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A NEW *SPIRANTHES* (ORCHIDACEAE) FROM ASH MEADOWS, NEVADA¹

CHARLES J. SHEVIK

ABSTRACT

Spiranthes occupying moist sites in Ash Meadows, Nye County, Nevada, which have been cited as *S. romanzoffiana* Cham., are described as the new species *S. infernalis* Sheviak. This species is distinguished by very small flowers with free perianth segments spreading at the apices, the segments ochraceous-ochroleucous with fleshy, emerald-green bases, and lips broadest near the middle.

Key Words: *Spiranthes infernalis*, *S. romanzoffiana*, *S. porrifolia*, Ash Meadows, Nevada

INTRODUCTION

Ash Meadows, in southern Nye County, Nevada, is famous as a center of endemism of both plants and animals. Lying on the east side of the Amargosa Valley and separated from Death Valley to the west by the Funeral Mountains and the Amargosa Range, the area owes its remarkable biota to a number of carbonate-rich springs which maintain isolated wetland communities scattered across 16,000 hectares of desert now occupying the bed of a Plio-Pleistocene lake (Beatley, 1976; Riggs, 1984; Schwartz, 1984).

The boreal, cool-montane, and alpine *Spiranthes romanzoffiana* Cham. was reported from Ash Meadows by Beatley (1976), based on a single collection from each of two sites. In conjunction with a study of the *S. romanzoffiana* complex, I examined the specimens cited by Beatley and found the plants to be quite distinctive and, although related to *S. romanzoffiana*, well outside

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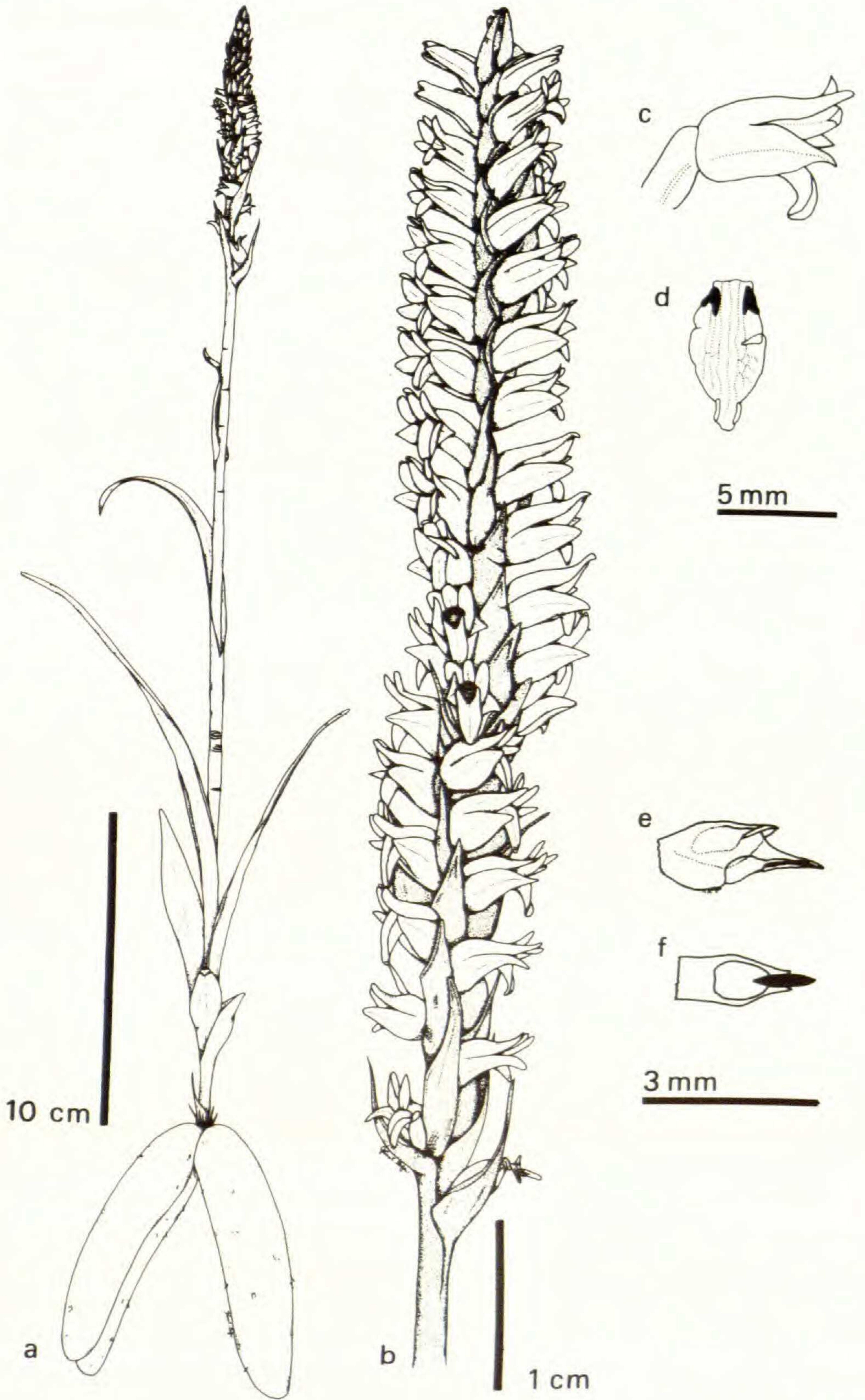
the known variation in this species. An extensive search of herbaria located throughout the region disclosed only one additional collection of the plant, again from Ash Meadows. In 1985 I visited Ash Meadows and located the plant at a fourth site. Although at the time of my collection the plants had already senesced following seed dispersal, two live plants were collected and have been grown since then in a controlled environment chamber. These bloomed in two subsequent years and have proven to be even more distinctive than was apparent in the pressed specimens. The unique features expressed in these plants warrant recognition as a distinct species:

***Spiranthes infernalis* Sheviak, *sp. nov.* (Figure 1)**

Herba erecta glabra, inflorescentia plerumque minute farinosa. Radices tuberoso-incrassatae. Folia linearia, lineari-lanceolata, vel lineari-oblongata, radicalia et saepe cauli versus basim inserta, abrupte bracteis sursum reposita, sub anthesi persistentia. Spica saepissime densissima, 50–130 mm longa, 6–10 mm diametro. Flores 4–6 mm longi, ochroleuci et leviter ochracei, prope bases smaragdini, labelli parte centrali armeniaca. Sepala ad basim connata, apicibus discretis. Labellum 5–6 mm longum, ellipticum, basi constrictionibus abrupte angustata, apicem versus supra minute sed conspicue puberulum.

Herb, slender to stout, 185–390 mm tall, glabrous, commonly minutely and sparsely farinose in the inflorescence. Roots tuberously thickened, to 15 mm in diameter. Leaves persisting into anthesis, linear to linear-lanceolate or linear-oblongate, the larger to 150 mm long and 9 mm wide, basal and often extending along the basal half of the stem, the transition to sheathing bracts abrupt. Spike usually very dense, rarely lax, 50–130 mm long, 6–10 mm in diameter. Floral bracts acuminate, the lower 10–20 mm long. Flowers tubular, perianth 4–6 mm long, ochroleucous and slightly ochraceous, with basal $\frac{1}{4}$ of sepals and petals and up to $\frac{1}{2}$ of lip green and fleshy, remainder of lip ochraceous-ochro-

Figure 1. *Spiranthes infernalis* Sheviak. Drawings from the type collection (a–d: Holotype, *Sheviak 2741a* [NYS]; e, f: Isotype, *Sheviak 2741b* [NYS]). a, b: Drawings from photographs of live plant before pressing. a. Habit; b. Inflorescence. c–f: Camera lucida drawings of liquid-preserved flowers. c. Flower, lateral view; d. Lip, flattened; e. Column, lateral view; f. Column, ventral view. →



leucous and variably orange centrally. Sepals connate basally, lanceolate, acute, the apices spreading. Petals for most of their length associated with the dorsal sepal, lanceolate, obtuse, the apices spreading. Lip 5–6 mm long, broadly (in type) or occasionally narrowly elliptical, often divided by more or less evident constrictions into abruptly narrowed apical and basal segments notably narrower than the middle, the apical segment minutely but conspicuously puberulent above. Scent faint, rose-like.

Chromosome number: $2n = 44$.

TYPE. U.S.A.: Nevada, Nye County: Marshy meadow along stream, in sod of *Distichlis spicata* var. *gracilis*, w/ *Spartina gracilis* and *Anemopsis californica*. W. side of road N.E. from Death Valley Junction, 2.4 mi. S. of turn-off to Devil's Hole, Ash Meadows. Center E. edge Sec. 23, T18S, R50E, elev. 2190 ft. Collected 1984 (2650); bloomed in hort. 1985. *C. J. Sheviak 2741a* (HOLOTYPE: NYS).

PARATYPES. U.S.A.: Nevada. Nye County: Same locality as type, 8 August 1984, *C. J. Sheviak 2650* (NYS); Carex-Juncus vegetation type, Ash Meadows, near Crystal Pool, elev. 2190 ft., Sec. 3, T18S, R50E, 4 July 1968, *J. L. Reveal 1488* (CAS ex DS, RENO, US); Occas., edge of Ash woods, bank of stream running through large spring-fed area N.W. of Devil's Hole, Sec. 35, T17S, R50E, Ash Meadows, elev. 2200 ft., 14 July 1969, *J. Beatley s.n.* (US); In alkali meadow at Collins Ranch, with *Fraxinus velutina* var. *coriacea*, *Mentzelia leucophylla*, and *Oxystylis*, Ash Meadows, elevation ca. 2200 ft., 20 June 1980, *S. A. Cochrane & T. A. Swearingen 1577* (UNLV).

ETYMOLOGY. "Of the netherworld" or "of the lower regions," in allusion to the physiography and extraordinarily hot climate of the species' habitat and in keeping with the local penchant for names that reflect these conditions.

Spiranthes infernalis belongs to a small group of species including *S. romanzoffiana* and *S. porrifolia* Lindl. These species have in common sepals basally connate and forming a tube, lips with a very narrow subapical constriction, and chromosome numbers based on 22. Of these three species, *S. romanzoffiana* is distinct in its white, rather urceolate flower, its base broad, appearing somewhat inflated (I have heard the flower described as looking like it had swallowed a pea); strongly pandurate lip (the apex beyond the constriction broadly dilated); and sepals and petals united to form a hood above the lip. In both *S. porrifolia*

and *S. infernalis*, the flowers are ochroleucous with the sepals and petals free at the apices, these spreading or, in *S. porrifolia*, often recurving. The lips of these species (Figure 2) lack the marked apical dilation of *S. romanzoffiana*, but vestiges of a pandurate form are evident in the common presence of a subapical constriction and variably expanded apical margin, especially in *S. porrifolia*. In *S. infernalis*, after the flower has been open only a few days, this tissue of the apical margin commonly dies, drying as a darker irregular involute mass adherent to the surface of the lip and emphasizing the differentiation of the apical segment. The width and general shape of the lip in *S. infernalis* and *S. porrifolia* is somewhat variable, these species exhibiting similar patterns of variation from broadly to narrowly elliptical in *S. infernalis* and, in *S. porrifolia*, from ovate to lanceolate. In both *S. infernalis* and *S. porrifolia* the upper surface of the apical segment bears a variably dense cushion of peg-shaped trichomes (these appearing ligulate in dried material), a most distinctive feature lacking in *S. romanzoffiana*. The flowers of *S. infernalis* are much smaller (4–6 mm long) than those of *S. romanzoffiana* and *S. porrifolia* (typically 8–12.5 mm long). They have the proportions of those of *S. romanzoffiana*, being rather broad-based and robust, whereas those of *S. porrifolia* are much more slender, without the inflated base (Figure 3). In *S. romanzoffiana* a certain grace is imparted by the geometric precision of the flower's curving hood and downward-curving lip and the rigid ranking of the inflorescence. In *S. porrifolia* and *S. infernalis*, the independently spreading apices of the perianth segments give an aspect to the flowers simply of an open tube, and the geometry of the inflorescence is correspondingly obscured and less elegant. The inflorescence of *S. infernalis* is highly distinctive, the dense arrangement of very small flowers tending to obscure the individual components of the inflorescence and, in some longer inflorescences, suggesting that of a *Plantago*.

The most striking feature of *Spiranthes infernalis* is floral color. As is typical of nearly all species in the genus, flowers of *S. romanzoffiana* are uniformly white or ivory, and those of *S. porrifolia*, ochroleucous. In *S. infernalis*, however, the slightly duller, ochraceous-ochroleucous color evident upon casual observation is limited to the median and apical portions of the sepals and petals and to the more marginal portions of the lip. The basal quarter to half of each segment is deep emerald green, and the

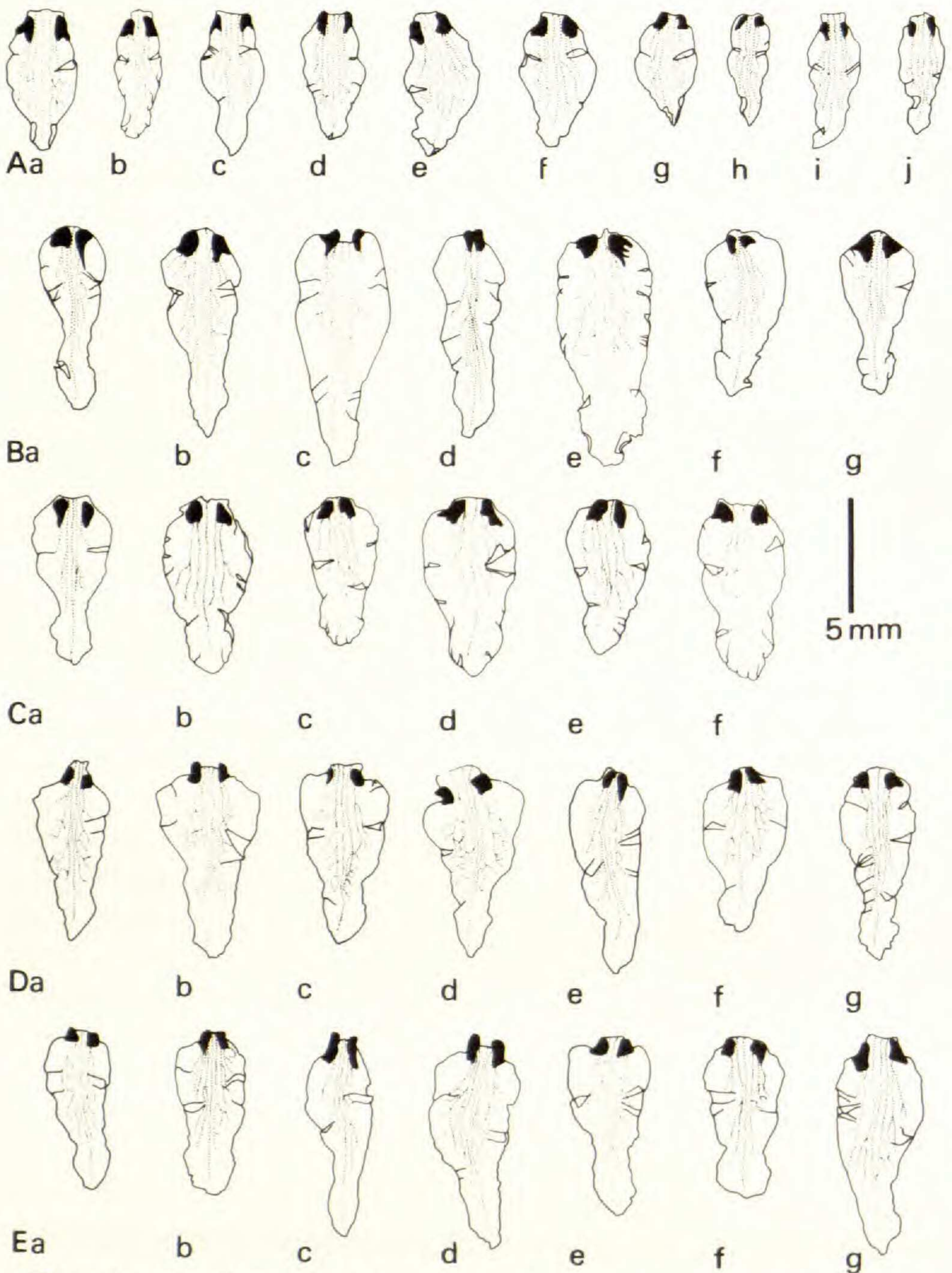


Figure 2. Lips (flattened) of *Spiranthes infernalis* Sheviak (Aa–Aj) and *S. porrifolia* Lindl. (Ba–Eg). Camera lucida drawings from liquid-preserved material (Aa, Ac, Bc) and pressed herbarium specimens.

Spiranthes infernalis: NEVADA: Nye County. **Aa.** Sheviak 2741a (NYS) (Holotype); **Ab.** Sheviak 2650b (NYS) (collected in field); **Ac.** Sheviak 2741b (NYS) (Isotype; same plant as in “Ab,” under cultivation). **Ad–Af:** Cochrane & Swearingen 1577 (UNLV). **Ad.** Plant 1; **Ae.** Plant 2; **Af.** Plant 3. **Ag–Aj:** Reveal 1488 (DS). **Ag.** Plant 1; **Ah.** Plant 2; **Ai.** Plant 3; **Aj.** Plant 4.

Spiranthes porrifolia: Population samples from two sites in CALIFORNIA: **Ba–Ca:** El Dorado County. Sheviak 2510 (NYS). **Ba.** Plant a; **Bb.** Plant b, collected in

apex and central portion of the lip is pale orange. Such coloration is unknown elsewhere in *Spiranthes*, *sensu stricto*.

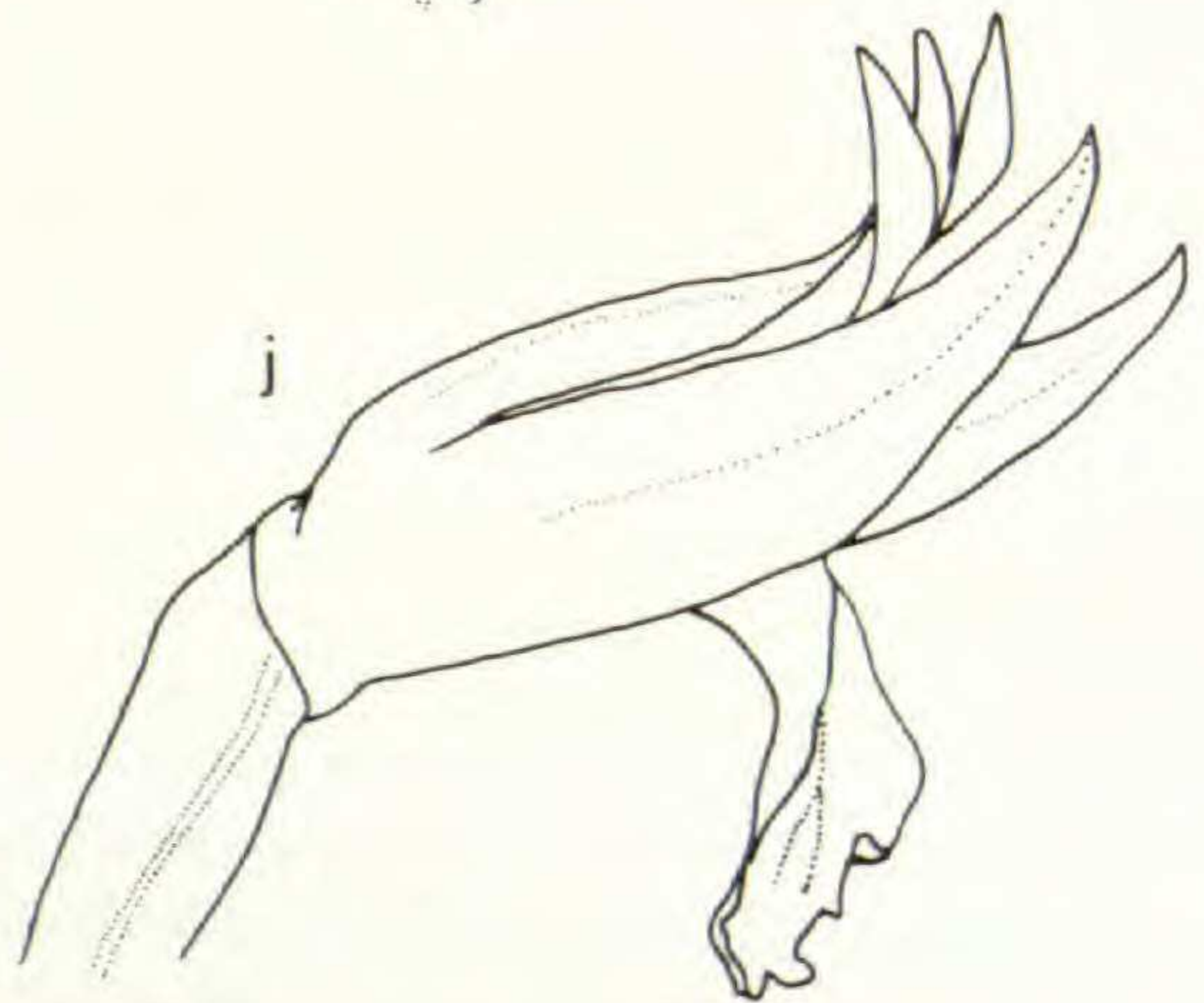
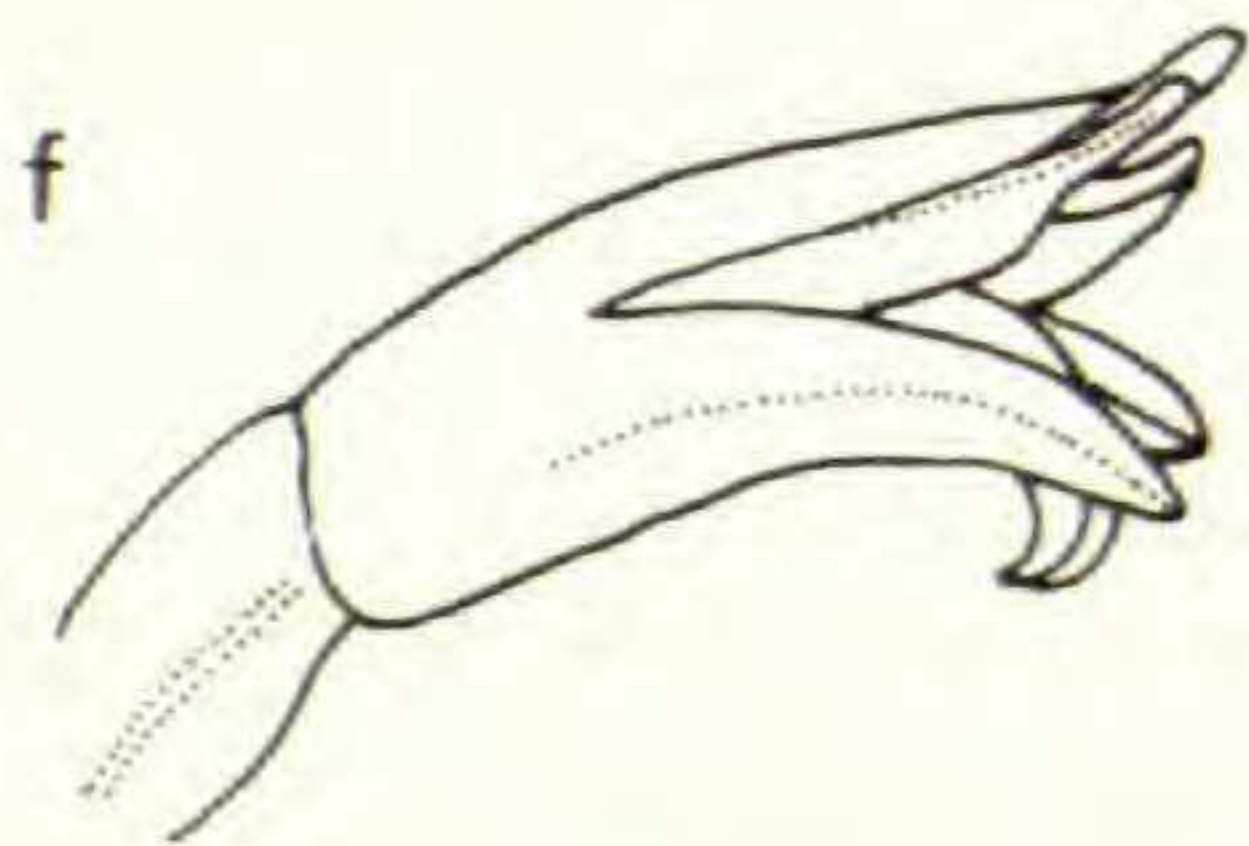
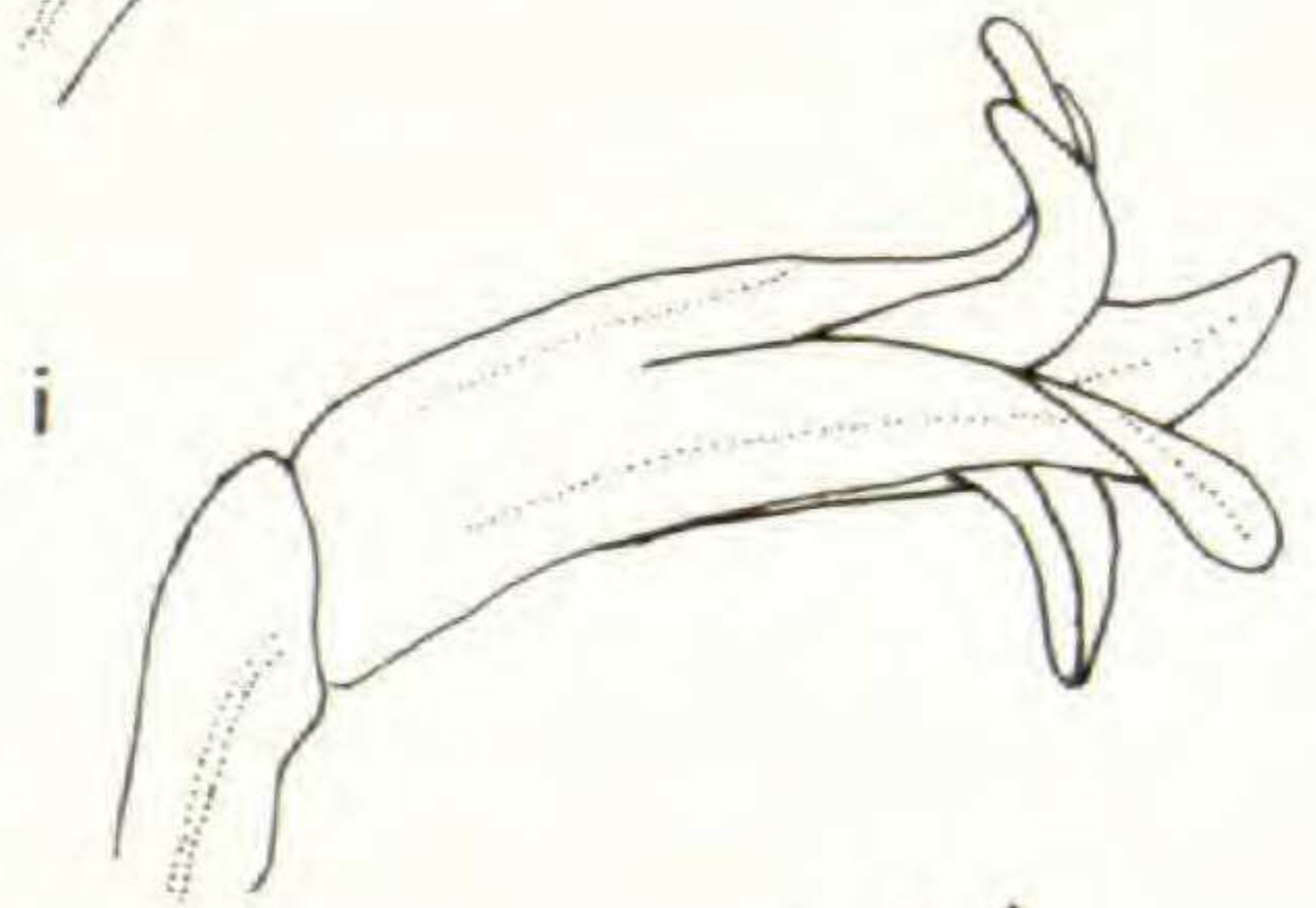
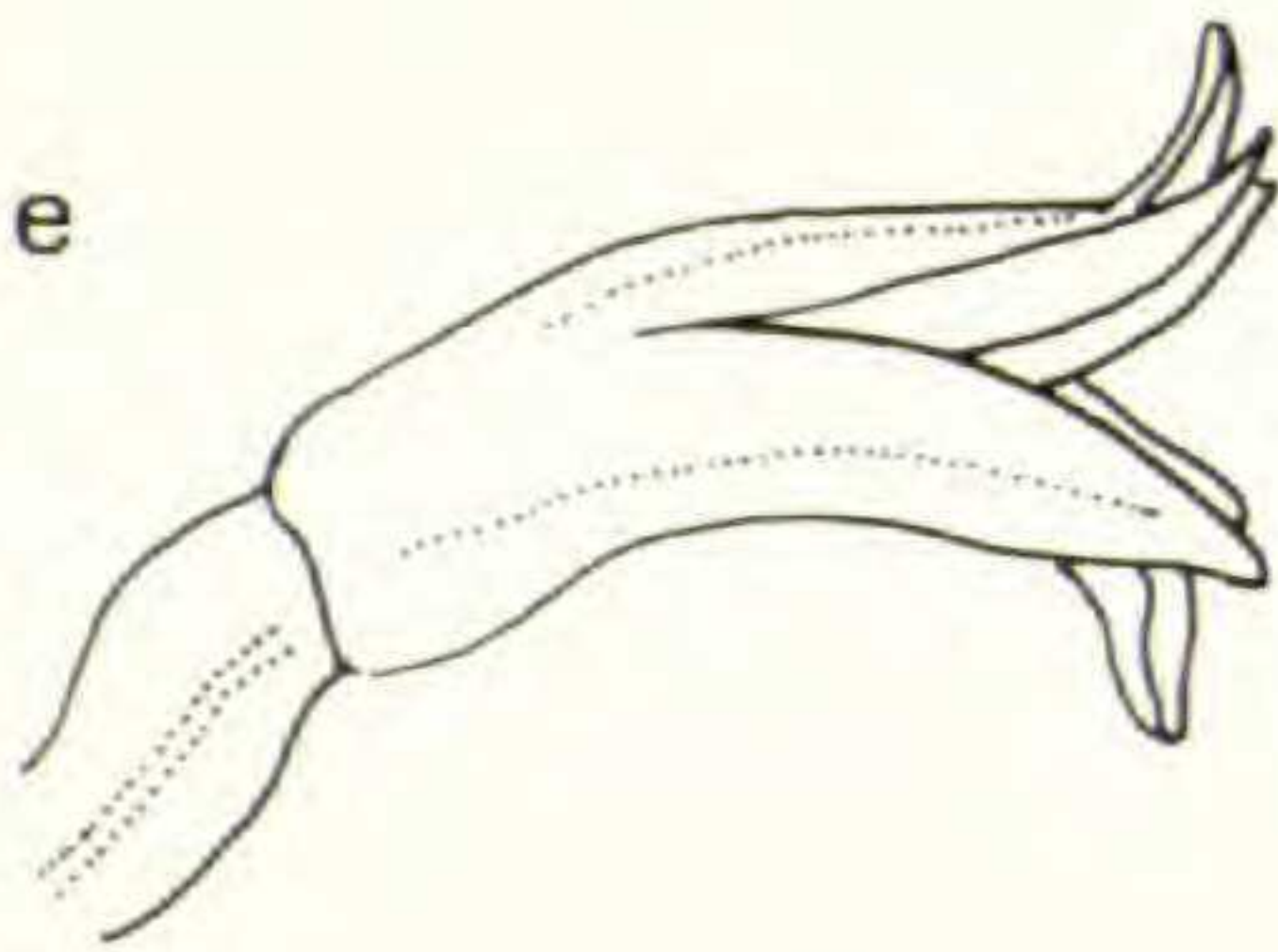
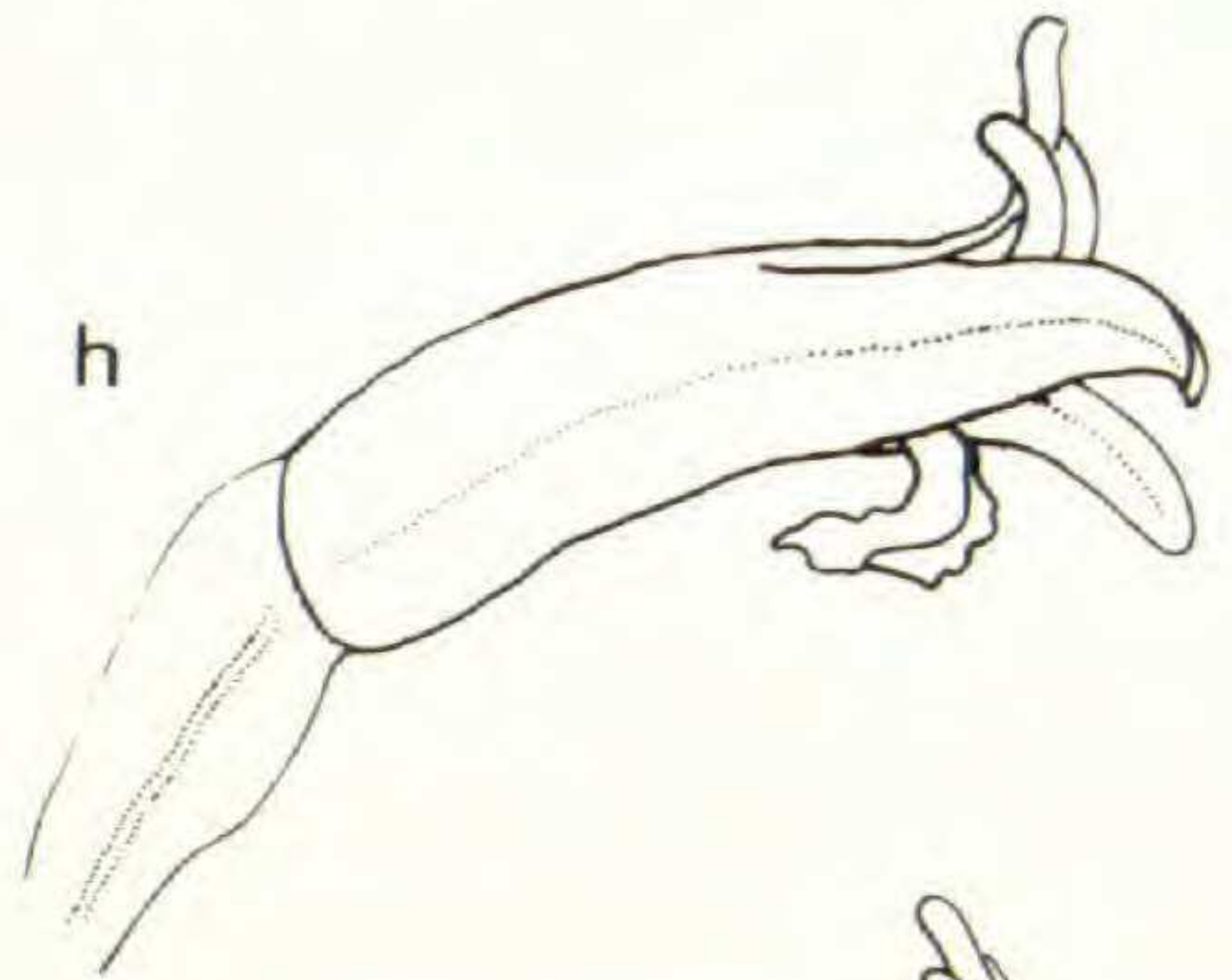
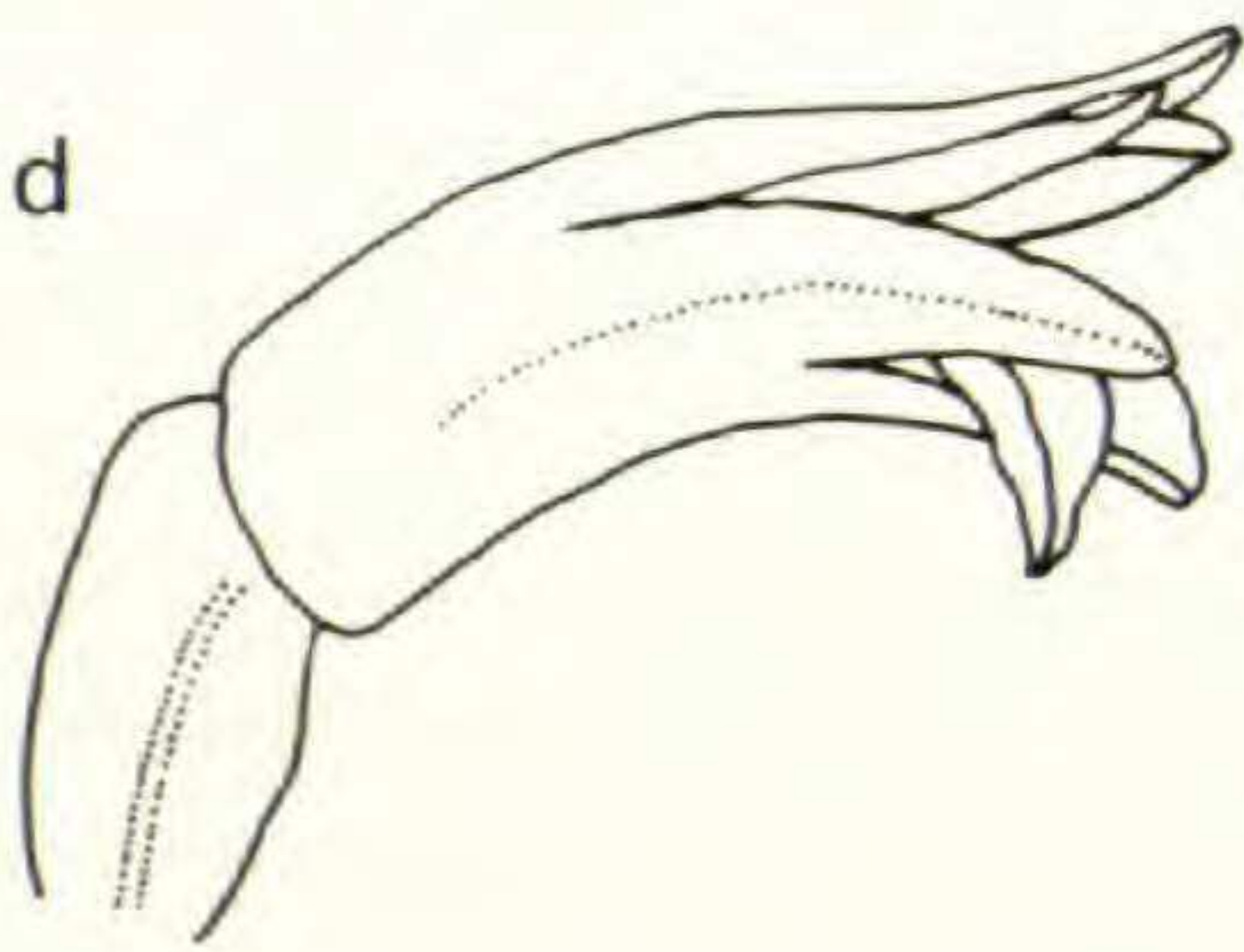
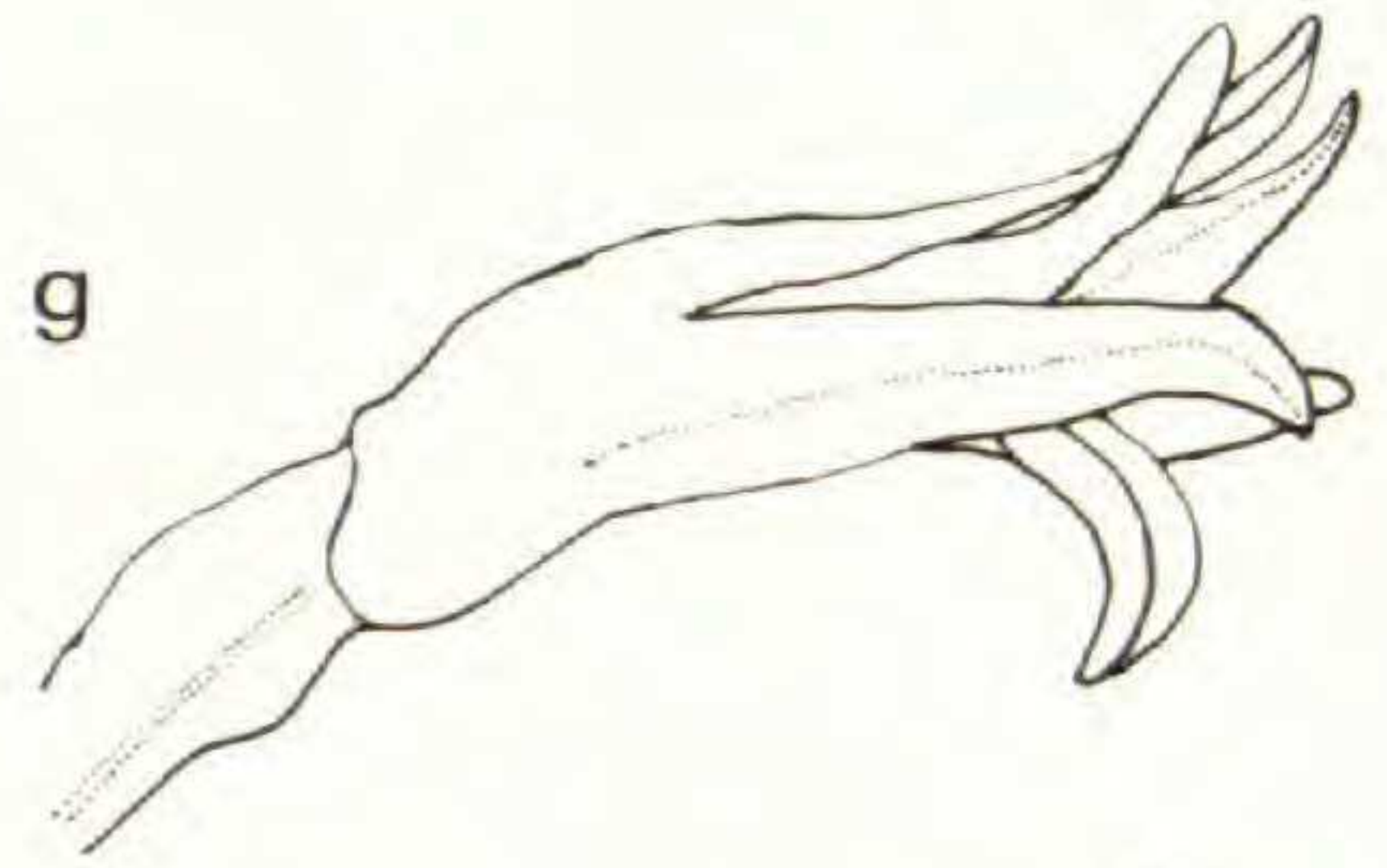
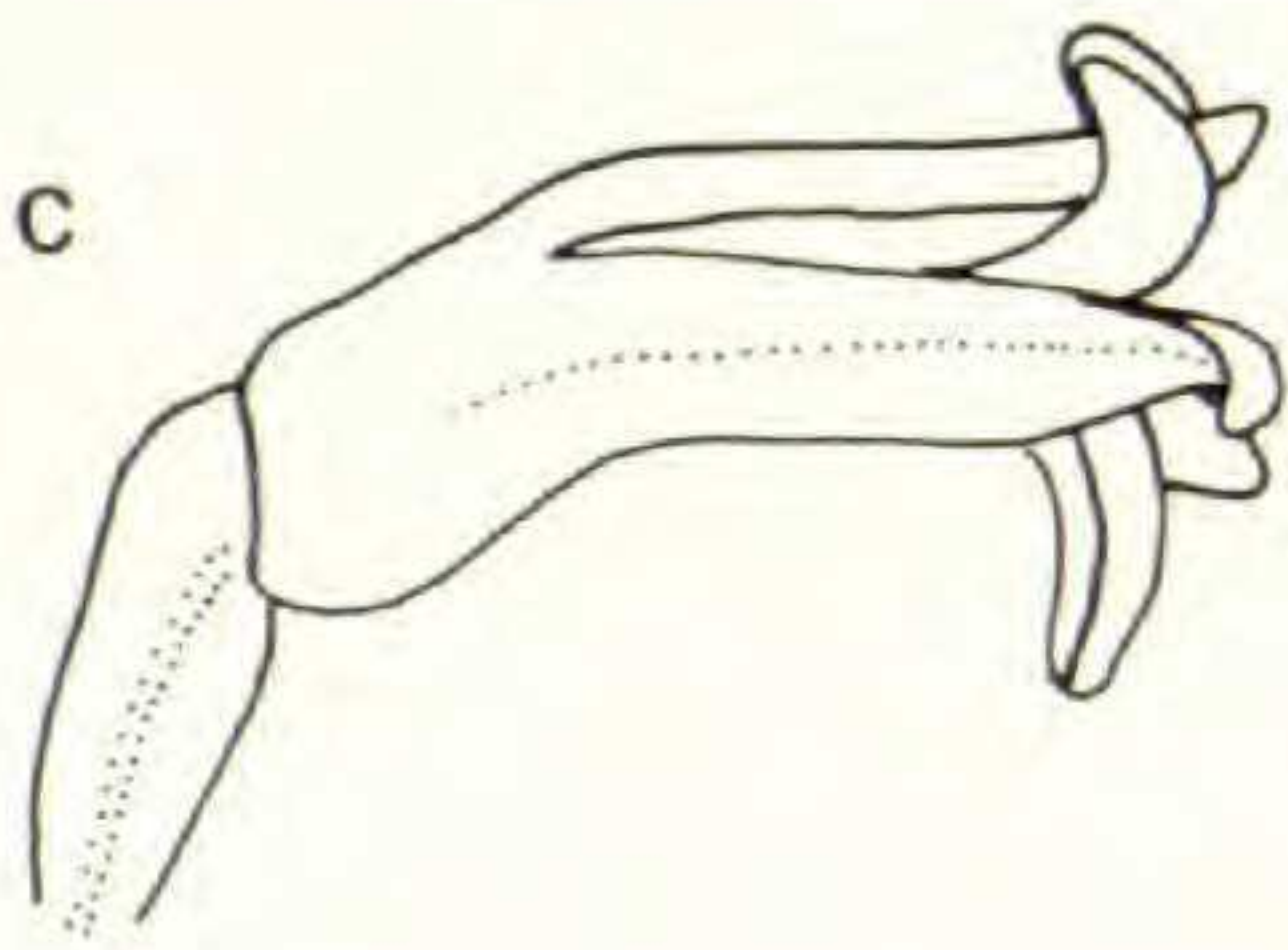
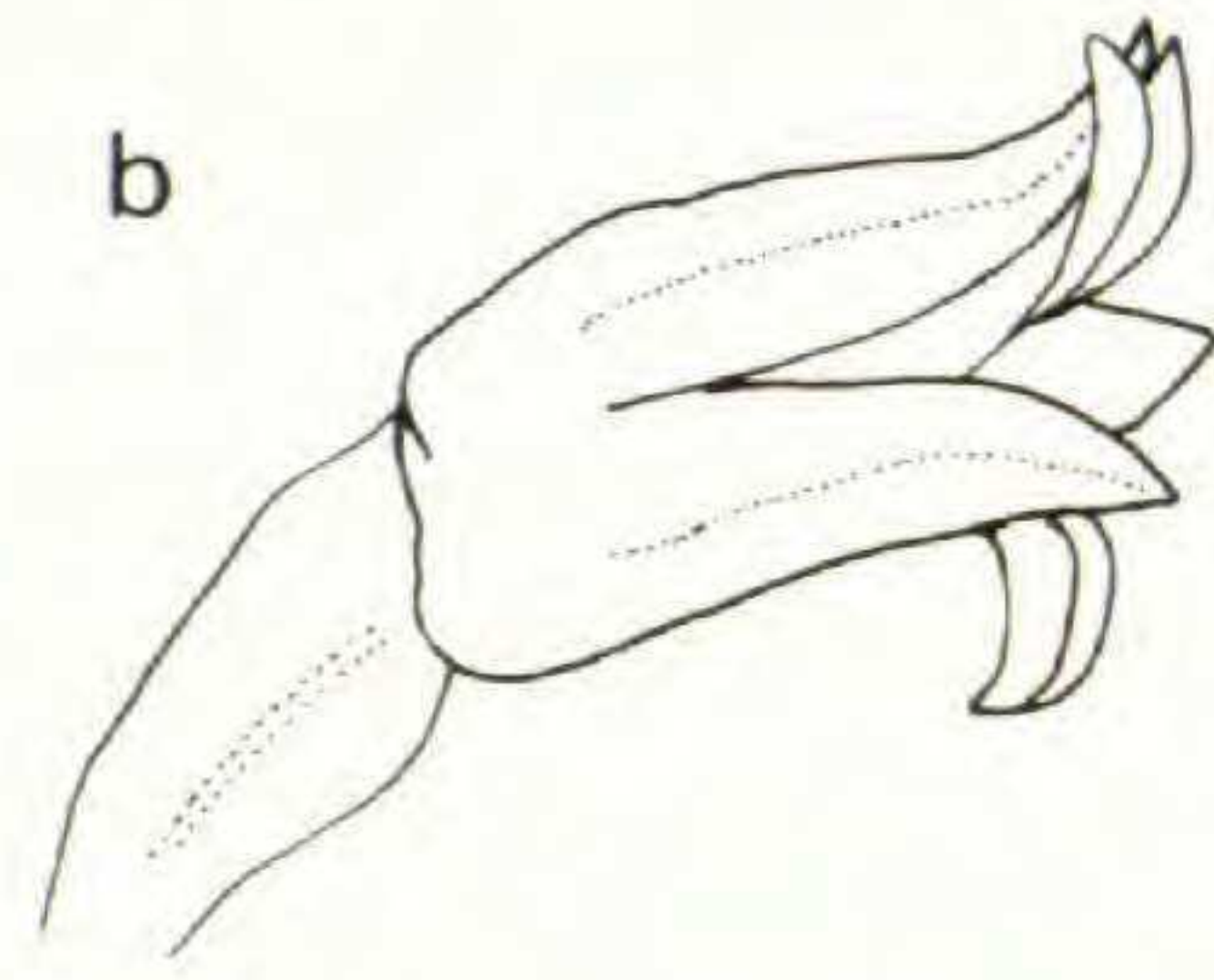
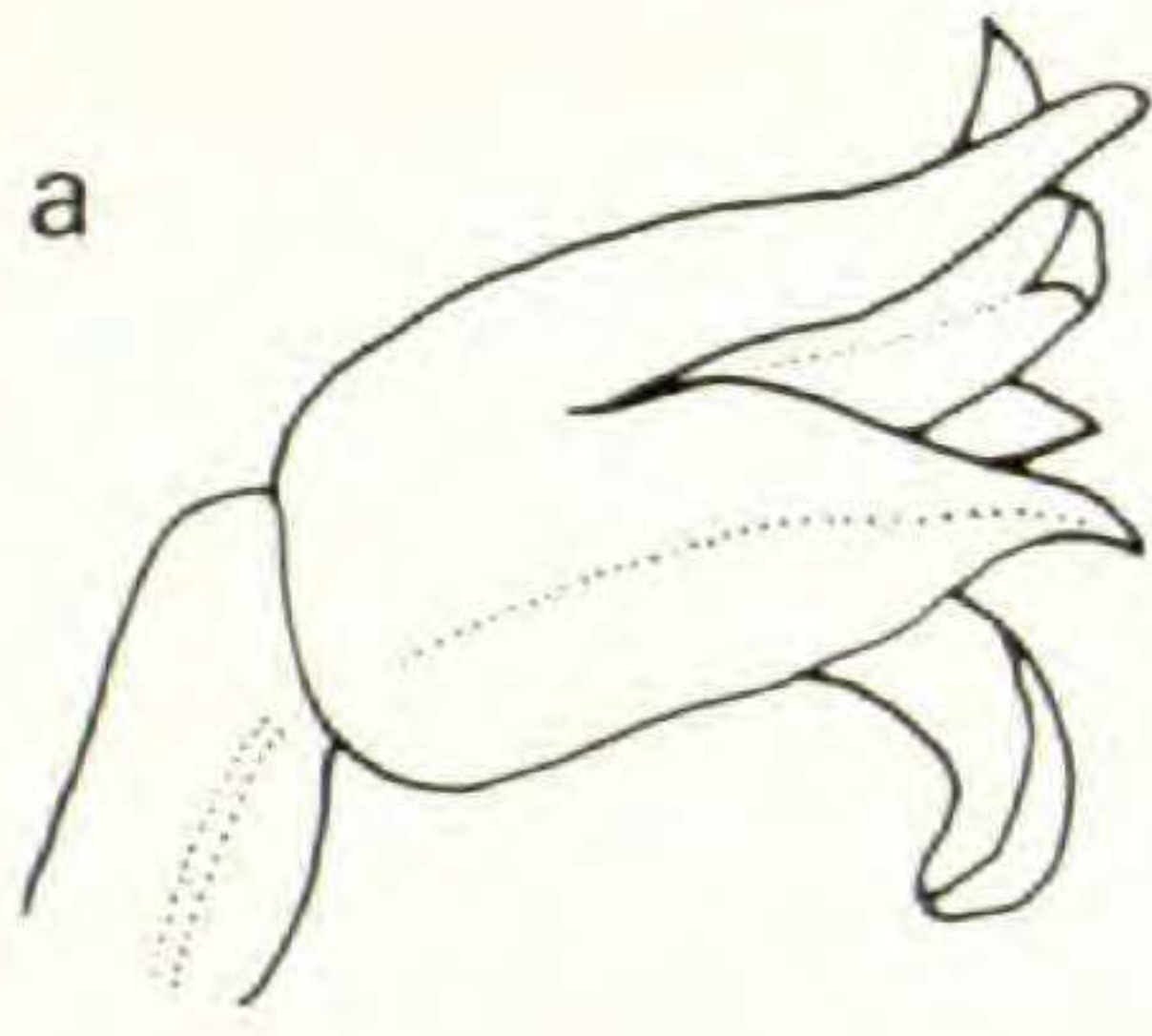
The basal coloration of the perianth corresponds to a zone of thick, rigid, fleshy tissue and in the lip is expressed as a basal segment that is markedly narrower than the middle of the lip. The differentiation of this segment is unique in the genus.

Spiranthes often exhibit marked phenotypic plasticity in floral characters. Stressed individuals in the field may be small-flowered, but under cultivation often produce larger flowers which may display more clearly any distinctive features (Sheviak, 1973, 1982). Similarly, the upper flowers of an inflorescence frequently are reduced in size and non-distinctive, and recent work has emphasized the use of only the lowest flowers in an inflorescence (Sheviak, 1982; Catling and Catling, 1988). This situation dictates caution in the interpretation of differences in size and shape. In the present case, under cultivation the two plants of *S. infernalis* collected for this study remained essentially constant in floral features over two years and compared favorably with the remnants of flowers remaining on the dehisced capsules present when the plants were originally collected. Several plants of *S. porrifolia* from two sites (El Dorado County, California: *Sheviak 2510*, NYS; Trinity County, California: *Sheviak & Sheviak 2911*, NYS) in cultivation exhibited a tendency toward larger flowers and broader lips (Figure 2, Bb and Bc). These changes only serve to emphasize the differences between the two species.


The similarity between *Spiranthes infernalis* and *S. porrifolia*

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field; **Bc.** Same plant as in "Bb," under cultivation; **Bd.** Plant *c*; **Be.** Plant *d*; **Bf.** Plant *1*; **Bg.** Plant *2*; **Ca.** Plant *3*. **Cb–Cf:** Trinity County. *Sheviak & Sheviak 2911* (NYS). **Cb.** Plant *a*; **Cc.** Plant *b*; **Cd.** Plant *c*; **Ce.** Plant *d*; **Cf.** Plant *2*.

Individual plants from across the range of *S. porrifolia*, arranged in approximate order of increasing distance from Ash Meadows. CALIFORNIA: **Da.** San Bernardino County, *Parish s.n.* (CAS 51703), plant "5." **Db.** Fresno County, *McDonald s.n.* (CAS 111842). **Dc.** Monterey County, *Howell 30632* (CAS). **Dd.** Tuolumne County, *Keck & Heusi 299* (CAS), plant *3*. **De.** San Joaquin County, *Rattan s.n.* (CAS 50143). **Df.** Marin County, *Howell 22212* (CAS). **Dg.** Napa County, *Raven 2399* (CAS), plant *2*. **Ea.** Sonoma County, *Rubtzoff 4641* (CAS), plant *7*. **Eb.** Lake County, *Ripley & Barneby 6903* (CAS), plant *1*. **Ec.** Mendocino County, *Zeile s.n.* (CAS 501075). **Ed.** Butte County, *Heller 10776* (CAS), plant *2*. **Ee.** Humboldt County, *Eastwood & Howell 4728* (CAS), plant *3*. **Ef.** Humboldt County, *Tracy 15667* (CAS), plant *1*. WASHINGTON: **Eg.** Klickitat County, *Suksdorf 11498* (CAS), plant *1*.



5 mm



in the reduction and pubescence of the apical segment of the lip, the pattern of variation in lip shape, the free apices of the sepals and petals, and the general ochroleucous floral color, suggest a close relationship between these two species. Indeed, it seems likely that *S. infernalis* evolved from *S. porrifolia* as increasing aridity isolated a small population in Ash Meadows and eliminated *S. porrifolia* from the rest of the region. The small flower and fleshy perianth base of *S. infernalis* are likely responses to the extremely desiccating conditions of extraordinary heat and saline soils which characterize the species' habitat.

Spiranthes infernalis occupies variably moist sites associated with springs and spring-fed streams and marshes. At the site at which I found the species, it occurred within a few meters of a small stream in a seasonally moist or wet community in a sod of *Distichilis spicata* var. *stricta* with *Spartina gracilis* and *Anemopsis californica*. Soil was fine-textured with a high salt content. At the time of collection in early August, the site was very dry and the *Anemopsis* were for the most part withered and brown, as were the *Spiranthes*.

A NOTE ON RARITY

Spiranthes infernalis may be endemic to Ash Meadows. Specimens have not been found from other localities despite an intensive herbarium search. The species has been collected at only four stations, and Beatley (1976) reported that the Crystal Pool colony was extirpated immediately after Reveal's collection was made. I was not able to locate the plant in the general area where Beatley made her collection, but I was uncertain of the precise locality and, of course, could easily have missed the plants if they

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Figure 3. Camera lucida drawings of liquid-preserved flowers, lateral view, of *Spiranthes infernalis* Sheviak (a, b) and *S. porrifolia* Lindl. (c–j). Flowers of *S. porrifolia* in “c”–“i” are small flowers from near apices of inflorescences, chosen to illustrate differences between the species at their closest approach in size. Flower in “j” is from near the base of an inflorescence.

Spiranthes infernalis. **a, b**: NEVADA: Nye County, Sheviak 2741 (NYS). **a**. Plant *a* (Holotype); **b**. Plant *b* (Isotype).

Spiranthes porrifolia. **c–f**: CALIFORNIA: Trinity County, Sheviak & Sheviak 2911 (NYS). **c**. Plant *a*; **d**. Plant *c*; **e**. Plant *2*; **f**. Plant *d*. **g–j**: CALIFORNIA: El Dorado County, Sheviak 2510 (NYS). **g**. Plant *a*; **h**. Plant *b*; **i**. Plant *c*; **j**. Plant *d*.

were in the same condition as those I found further south. Much of the area, however, was seriously disturbed. Again, because of the condition of the plants I found, I cannot judge abundance at the station I located, but the potential habitat was not extensive. Even if the species is more generally distributed than is apparent from collections, its restriction to fragile wetlands which are threatened by regional groundwater depletion suggests that it be considered for Federal endangered species status.

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