950, pi. 70,

12-13). Clearly, this drawing does not illustrate *S. casei*, and the distinctive features of each make the separation of *S. casei* from either variety of *S. cernua* relatively simple.

DISTRIBUTION AND ECOLOGY

The range of *Spiranthes casei* extends from Michigan through Ontario and southern Quebec to the New England states and Canadian maritime provinces (Fig. 3). It is fairly frequent in the Muskoka-Haliburton region of Ontario, where there are 34 stations (and probably many

more) separated from

one mile. Here it is i

been

turbed but are not continually disturbed. Associated plants in such habitats include *Danthonia spicata* (L.) Beauv., *Pteridium aquilinum* (L.) Kuhn., and *Polytrichum* spp.

The barren tops of ridges (Fig. 4) are the only naturally occurring habitats in which this orchid has been frequently encountered.

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on specimens

Figure 3. Distribution of *Spiranthes casei* based
examined in the following herbaria: acad, ames, can, dao, ham

LKHD, MICH, MTMG, NBM, NEBC, NFLD, OAC, QFA, QK, TRT, IJWO.

Figu

Barren ridge-top on the Precambrian Shield in Matche-

dash Township, Simcoe County, Ontario. *Spiranthes casei* was quite
frequent on this ridge, growing in coarse shallow soil in open loca-
tions.

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The earliest collection of *Spiranthes casei* from Ontario
was made in 1904. Prior to 1965 it had been collected only
eight times in the province. However, during the period

from 1965-1972 more than 25 specimens have been added to local herbaria. It is true that some of this represents our own field work, but we cannot overlook the possibility that this orchid has become more abundant in Ontario due to human activity, such as land-clearing and road-building. Of 14 collections made since 1970, 10 were from formerly disturbed habitats such as roadsides, sand pits, abandoned fields, and hydro-line transects. *Spiranthes casei* becomes apparent in these sites several years after the initial disturbance.

As with many other plants that quickly colonize habitats created by human activity, *Spiranthes casei* has proved to be at least partially apomictic. Seeds obtained from flowers, from which pollinators were excluded with cloth bags demonstrated 10-25% germination.

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Herbarium

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Mars : Mr. W

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