

CAREX SECT. STELLULATAE (CYPERACEAE) IN THE NEOTROPICS

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INTRODUCTION

Reznicek & Ball (1980) revised *Carex* sect. *Stellulatae* (Kunth) Christ for North America but paid scant attention to the Neotropical representatives of the section. This paper provides a treatment of all the species that occur in Mexico, Central America, the West Indies, and South America. A key is provided to all Neotropical species. Neotropical endemics are described in full, but North American species that barely enter the region are not described and only briefly discussed. Members of *Carex* sect. *Stellulatae* can be distinguished from all other multiple-spiked members of subg. *Vignea* in the Neotropics by the combination of gynecandrous spikes and spreading to reflexed, planoconvex to biconvex, thick-margined perigynia.

Four species of *Carex* sect. *Stellulatae* are reported from the Neotropics: *C. angustior* Mackenzie, *C. interior* L. Bailey, *C. townsendii* Mackenzie, and *C. turumuquirensis* Steyermark. *Carex interior* is a very wide ranging North American species (Reznicek & Ball 1980) barely entering northern Mexico. The species was treated in detail and Mexican occurrences mapped in Reznicek & Ball (1980). *Carex turumuquirensis* is known only from the type locality in Venezuela. *Carex angustior* is reported from Hispaniola, and Mexico and Guatemala (Hermann 1974; Mackenzie 1931). The type of *C. angustior* is from the state of New York, and the name was placed in the synonymy of the circumboreal *C. echinata* Murray subsp. *echinata* by Reznicek & Ball (1980). *Carex townsendii* is endemic to the cordillera of Mexico and Guatemala and was not discussed by Reznicek & Ball (1980).

Carex turumuquirensis, though known from only one collection, appears to be a distinct species. The perigynia very closely resemble those of *C. interior*, but the more or less acuminate-awned lower staminate scales of the terminal spike set it clearly apart.

Carex angustior and *C. townsendii* both belong in what Reznicek & Ball (1980) termed the *C. echinata* complex. The six species of this complex recognized by Mackenzie (1931) as occurring in North America north of Mexico were reduced by Reznicek & Ball (1980) to one species with two subspecies. Mackenzie (1931) distinguished *C. townsendii* from all other members of the *C. echinata* complex by the combination of obtuse or obtusish, chestnut brown-tinged pistillate scales, phyllopodic culms, and thick, firm, and stiff leaf blades. Mackenzie, however, saw only the type collection. Hermann (1974) concisely summarized the differences universally used to separate *C. townsendii* and *C. angustior* in Mexico and Guatemala by the following couplet:

"Perigynia ovate, abruptly short-beaked, the beak less than half the length of the body.

C. townsendii.

Perigynia lanceolate, tapering into a beak more than half of to about the length of the body.

C. angustior."

Figure 1 shows a scatter diagram of perigynium beak length/body length versus perigynium length/width for all collections of the *Carex echinata* complex from Mexico and Guatemala (not more than two specimens plotted from any locality). Two groups corresponding to the two couplets quoted above are not evident. More striking is the considerable uniformity among specimens in these features, even though collected on different mountains and mountain systems. Figure 2, using the same axes, is based on a random sample of 50 perigynia from 50 culms of a single population sample from central Mexico (Anderson 12946). The variation from throughout Mexico and Guatemala in these perigynium features can be essentially matched by that within one large population. *Carex angustior* in Mexico and Guatemala, as in North America, is not a separable entity. Indeed, few collections from Mexico and Guatemala have lanceolate perigynia (L/W ratio = 3–6).

Based on the perigynium features noted above and all other features examined, Mexican and Guatemalan plants called *C. angustior* and *C. townsendii* are the same species. However, the relationship of these plants to north temperate representatives of *C. echinata* needs clarification. Mexican and Guatemalan plants are most similar to the variable circumboreal *C. echinata* subsp. *echinata*. A few points of distinction, however, are evident. Mexican and Guatemalan plants usually have dark inflorescences with pistillate scales dark brown with very narrow hyaline margins less than 0.1 (–0.2) mm wide. *Carex echinata* subsp. *echinata* usually has pale inflorescences with pale castaneous pistillate scales with broad hyaline margins 0.2–0.4 mm wide. Terminal spikes in Mexican and Guatemalan plants often are lacking a basal staminate portion or have one less than 2 mm long. *Carex echinata* subsp. *echinata* invariably has a staminate basal portion on the terminal spike (1–) 2–8 (–16.5) mm long (Fig. 3). Mexican and Guatemalan plants normally flower centrally, with fertile culms having old leaves of the previous year's vegetative shoot at their base. *Carex echinata* subsp. *echinata* usually flowers laterally, with bladeless sheaths at the base of the fertile culm. The latter difference, however, may be largely due to climate. Plants of *C. echinata* subsp. *echinata* from the very south of its range (e.g., coastal New Jersey) may also flower centrally, presumably because the apical meristem of the previous year's vegetative shoot is not killed by severe winter cold. Mexican and Guatemalan plants also do have stiff leaves, but this feature is difficult to assess and quantify in herbarium material.

None of the above characters alone provides a clear-cut separation of Mexican and Guatemalan plants but in combination allow most collections to be placed without reference to country of origin. The slight morphological differences of Mexican and Guatemalan plants from north temperate representatives of *C. echinata* argue against recognition at species rank. They are here recognized as a subtropical and tropical alpine subspecies, *C. echinata* subsp. *townsendii*, characterized by the separate geographical distribution and the minor morphological differences noted above.

The *Carex echinata* complex also occurs in the Neotropics on the island of Hispaniola in the West Indies. All collections from there, however, have pale

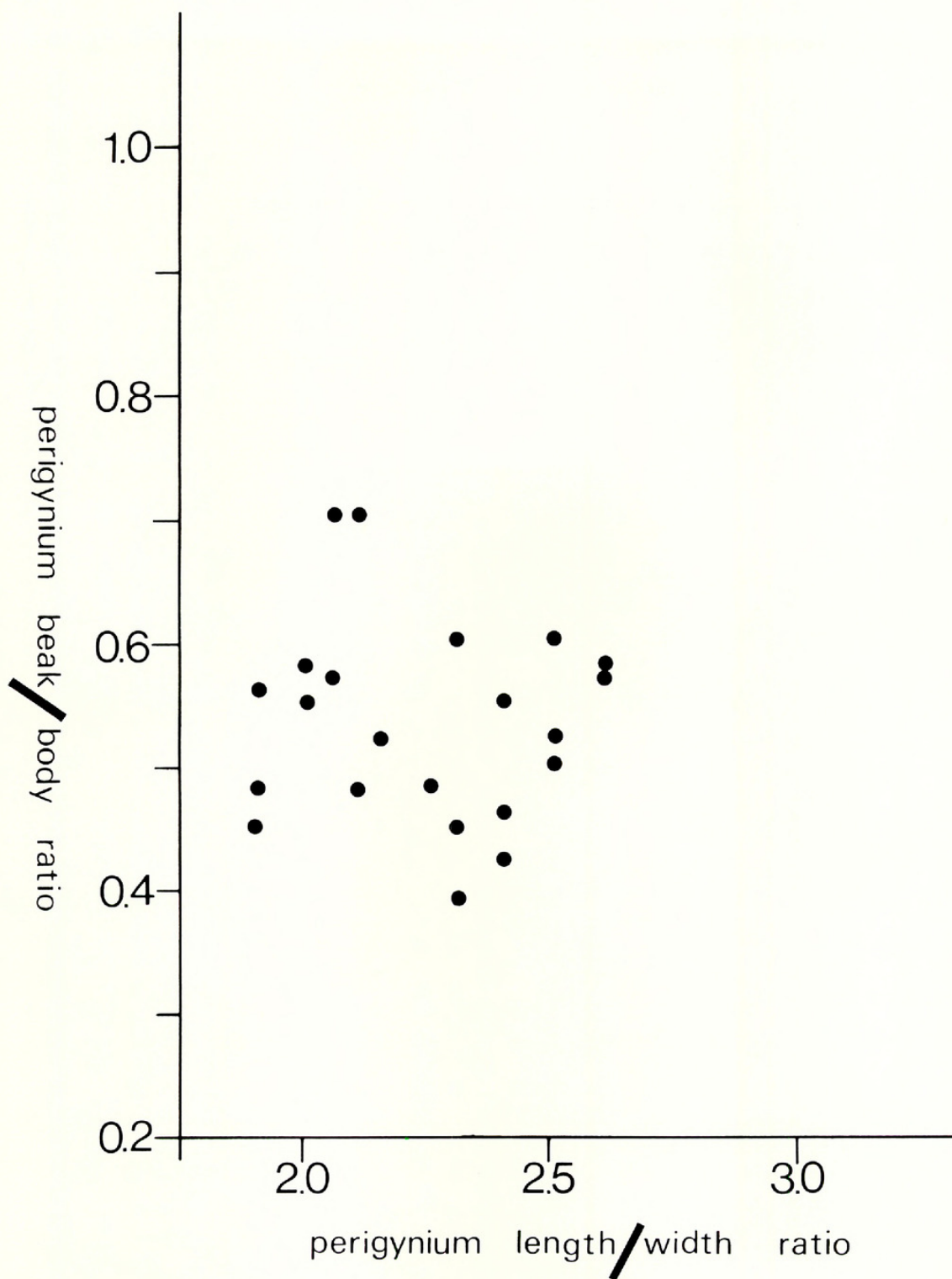


FIG. 1. Scatter plot of perigynium length/width ratio and perigynium beak length/perigynium body length ratio for *Carex echinata* subsp. *townsendii* from Mexico and Guatemala.

inflorescences and scales and staminate bases to the terminal spikes mostly 1.4–5.8 mm long. These collections are clearly referable to *C. echinata* subsp. *echinata*. All have very narrow leaves mostly 0.7–1.4 mm wide and small, narrow perigynia, and are essentially identical with the eastern North American plants, formerly segregated as *C. angustior*, that are of frequent occurrence from the

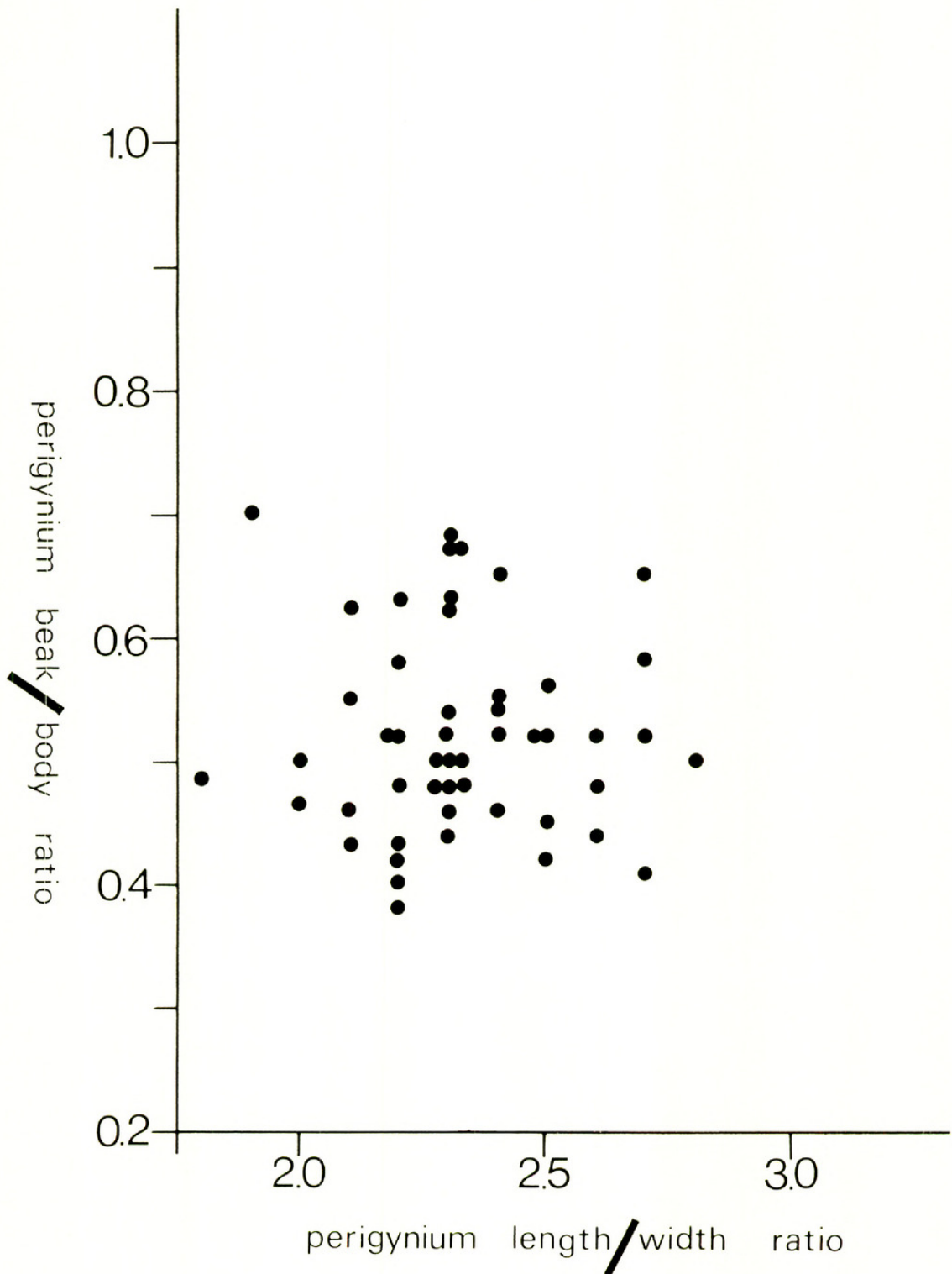


FIG. 2. Scatter plot of perigynium length/width ratio and perigynium beak length/perigynium body length ratio for *Carex echinata* subsp. *townsendii* from a random population sample of 50 perigynia from 50 inflorescences (from Anderson 12946).

southern Appalachian Mountains north to New England. The occurrence of a temperate North American *Carex* on a Caribbean island may seem odd, but odder still is that *C. echinata* subsp. *echinata* is not the only such species in the central cordillera of Hispaniola. *Carex limosa*, *C. leptalea*, *C. longii*, *C. lurida*, and *C. prairea* also occur there, for all but *C. longii* and *C. lurida* their only occurrence in the Neotropics.

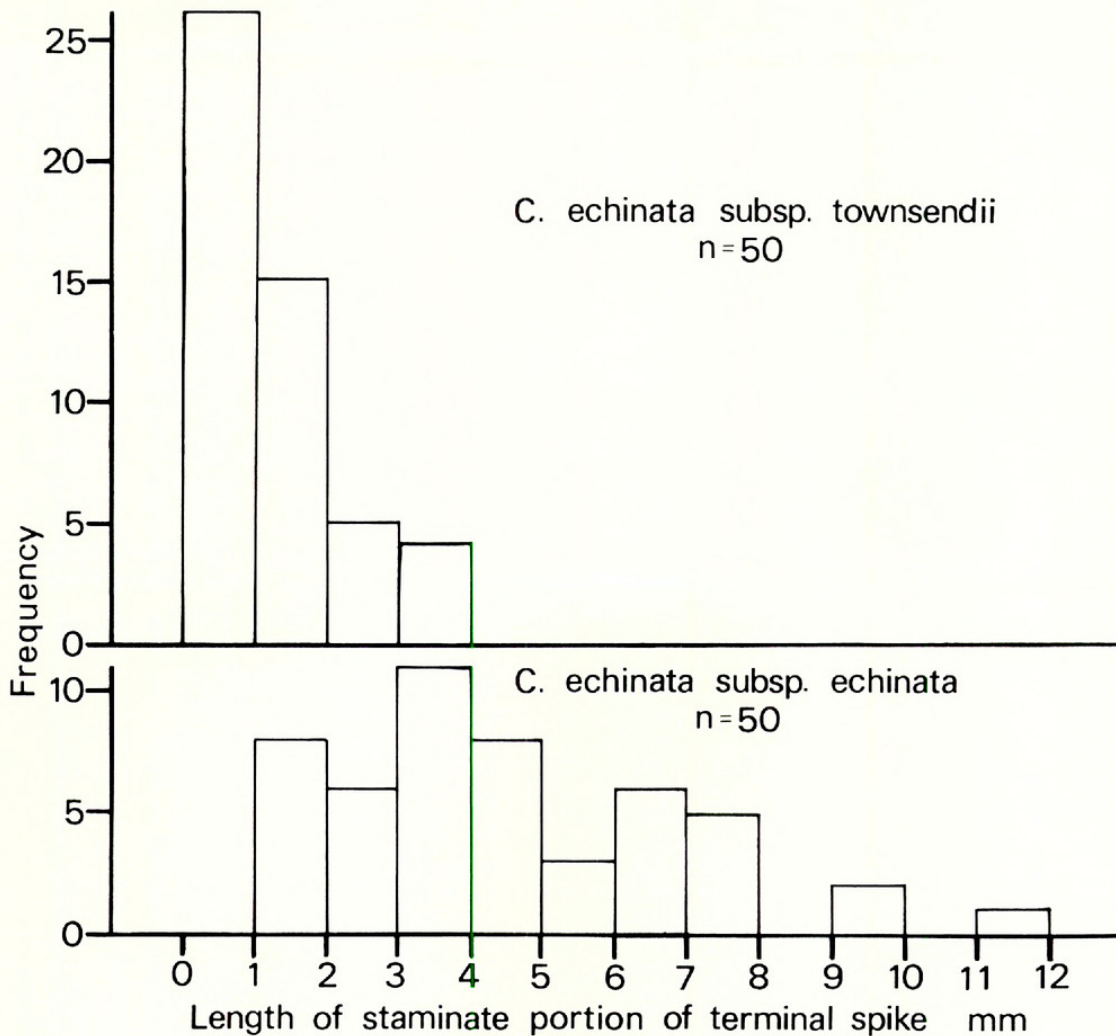


FIG. 3. Frequency diagram of the length of the staminate portion of the terminal spike of *Carex echinata* subsp. *townsendii* (top) and *C. echinata* subsp. *echinata* (bottom).

TAXONOMIC TREATMENT

1. Lower perigynia of spikes mostly 2–3.1 (–3.3) mm long; perigynium beaks 0.4–1 mm long; anthers mostly 0.6–1.2 (–1.4) mm long.
2. Lower staminate scales of terminal spike obtuse to acute; northern Mexico. 1. *C. interior*.
2. Lower staminate scales of terminal spikes acuminate to scabrous-awned; Venezuela. 2. *C. turumuquirensis*.
1. Lower perigynia of spikes mostly (2.65–) 2.8–4.6 mm long; perigynium beaks 0.9–1.8 mm long; anthers mostly (0.8–) 1.1–1.6 mm long.
3. Staminate portion of terminal spike absent or up to 2 (–5.5) mm long; pistillate scales usually castaneous to very dark brown with narrow hyaline margins up to 0.1 (–0.2) mm wide; Mexico and Guatemala. 3b. *C. echinata* subsp. *townsendii*.
3. Staminate portion of terminal spike (1–) 2–8 (–16.5) mm long; pistillate scales stramineous to pale castaneous with hyaline margins 0.2–0.4 (–0.6) mm wide; Hispaniola. 3a. *C. echinata* subsp. *echinata*.

1. *Carex interior* L. Bailey.

This species was described and discussed in detail in Reznicek & Ball (1980) and its distribution in the Neotropics mapped. The collection mapped by Reznicek & Ball from the Distrito Federal, Mexico, and alluded to by Hermann (1974) (*Rzedowski 20386*) has very dark scales and perigynium beaks ca. 0.9–1.1 mm long. This specimen is almost certainly a depauperate individual of *C. echinata*

subsp. *townsendii* and is cited here under that species. The southernmost dot in Mexico on the map in Reznicek & Ball, therefore, should be deleted.

2. *Carex turumuquirensis* Steyermark, Fieldiana: Bot. 28: 70. 1951.—TYPE: VENEZUELA. Sucre: Cerro Turumuquire, on ridge dividing headwaters of Río Manzanares and Río de Amana, 1900–2000 m, 10 May 1945, *Steyermark* 62704 (holotype: F!; isotypes: GH! NY! US!).

Plants caespitose, with short rhizomes; roots brown; fertile culms 15–45 cm tall, trigonous, erect to spreading, elongating in fruit, antrorsely scabrous-angled distally, with glabrous, pale brown basal sheaths. Leaves ca. 4–6, all in basal third; blades 8–25 cm long, 0.8–2.2 mm wide, flat to plicate, glabrous, margins antrorsely scabrous distally, the widest leaves 1.2–2.2 mm wide; leaf sheaths ca. 2–9 cm long, tightly enveloping culms, glabrous, green; inner band of sheaths hyaline, usually purple-dotted on lower sheaths, glabrous, apex concave; ligules 0.7–1.9 mm long, rounded, free portion thickened, stramineous. Vegetative shoots ca. 10–20 cm tall; leaves 4–6, similar to those on fertile culms; pseudoculms ca. 2–6 cm tall. Inflorescences 1.3–2.7 cm long, with the upper spikes overlapping and the lowest 2 spikes overlapping or separate, 3.1–6.8 mm distant; lateral spikes sessile; lowermost bracts 4–27 mm long, sheathless, lanceolate, prolonged into a green, scabrous, setaceous awn 2–25 mm long, the uppermost bracts much reduced. Spikes 3–7, gynecandrous or pistillate. Terminal spikes gynecandrous, 5.1–11.2 mm long; staminate portion 2.2–6.7 mm long, 0.8–1.3 mm wide, 4–11-flowered; pistillate portion 2.3–7.1 mm long, 4.3–5.3 mm wide, 2–12-flowered; sessile or on peduncles up to 3.9 mm long. Lateral spikes gynecandrous or pistillate, 3.2–6.9 mm long, 4.2–5.2 mm wide; staminate portion, if present, up to 2.3 mm long and 1–4-flowered; pistillate portion 2.6–5.8 mm long, 4–11-flowered. Pistillate scales 1.5–2.4 mm long, 1.1–1.8 mm wide, ovate, acute, glabrous, stramineous to pale castaneous with narrow hyaline margins up to 0.4 mm wide and green center, 1-veined. Staminate scales 1.7–3.5 mm long, 1–1.8 mm wide, narrowly ovate, acute to acuminate, the lowermost of the terminal spike sometimes prolonged into a scabrous awn up to 1.5 mm long, glabrous, stramineous to pale castaneous with narrow hyaline margins up to 0.2 mm wide and green center, 1-veined. Lower perigynia of spikes 2.4–3.1 mm long, 1–1.7 mm wide, spreading to more or less reflexed, planoconvex to slightly biconvex, ovate in outline, 1.7–2.4 times as long as wide, stramineous to castaneous, sessile, smooth-margined or serrulate on margins to 0.3 mm below base of beak, veinless or with up to 3 veins over achene adaxially, abaxially 6–12-veined over achene, spongy-thickened at base surrounding achene, contracted into a beak; beaks 0.7–1 mm long, 0.4–0.55 times as long as the body, stramineous to castaneous, serrulate on margins, the apex bidentulate with teeth up to 0.3 mm long. Achenes ca. 1.3–1.5 mm long, ca. 0.9–1.2 mm wide, biconvex, rhombic-ovate in outline, tightly enveloped by the perigynia, brown, sessile. Styles withering; stigmas 2. Anthers 3, 0.9–1.2 mm long.

Carex turumuquirensis was collected in a swampy meadow and is known only from the type collection. The type has spikes in mature fruit as well as ones just budding and ones far past maturity, thus fruiting probably occurs throughout the year.

Steyermark (1951) compared *C. turumuquirensis* quite accurately with *C. interior*. The thick-margined, small perigynia are certainly similar to those of *C. interior*; sufficiently so that individual perigynia of the two species could not be

reliably distinguished, although those of *C. turumuquirensis* are often narrower and slightly longer beaked. The consistent presence of a bract with a setaceous awn 2–25 mm long subtending the lowermost spikes also helps distinguish *C. turumuquirensis* from *C. interior*, which only rarely has a short setaceous awn on the lowermost bract. Representative inflorescences of *C. turumuquirensis* are shown in Figure 5.

3a. *Carex echinata* Murray subsp. *echinata*.

This subspecies was described and discussed in detail in Reznicek & Ball (1980) and its North American distribution mapped. In Hispaniola it occurs in wet places in open pine forest; seepy, grassy hillsides; "silt flats;" and other wet open sites from 1900–2900 m. Fruiting collections have been gathered from May through September. To the map in Reznicek & Ball (1980) must be added the localities in Hispaniola cited below.

SPECIMENS EXAMINED. HISPANIOLA. Santo Domingo; prope Constanza in Valle Nuevo, *von Türckheim* 3416 (NY); Valle Nuevo, *Augusto & Alain* 1492 (A, NY); Cordillera central, prov. de Azua, San Juan, Lomas de la Mediana, Sabaná Nueva, *Ekman* 13600 (A, GH, MICH, NY); Cord. Central, La Agüita, La Rucilla, *Liogier* 21729 (NY); Dominican Republic, La Vega: vicinity of Lagunita, *Gastony, Jones & Norris* 304 (GH, MICH, NY). San Juan: Sabaná Nueva, *R.A. & E.S. Howard* 9085 (GH, MICH, NY), 9095 (GH, NY).

3b. *Carex echinata* Murray subsp. *townsendii* (Mackenzie) Reznicek, comb. nov.

Carex townsendii Mackenzie, N. Amer. Fl. 18:111. 1931.—TYPE: MEXICO.

Chihuahua: Sierra Madre near Colonia García, 7500 feet, Jul 21 1899, *Townsend & Barber* 157 (holotype: NY!; isotypes: CAS! GH! MO! US!).

Plants caespitose, with short rhizomes; roots pale yellow to brown; fertile culms 10–65 cm tall, trigonous, erect to spreading, elongating in fruit, antrorsely scabrous-angled distally, with glabrous, pale brown basal sheaths. Leaves 4–8, all in basal third; blades 9–23 cm long, 1.4–2.8 mm wide, flat to plicate, glabrous to more or less papillose, usually more or less antrorsely scabrous on main veins adaxially, glabrous abaxially, the margins antrorsely scabrous distally, the widest leaves 1.6–2.8 mm wide; leaf sheaths 1.1–9.5 cm long, tightly enveloping culms, glabrous, green; inner band of sheaths hyaline, stramineous, sometimes faintly purple-dotted, glabrous, apex concave; ligules 0.8–1.7 mm long, rounded, free portion thickened, whitish to stramineous. Vegetative shoots ca. 6–33 cm tall; leaves 4–7, similar to those on fertile culms; pseudoculms ca. 2–11 cm tall. Inflorescences 1.1–3.9 cm long, with the upper spikes overlapping and the lowest 2 spikes overlapping or separate, 4.3–15 mm distant; lateral spikes sessile; lowermost bracts 3.6–27 (–45) mm long, sheathless, ovate, acuminate or more usually prolonged into a green, scabrous, setaceous awn 1.2–25 (–42) mm long, uppermost bracts much reduced. Spikes (2–) 3–8, gynecandrous or pistillate. Terminal spikes gynecandrous or pistillate, 4.4–11.8 mm long; staminate portion 0–2 (–5.5) mm long, 1.4–1.6 mm wide, 0–6 (–13)-flowered; pistillate portion 4.4–8.9 mm long, 5.6–8.5 mm wide, 7–26-flowered; sessile or on peduncles up to 2.2 mm long. Lateral spikes usually pistillate, 4.2–8.5 mm long, 5.3–8.7 mm wide; staminate portion, if present, up to 1.5 mm long and 1–3-flowered; pistillate portion 4.2–8.5 mm long, 5–17-flowered. Pistillate scales 1.9–2.9 mm long, 1.4–2.4 mm wide, ovate, obtuse to acute, glabrous, castaneous to very dark brown with narrow, hyaline margins up to 0.1 (–0.2) mm wide and green center, 1 (–3)-veined. Staminate scales 2.6–3.9 mm long, 1.4–2.1 mm wide, ovate,

acute, glabrous, pale castaneous to very dark brown with narrow, hyaline margins up to 0.1 (–0.2) mm wide and green center, 1 (–3)-veined. Lower perigynia of spikes (2.8–) 3.1–4.6 mm long, 1.3–2.1 mm wide, spreading to more or less reflexed, planoconvex, ovate in outline, 1.8–3.1 times as long as wide, stramineous to dark brown, sessile, smooth-margined or serrulate on margins to 0.7 mm below base of beak, usually veinless or rarely with up to 4 faint veins over achene adaxially, abaxially 3–14-veined over achene, spongy-thickened at base surrounding achene, contracted into a beak; beaks 0.9–1.8 mm long, 0.4–0.6 times as long as the body, stramineous to dark brown, serrulate on margins, the apex usually bidentulate with teeth up to 0.4 mm long. Achenes 1.4–1.9 mm long, 1.1–1.5 mm wide, biconvex, rhombic-ovate in outline, tightly enveloped by the perigynia, brown, sessile. Styles withering; stigmas 2. Anthers 3, 1–1.6 mm long.

Carex echinata subsp. *townsendii* occurs in open sedgy and boggy seeps, along streambanks in open pine forest, and in wet, open meadows from 2300–3800 m from Chihuahua, Mexico, to western Guatemala (Fig. 4). Fruiting occurs from late May through October. The range of this subspecies appears to be divided into three parts. The plant is locally frequent in western Guatemala and the transvolcanic belt in central Mexico; the type is the only known collection from Chihuahua. Although the sample of specimens is too small for positive conclusions, there appear to be no substantial differences in plants from these three areas, although the Chihuahua collection has slightly paler scales than most specimens from the other areas. A gap of about 1200 km separates the Chihuahua locality from the

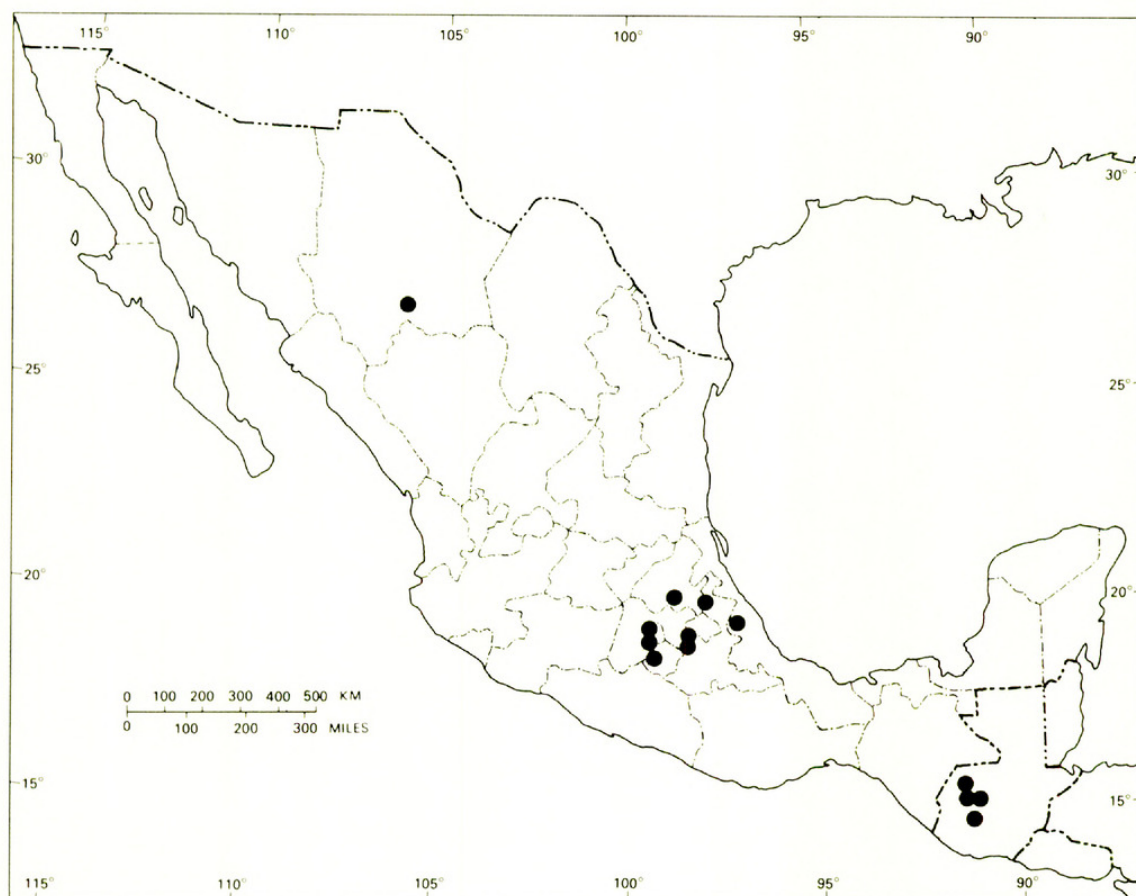
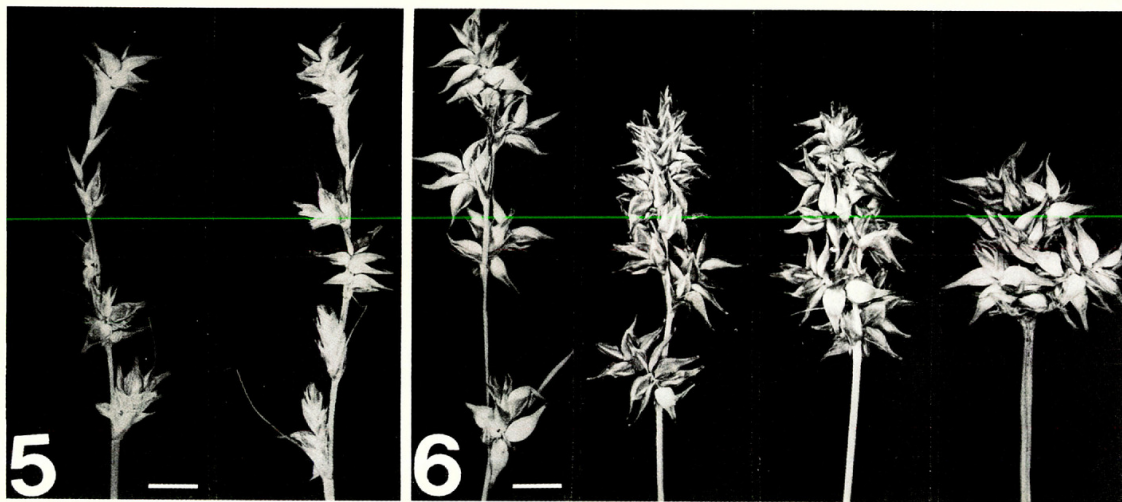


FIG. 4. Distribution of *Carex echinata* subsp. *townsendii*.



FIGS. 5-6. Representative inflorescences of *Carex turumuquirensis* and *C. echinata* subsp. *townsendii*; bar = 3 mm. 5. *C. turumuquirensis* (from Steyermark 62704). 6. *C. echinata* subsp. *townsendii* (from Anderson 12946).

nearest localities of *C. echinata* subsp. *echinata* in central Utah and Colorado and southern California.

With its dark scales and perigynia and terminal spikes often lacking a basal staminate portion, *C. echinata* subsp. *townsendii* might seem similar to the north-eastern North American *C. sterilis* Willd., but it can readily be distinguished by the narrow, usually less than 0.1 mm wide hyaline margins of the pistillate scales, the shorter anthers 1–1.6 mm long, the narrower perigynia 1.8–3.1 times as long as wide, and the smooth or only sparsely ciliate-serrulate margins of the perigynium body. *Carex sterilis* has broader hyaline margins 0.2–0.5 mm wide on the pistillate scales, anthers (1–) 1.2–2.2 (–2.35) mm long, perigynia 1.4–2.3 (–2.7) times as long as wide, and densely ciliate-serrulate margins on the perigynium body. *Carex sterilis* is also usually more or less dioecious. Representative inflorescences of *C. echinata* subsp. *townsendii* are shown in Figure 6.

SPECIMENS EXAMINED. GUATEMALA. Huehuetenango: alpine areas in vicinity of Tunimá, Sierra de los Cuchumatanes, *Steyermark* 48331 (F, GH); top of Cerro Chemalito, Sierra de los Cuchumatanes, *Steyermark* 49924 (F); Chiantla, between Llano de Musmul and Llano de San Nicolás, *Smith* 174 (F–2, MICH). Totonicapán: on the Tecum Uman Ridge at km 154 on Ruta Nacional No. 1, ca. 20 km east of Totonicapán, *Beaman* 4184 (ENCB, GH, MICH); Totonicapán, parcialidad Velasquez, *Smith* 827 (F).—MEXICO. Distrito Federal: Desierto de los Leones, *Lyonnet* 2145 (CAS, ENCB, MEXU–2, US), 2597 (ENCB, MEXU–2); 4º dinamo de contreras, *Rzedowski* 20386 (US); Llano de la Cieneguilla, arriba del Desierto de los Leones, *González* 1107 (ENCB), 1108 (ENCB, MEXU); Delegación de Cuajimalpa, Puerto de las Cruces, *Rzedowski* 30808 (ENCB), 34273 (ENCB), 36722 (ENCB), *González* 997 (ENCB). Hidalgo: Sierra de Pachuca, *Pringle* 11364 (GH). México: 5 km al NW de Santa Ana Jilotzingo, *Rzedowski* 35121 (ENCB); south-west slopes of Volcán Ixtaccihuatl along north side of Hwy 451 just below (W of) Parque Ixtapopo entrance, 2 km W of road jct. at Paso de Cortés, *T.S. & B.A. Cochrane* 8563 (ENCB, MEXU, MICH); Ladera NW del Popocatepetl, cerca del Paso de Cortés, *González* 1152 (ENCB); Mpio. de Amecameca, La Joya de Alcalicán, *Rzedowski* 36656a (ENCB), 36658a (ENCB), 36659a (ENCB); Mpio. de Iturbide, Presa Iturbide, 6 km al WNW de Santiago Tlazala, *Rzedowski* 35100 (ENCB); 2 km al SW de Santiago Tlazala, *González* 1119 (ENCB); Mpio. de Naucalpan, Villa Alpina, *Rzedowski* 35677 (ENCB, MEXU), 36153 (ENCB), 36156 (ENCB), 36159 (ENCB); Mpio. Ixtapaluca, Estación experimental de Investigación y Enseñanza de Zoquiapán, 8 km al S del Río Frío, *Koch* 75351 (ENCB, MEXU), *Vega* 234 (ENCB), 357 (ENCB, MEXU), *Galván* 699–B (ENCB), *Anderson* 12946 (MICH); entre Cerro Telapón y Cerro Tlaloc, *Arroyo* 274 (ENCB); Cañada de Temascatitla, 12 km al SSW de Río Frío, *Rzedowski* 37017 (ENCB). Morelos: Lago Zempoala, *Matuda* 25608 (NY). Puebla: Honey Station, *Pringle* 13293 (GH, MICH, US). Veracruz: Cofre de Perote, *Balls* B4776 (UC), B4631 (UC).

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