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Phyton (Austria)	Vol. 23	Fasc. 1	101—116	15. 2. 1983

The Genus *Thrasyopsis* PARODI (*Gramineae*)

By

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With 3 Figures

Received March 1, 1982

Key words: *Gramineae*, *Poaceae*; *Paniceae*, *Thrasyopsis*. — Systematics, taxonomy. — Flora of Brazil

Summary

BURMAN A. G. 1983. The genus *Thrasyopsis* PARODI (*Gramineae*). — Phyton (Austria) 23 (1): 101—116, 3 figures. — English with German summary.

The grass genus *Thrasyopsis* (*Paniceae*) from southern Brazil has affinities mainly with *Paspalum* and *Thrasya*; the two species of *Thrasyopsis*, *T. repanda* (NEES) PARODI and *T. juergensii* (HACK.) SODERSTROM ex A. G. BURMAN are rare, perennial, pyroresistant plants and at present probably in decline. History, characteristics, affinities and distribution of the genus are discussed. The genus and its two species are described in detail (with figures).

Zusammenfassung

BURMAN A. G. 1983. Die Gattung *Thrasyopsis* PARODI (*Gramineae*). — Phyton (Austria) 23 (1): 101—116, 3 Abbildungen. — Englisch mit deutscher Zusammenfassung.

Die südbrasilianische Gramineen- (*Paniceae*-)Gattung *Thrasyopsis* ist vor allem mit *Paspalum* und *Thrasya* verwandt; die zwei Arten der Gattung, *T. repanda* (NEES) PARODI und *T. juergensii* (HACK.) SODERSTROM ex A. G. BURMAN, sind seltene, anscheinend im Rückgang begriffene, perennierende, feuerresistente Pflanzen. Geschichte, Merkmale, Verwandtschaftsverhältnisse und Verbreitung der Gattung werden diskutiert. Die Gattung und ihre beiden Arten sind ausführlich beschrieben (mit Abbildungen).

Introduction

The grass genus *Thrasyopsis* PARODI 1946 was established on the basis of what appeared to be a newly collected taxon, named as *Thrasyopsis*

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rawitscheri PARODI, from the south of Brazil, together with a new combination, *Thrasyopsis repanda* (NEES) PARODI, for the related *Panicum repandum* NEES in TRINIUS 1829. While offering observations on the "new" species, which had in fact been previously described as *Panicum juergensii* HACK., PARODI provided relatively little information about the relationship with *T. repanda*, and thus about the genus as a whole.

The genus *Thrasyopsis* (*Gramineae*, *Paniceae*) is still limited to two species, known only from a small area of the New World subtropics, and probably in decline.

Material and Methods

Most of the material used in this study is in the form of herbarium specimens. I would like to express gratitude to the curators of the following herbaria for provision of study facilities, loan of material, or both: K Royal Botanic Gardens, Kew. — MO Missouri Botanical Garden. — R Museu Nacional, Rio de Janeiro. — RB Jardim Botânico, Rio de Janeiro. — SPF Universidade de São Paulo. — US United States National Herbarium.

Material was prepared for study and measurement in a solution of Aerosol-OT, and cleared where necessary in 50% lactic acid/50% glycerine.

Small-scale structures (spikelets and spikelet parts) were measured with an ocular micrometer fitted to a Zeiss binocular microscope. Drawings were made with the use of a Zeiss camera lucida.

History of the Genus *Thrasyopsis*

Literature referring to the two species which form the genus *Thrasyopsis* is predictably limited. While the genus is of recent establishment, the earliest relevant description is that of *Panicum repandum* NEES in TRINIUS, Species Graminum II, pl. 150 (1829), accompanied by a useful plate. The description is reasonably complete, but there is no observation on the affinities between this species and other constituents of the genus *Panicum*.

NEES 1829 acknowledged that *P. repandum* was in some ways an anomaly within its genus, but failed to make clear what he considered the anomaly to be: "Si *Panicum monostachyum* H. & K. excipias, vix ulli hujus generis speciei comparabis. Haec ita definienda est". *Panicum monostachyum* H. B. K. (= *Paspalum pilosum* LAM.) seems not to have been known from Brazil at the time, though it is a common and widespread species. Thus NEES gave it no full treatment in his Agrostologia Brasiliensis. To support his comparison between *Panicum repandum* and *P. monostachyum*, he provided a very brief description of the latter species, but then observed merely that the ligule is ciliate in *P. monostachyum* but not in *P. repandum* — a matter of minor importance.

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Any potential value in this comparison was reduced by the subsequent interpretation of *Panicum monostachyum* H. B. K. as being synonymous with *Panicum cultratum* TRIN. [= *Thrasya cultrata* (TRIN.) NEES]. It thus became uncertain which of two distinct taxa, *Paspalum pilosum* or *Thrasya cultrata*, was the basis of NEES' comparison for *Panicum repandum* (TRINIUS 1834; STEUDEL 1855).

NEES placed *Panicum repandum* in part A of his Sectio I (*Digitariae*) of *Panicum*, where it is the only species. It is separated in the synopsis by the character "Spica solitaria vel gemina". The 3 species in part B of this Sectio are *Panicum horizontale* (WILLD.) S. MAYER (= *Digitaria horizontalis* WILLD.), *P. glaucescens* NEES (= *Digitaria marginata* LINK ?), and *P. adustum* NEES [= *Digitaria adusta* (NEES) GRISEB.]. Thus Sectio *Digitariae* was later to be wholly dismembered.

The individual nature of *Panicum repandum* was sufficiently recognized by TRINIUS 1834, followed by STEUDEL 1855, to cause him to remove it from his Sectio II (*Digitaria*) and place it in Sectio VIII (*Harpostachys*), a section loosely constructed on the basis of the usually single spike-like raceme, and subsequently redistributed into 7 different genera, leaving in the genus *Panicum* no single species originally placed in Sectio *Harpostachys*.

HACKEL 1915 described the striking and superficially very different *Panicum juergensii*, ascribing it also to the still extant section *Harpostachys* of TRINIUS. He also made an analogy with *Panicum monostachyum* H. B. K., but without mentioning *Panicum repandum*.

PARODI 1946 overlooked *Panicum juergensii*, either on account of the small amount of known material or the obscurity of the description. He described the same taxon as *Thrasyopsis rawitscheri*, thus simultaneously creating a synonym and a new genus, into which he correctly transferred *Panicum repandum* as *Thrasyopsis repanda* (NEES) PARODI. Apparently CHASE 1962 was the first to observe that *Panicum juergensii* and *Thrasyopsis rawitscheri* were the same species. The combination *T. juergensii* was made, after examination of both holotypes, by BURMAN 1980.

Generic Limits and Affinities

HACKEL's inclusion of his very curious new species in the genus *Panicum* as *P. juergensii* was a reasonable way of viewing its affinities in the light of existing information. But delimitation of the genus *Panicum* was already strained by the presence of what are now *Mesosetum*, *Thrasya*, *Digitaria*, and *Holcolemma*, in addition to numerous species of *Paspalum*.

PARODI justified his new genus on the basis of several characters which, to be entirely effective, must be taken in combination. These are

1. The unilateral spike-like inflorescence,
2. The membranaceous rachis,
3. Paired spikelets with male and hermaphrodite florets,
4. The second glume: rigid, truncate, cochlear, multinerved.

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The author further observed that *T. rawitscheri* is in overall appearance similar to species of *Thrasya*, while the spikelets are closer in form to those of some species of *Panicum* and *Paspalum*, particularly in the groups *Ceresiae* and *Decumbentes* of the latter genus.

Certain aspects of PARODI's protologue to the genus seem to have been based on his *T. rawitscheri*, and to have taken much less account of *T. repanda*. He stated that the genus has, as a character, "spica solitaria". But the racemes of *T. repanda*, in any case different in superficial appearance from those of *T. juergensii*, are as often as not in sub-approximate pairs, of which NEES wrote "geminae, rarius solitariae" (my spaced types). This fact is adequately supported by modern collections of the species. A unilateral spike-like inflorescence is not, in isolation, of any definitive diagnostic value — a fact clearly demonstrated by the fate of Sectio *Harpostachys*.

PARODI's translation of his own Latin "rhachi foliacea" as "con raquis membranáceo" raises a problem which applies as much to certain species of *Paspalum* (informal groups *Ceresiae*, *Pectinata*, *Dissecta* and *Gardneriana*) as it does to *Thrasyopsis*. The subgenus *Ceresia* of *Paspalum* is now too diversified, as a result of indiscriminate additions, to be coherent. Four species — *Paspalum ceresia* (KUNTZE) CHASE, *P. carinatum* H. & B. ex FLÜGGE, *P. heterotrichon* TRIN., and *P. stellatum* H. & B. conform to the original delimitations of the subgenus, and have broad rachis wings of which at least the marginal half might reasonably be called "membranaceous" — that is, of a tenuous structure of slightly elongated cells, and lacking nerves. The inner half of the rachis wings of *P. ceresia*, and the entire wings of two related species, *P. trachycoleon* STEUD. and *P. petrense* A. G. BURMAN may, by analogy, be called truly "foliaceous" — that is, a stouter structure with a prominent system of anastomosing nerves, and therefore "leaf-like". The difference is of considerable diagnostic value; where a rachis wing is composed of both membranaceous and foliaceous structures, as in *P. ceresia*, the two are generally distinguishable by colour as well as by organization and texture. A well-developed fringe of hairs on the rachis margin (as occurs in numerous species of *Thrasya*) is commonly characteristic of a foliaceous rather than a membranaceous margin.

PARODI stated that *Thrasyopsis* "in the appearance of the membranaceous spathiform rachis is similar to *Thrasya* and those species of *Paspalum* in the subgenus *Ceresia* (PERS.) REICHENB." This should be clarified: the rachis in the genus *Thrasya*, and in both the broad-winged *Thrasyopsis juergensii* and the narrow-winged *T. repanda* is, in accordance with the above attempt to differentiate the structures, exclusively foliaceous, with a well-defined vascular system radiating to the rachis margins. This is particularly prominent in *T. juergensii*; in *T. repanda*, the venation finally spreads into the marginal lobes which occur above all towards the distal end of the rachis, giving it something of the appearance of a miniature oak-leaf.

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Whereas this brings *Thrasyopsis* close to *Paspalum trachycoleon* and *P. petrense*, and to isolated species such as *P. falcatum* STEUD. and *P. phyllorhachis* HACK., and also to *Thrasya*, it distinguishes the genus from other species of *Paspalum* with a clearly membranaceous rachis — *P. stellatum*, for instance.

PARODI separated *Thrasyopsis* from *Thrasya* on the grounds that the latter genus shows a 3-nerved membranaceous second glume, while the

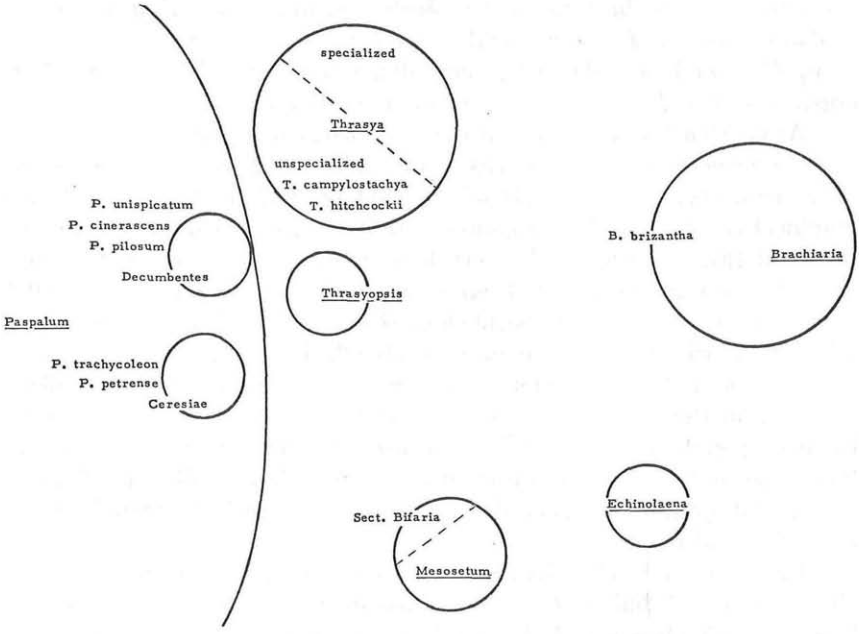

Fig. 1. Conspectus of relationships between *Thrasyopsis* and allied genera

sterile lemma splits before maturity. While *Thrasya* may have as many as 7 nerves in the second glume (*T. achlysophila* SODERSTROM, *T. granitica* A. G. BURMAN), and while the second glume may be moderately robust [*T. thrasyoides* (TRIN.) CHASE] it never has the 11 to 15 or even 17 nerves characteristic of *Thrasyopsis*, nor is it so toughly coriaceous. The sterile lemma of *Thrasya* does not split in all species, nor with the regularity which has sometimes been supposed. The second glume and sterile lemma are dissimilar in *Thrasya*, similar in *Thrasyopsis*.

The affinities with *Paspalum* referred to by PARODI are limited. The morphological line of informal group *Decumbentes* represented by *Paspalum pilosum* LAM., *P. unispicatum* (SCRIBN. & MERR.) NASH, and *P. cinerascens* DOELL comes close to *Thrasya* and *Thrasyopsis* in the possession of a well-developed sterile palea. Two species of *Paspalum* in group *Ceresiae*, two

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isolated species, and a number of species in group *Dissecta*, have a foliaceous rachis. No species in the *Decumbentes* has more than a very narrow membranaceous edge to the rhachis; no species in group *Ceresiae* or any of its immediate allies has a sterile palea. *Thrasyopsis* further differs from the closer species of group *Decumbentes* in showing no disposition towards dimorphism of the first glume. The regular occurrence of this dimorphism — the first glume strongly developed in the primary spikelet, rudimentary in the second — led FOURNIER 1875 (hesitantly followed by HEMSLEY 1886) to establish the genus *Dimorphostachys*, which he regarded as intermediate between *Paspalum* and *Panicum*. Most species in *Paspalum* group *Ceresiae* have subequal second glume and sterile lemma, but these organs are never leathery and never prominently multinerved.

As is often the case among the *Gramineae*, exact generic affinities are easy to suggest but none too easy to establish, and may to some extent seem arbitrary. On the basis of morphological characters, a tentative graphical conspectus of *Thrasyopsis* and those genera close to it may be proposed (Fig. 1). Due to the very large number of species in the genus *Paspalum*, it is not possible to keep the representative units in scale. Table 1 presents a comparison of morphological characters of the 2 species of *Thrasyopsis* with those of the more closely allied genera.

Certain of these characters may suggest a primitive and unspecialized form within the *Panicoideae*. A distribution pattern of scattered and infrequent populations, of which some are numerous in individuals, may further suggest that this form has been a failure in its ability to adapt or compete; it appears now to be absent from areas of southern Brazil in which it formerly existed.

In accordance with HUBBARD 1948 the large multinerved leaflike glumes, (1st and 2nd in *T. repanda*, 2nd in *T. juergensii*), the similarity between both glumes and the sterile lemma in *T. repanda*, and also in *T. juergensii* when the 1st glume is developed, the strongly developed sterile palea (sometimes containing the relicts of a perfect flower in *T. repanda*) are possible primitive characters, to which may be added the very simple foliaceous rachis. Neither species seems to show any sort of facility for dispersion — the spikelets do not readily fall from the rachis, even when dry and old, and do not seem to be of interest to birds. There are no specialized mechanisms. The extremely tough outer parts of the spikelet may possible inhibit pollination or germination. Both species are pyroresistant; *T. repanda* will flower after burning while the new plants are still very small, and may be pyrophilous.

Intrageneric Affinities

Thrasyopsis juergensii (HACK.) SODERSTROM ex A. G. BURMAN, and *T. repanda* (NEES) PARODI, the only two species in the genus, are in overall aspect dissimilar: the long, broadly-winged spike of the former seems to

Table 1

Comparison of some morphological characters of rhachis and spikelets in *Thrasyopsis juergensii*, *T. repanda*, and allied genera

Character	*T. juergensii*	*T. repanda*	*Thrasya*	*Paspalum*	*Mesosetum*	*Brachiaria*	*Echinolaena*
Number and position of infl. branches	1	1–2 approximate	1–2 (3) approximate	1-numerous approximate or subapproximate	1	3 to several subapproximate	1
Rachis form	broad foliaceous	narrow foliaceous	broad; clearly foliaceous in specialized spp.	narrow to broad foliaceous or membranaceous	broad foliaceous in some spp.	narrow	narrow
Position of spikelets on rachis	not appressed	not appressed	not appressed	appressed in some groups	appressed	not appressed	not appressed
1st glume	squamiform or null; rarely strong. Not dimorphic	strong; not dimorphic	squamiform or null; rarely strong. Not dimorphic	usually null; dimorphic in gp. Decumbentes	strong	strong	strong
Nerves of 2nd glume	13–17	11	5–7	3–5; rarely as many as 9	3–7	5–9	5–9
Nerves of sterile lemma	7–9	9	5	3–5	5	5–11	5
Sterile palea	strong	strong	strong in most spp.	lacking in most spp; strong in some of gp. Decumbentes	strong in some spp.	usually strong	strong

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have little in common with the short rachis and spreading spikelets of the latter. Closer comparison confirms correspondence in organization of the inflorescence, and also in spikelet forms.

Both are rhizomatous perennials, with an apparent tendency to flower after burning of the 'campo'; the persistance of dead leaf-fibres at the base of the plants probably serves, as in other genera, to provide some degree of protection against heat. Difference in rachis is largely a matter of size: the rachis of *T. juergensii* is more prominently winged than, for example, any species of *Thrasya*, but much more so than that of *Thrasyopsis repanda*. But in both species the rachis is foliaceous with a vascular system extending to the undulate margins. Close pairing of the spikelets causes them to stand away from the rachis, rather than lying flat; in *T. repanda* the spikelets also spread sideways. This may sometimes happen in *T. juergensii* where the broader margins permit; in fact the spikelets are often so closely packed that they force the rachis margins apart. The pedicels of both species have a broad membranaceous disc at the tip; this is less obvious in *T. repanda*, where the tip tends to tear off with the spikelet.

The spikelets of the two species may differ in the first glume; this is consistently well-developed and similar to the second glume in *T. repanda*, and is inconsistently so in *T. juergensii*. The normal form in *T. juergensii* is a small scale. PARODI's generic description ("1—5 nervada") does not accomodate the normal 7 nerves of *T. repanda*. Both species have a 7—9 nerved cucullate sterile lemma, and a large sterile palea. The staminal filaments of the lower floret are well-developed, but formed anthers are rarely observed; *T. repanda* sometimes has a rudimentary style. The fertile lemma in both species has a well-formed areole; the fertile palea has a tuberculate inner surface.

Distribution

PARODI 1946 cites *Thrasyopsis* as being "gramina tropicalia"; however, the type collection of *Panicum juergensii* HACK. is from the southern Brazilian state of Rio Grande do Sul, between 3° and 9° S of the tropic, and that of *T. rawitscheri* is from the state of Paraná, approximately 2° S of the tropic. SELLOW's collections of *Panicum repandum* are cited as from "Brasilia australiori", which may be held to refer to a similar area. No precisely tropical collection of *T. juergensii* has come to light; the northern limit of *T. repanda* is represented by collections by WARMING and CLAUSSEN (cited by DOELL) from Lagoa Santa and Itabira respectively, both in the state of Minas Gerais and inside the tropic. There is a further collection (GLAZIOU) at K; all these collections are from reasonably high altitudes (ca. 1,000 m) and WARMING's collection at least was made in the month of July, when the temperatures in Minas Gerais can fall below 0° C. GARDNER recorded heavy frost at Itambé do Mato Dentro, near Itabira.

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All evidence suggests that both species are rare, though individual populations may be numerous, and even the larger Brazilian herbaria have little or no material. Collections from Minas Gerais in the last century find no reflections in modern times, and it may be that *T. repanda* has died out in that state. The label of LOFGREN 192 states that the species was "rara" in the region of Itapetininga (state of São Paulo); if the place of collection referred to on the label of PUTTEMANS s/n as "São Bernardo" is the present town of São Bernardo do Campo, then the area where the plant was collected in 1902 is now a neavily industrialized satellite of São Paulo, and about as likely a place to find *Thrasyopsis repanda* as would be downtown Chicago. It is curious that T. *repanda* has been so consistently collected in the region of Vila Velha (state of Paraná), also the northernmost known limit for *T. juergensii*. A. possible explanation is that the unusual and striking natural rock formations have simply attracted more collectors. However, collections of *T. juergensii* from the states of Santa Catarina and Rio Grande do Sul seem to indicate that the species has a preference for rocky river-banks and areas where outcropping is common — which it also is in the high 'serras' of Minas Gerais.

Thus the conclusions at present available as regards distribution are:

Thrasyopsis repanda: Brazil, states of Parana and São Paulo, possibly extending southwards into Rio Grande do Sul and known in the past from Minas Gerais to the north.

Thrasyopsis juergensii: Brazil, states of Rio Grande do Sul, Santa Catarina and Paraná.

Systematic Treatment

Thrasyopsis PARODI,

Bol. Soc. Arg. Bot. 1(4): 293—297, 1946; POTZTAL in ENGLER & PRANTL, Nat. Pflanzenfam. 14d: 189—190, 1956

Perennials with slender to moderately robust, erect or slightly geniculate culms. Leaves mostly clustered at the culm-bases. Leaf-sheaths longer or shorter than internodes, pilose at least towards throat. Ligule a short membrane. Leaf-blades spreading or erect, flat or partially folded, sparsely to densely pilose, the uppermost reduced. Inflorescence a narrowly or broadly winged spike-like raceme, solitary or paired. Rachis foliaceous, covering the basal part of the spikelets or not, margins glabrous or bearing occasional hairs. Spikelets crowded, standing away from rhachis, in pairs on short prominently discoid-tipped pedicels of unequal length, glabrous or with sparse hairs at base; disarticulation below the glumes. Glumes 2; the first rudimentary, squamiform, or up to ¾ the length of the spikelet, nerveless when reduced, otherwise from 1 to 9-nerved; the second almost the length of the spikelet, stout, oblong-ovate, strongly concave, 11—17 nerved, the nerves prominent, often excurrent. Sterile

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lemma a little longer than 2nd glume, coriaceous, oblong, cucullate with 2 dorsal keels, 5—9 nerved. Sterile palea length of the lemma, lanceolate-elliptical, firm along the 2 nerves, thin in the centre and expanded into 2 inrolled membranaceous flaps. Fertile lemma firm, elliptical, acute, minutely striate-punctate with a distinct areole. Fertile palea firm, membranaceous at margins, the inner surface dotted with minute tubercular processes.

Key to Species

1. Racemes 1.5—4.5 cm long; rachis narrow, not covering the spikelets at the base ..... *T. repanda* (Fig. 2)
1. Racemes 10.0—15.0 cm long; rachis broad, covering spikelets up to $^2/_3$ their length ..... *T. guergensii* (Fig. 3)

1. *Thrasyopsis repanda* (Nees) Parodi, Bol. Soc. Arg. Bot. 1 (4): 293, 1946

Panicum repandum Nees in Trinius, Spec. Gram. II: pl. 150, 1829.

Caespitose perennial with tough rhizomes and wiry roots. Culms erect or slightly geniculate, slender, simple, glabrous below, pubescent below inflorescence, 15.0—65.0 cm tall; the base of the plant covered by old leaf-fibres. Nodes strongly retrorsely bearded, the hairs yellowish. Leaf-sheaths longer or shorter than internodes, striate, hirsute, densely so towards throat, the hairs silvery. Ligule short, membranaceous, entire, ca. 0.8 mm. Leaf-blades flexuous, flat, linear, acuminate, very pale green, densely hirsute with silver hairs on both surfaces, 5.0—20.0 cm long, 2.5—5.0 mm broad, the uppermost much reduced. Racemes commonly paired, sometimes simple, approximate on a short pilose common axis, straight or slightly arcuate, 1.5—4.0 cm long. Rachis narrowly winged, up to 3.0 mm broad overall, not covering spikelets at base, foliaceous, pubescent dorsally along midnerve, otherwise glabrous, ventrally with some pubescence along the septum, margins irregular, produced into small lobes or denticles at intervals, especially distally, glabrous with occasional white hairs. Spikelets closely paired, standing away from the rhachis and also spreading laterally, 4.0—4.5 mm long, 1.7—2.0 mm broad, obtusely elliptical-obovate. Pedicels somewhat flattened, the lower very short, the upper ca. 1.0 mm long, the apex expanded into a membranaceous disc, ca. 0.8 mm in diameter. First glume chartaceous, ovate to oblong, 5—7 nerved, the nerves reticulate near apex, $^2/_3$ to $^3/_4$ the length of the spikelet, glabrous except for spreading short white hairs at the base. Second glume obovate, strongly concave and hooded, glabrous except for spreading short white hairs at the base, length of the anthoecium, 11-nerved with some reticulation near apex, the nerves dorsally prominent. Lower floret usually male, the staminal filaments long but the anthers not developed, occasionally

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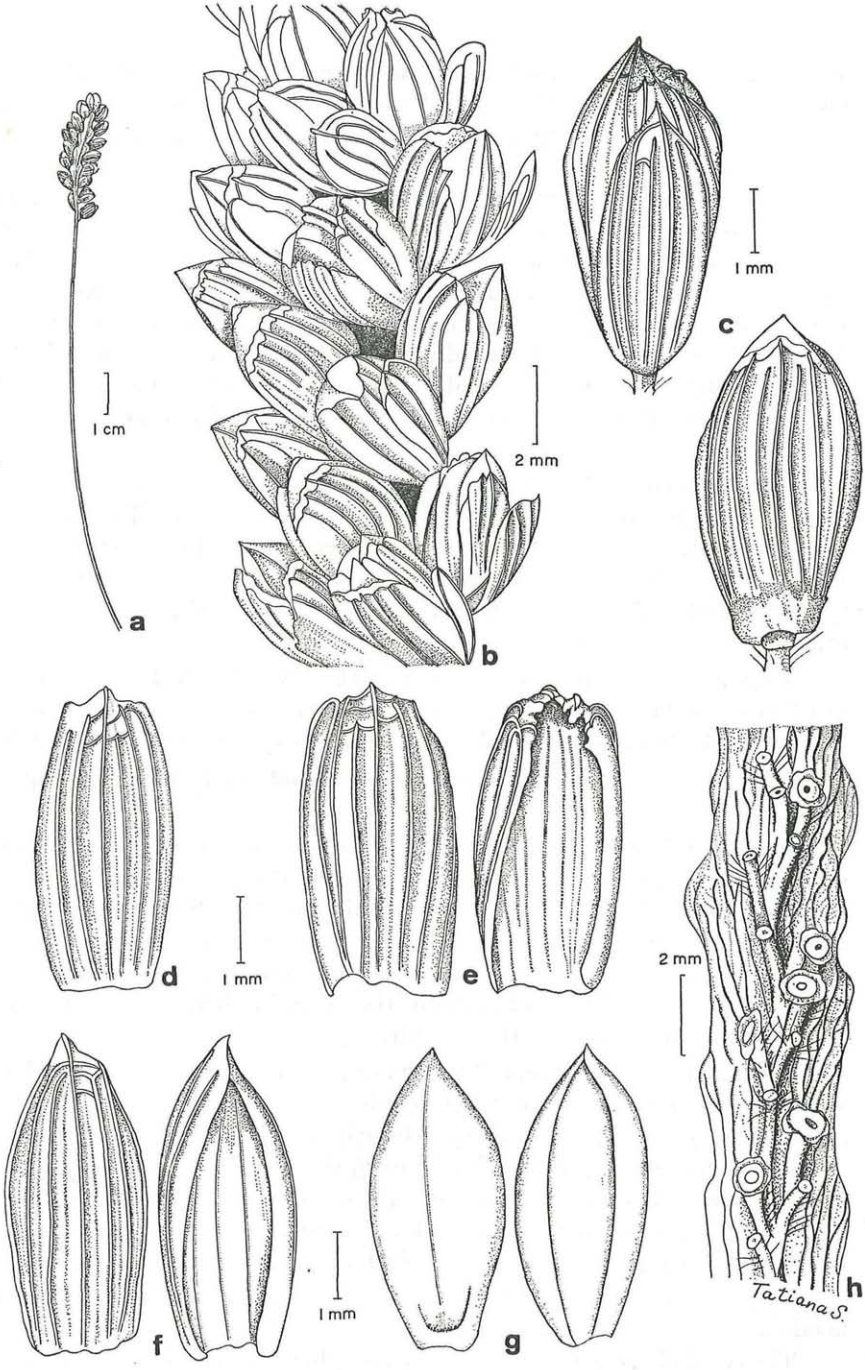

Fig. 2. *Thrasyopsis repanda* (NEES) PARODI. — a Culm with inflorescence. — b Spikelets on rachis. — c Spikelet from 1st and 2nd glume sides. — d First glume. — e Second glume, abaxial and adaxial views. — f Sterile lemma, abaxial and adaxial views. — g Anthoecium, fertile lemma side and fertile palea side. — h Section of rachis, showing discoid pedicel tips

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with a rudimentary style. Sterile lemma coriaceous, hooded, oblong to elliptical, subacute, 9-nerved slightly longer than anthoecium. Sterile palea well-developed, elliptical-lanceolate, thin in the centre, stout at the 2 submarginal nerves, the margins thinly membranaceous, forming flaps near the apex. Upper floret hermaphrodite. Fertile lemma elliptical-acute, firm, striolate, pale, slightly hooked at apex, the areole thin, depressed, open U-shaped. Fertile palea elliptical-acute, punctulate between nerves, smooth towards margins, these becoming membranaceous, inner surface covered with small but prominent tuberculate processes. Lodicules of both florets broadly cuneate, truncate at apex, adaxial side becoming fleshy at a diagonal angle towards the base and forming a finger-like protuberance at posterior distal margin. Stamens 3, anthers violet; styles 2, stigma plumose.

Leaf-anatomy is of the kranz type, with the kranz sheath deriving from a mestome sheath (K, M. S. See BROWN 1975, 1977). The 13C/12C ratio of —11.1 (W. V. BROWN: voucher specimen HATSCHBACH 7239, US sheet 2307875, reported in BROWN 1977) is characteristic of C_4 photosynthesis, and might be expected in a species which normally inhabits rather arid and exposed regions.

Type: "Brasilia australiore", SELLOW (B; US!). A collection of 5 plants in US (1061564) labelled "Brasilia. Reliquiae d. Sello" and originating from B may also be from the type collection, as may the SELLOW material at K.

Icones: h. l. Fig. 2. — There is an useful plate in *Trinius* 1829 (Spec. Gram. 150).

Observations: The racemes of *T. repanda* are frequently rather longer than the maximum of 1″ admitted in early descriptions, but are consistent in width. The lower raceme of a pair may be substantially shorter than the upper. The rachis becomes slightly broader near the summit, and the margins are more irregular. The margins were stated by TRINIUS to be glabrous and by NEES to be ciliate; they may be either, but commonly bear a few whitish cilia near the summit.

NEES and TRINIUS (followed by STEUDEL) cite the first glume as being, variously, from ⅓ to ½ the total length of the spikelet. Unlike the 1st glume of *T. juergensii*, it is always strongly developed. In material from recent collections it usually reaches $^2/_3$ to $^3/_4$ the total length of the spikelet. It has 7 nerves as commonly as it has the 5 noted by NEES and TRINIUS, and may very occasionally have 9. The lateral nerves anastomose before the apex, leaving a membranaceous apical margin.

The second glume is similar to the first in texture, but is distinctly hooded.

The sterile lemma is similar to the 2nd glume, and lacks the "square" tip caused by projection of the lateral nerves in *T. juergensii*. The inner surface of the fertile palea is similar to that of *T. juergensii*.

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Material examined: Brazil: No locality: SELLOW, without number Type, US); SELLOW, without number (US); SELLOW 1246 (US). Paraná: DUSÉN 10478 (US); F. C. HOEHNE, without number (SP, US); HATSCHBACH 7239 (US); A. B. JOLY *et al.* 1178 (SP); E. SANTOS 2141 (R). São Paulo: LOFGREN 192 (SP, R, US); PUTTEMANS, without number (SP); LOFGREN, without number (US); C. DUARTE 9885 (US).

Mr. S. A. RENVOIZE was kind enough to send me information relating to collections from Minas Gerais in K; these are CLAUSSEN, without number, collected in 1840 and presumably the material referred to by DOELL, and GLAZIOU 15622, 15630.

2. *Thrasyopsis juergensii* (HACK.) SODERSTROM ex A. G. BURMAN, Brittonia, 32 (2): 221, 1980

Panicum juergensii HACK. (as *P.* "*jürgensii*"; cf. Code 73.6), Verh. k. k. zoolog.-bot. Ges. Wien 65: 70, 1915.

Thrasyopsis rawitscheri PARODI, Bol. Soc. Arg. Bot. 1 (4): 293, 1946.

Caespitose perennial with short strong rhizomes. Culms erect, moderately robust, simple, glabrous with very sparse hairs, becoming pilose below the inflorescence, 80.0—140.0 cm tall. Nodes glabrous, constricted. Leaf-sheaths longer or shorter than internodes, striate, sparsely to moderately papillose-pilose below, the hairs falling with age. Ligule extremely short, membranaceous, erose. Leaf-blades spreading, flat or partially folded, linear, acuminate, sparsely to densely hirsute with a collar of white hairs at the ligule, 15.0—50.0 cm long, 8.0—12.0 mm broad, the uppermost much reduced, erect. Racemes terminal, solitary, arcuate, 10.0—15.0 cm long. Rachis broadly winged, up to 7.0 mm wide overall, covering the spikelets for up to $^2/_3$ their length, distinctively foliaceous, puberulent dorsally along midnerve, otherwise glabrous. Spikelets closely paired, standing away from the rachis, 4.0—4.7 mm long, 1.8—2.1 mm broad, obtusely elliptical-, obovate. Pedicels very short, the upper not exceeding 1.0 mm in length. the apex expanded into a membranaceous disc ca. 0.8 mm in diameter. First glume membranaceous, nerveless, ca. 0.4 mm in length, occasionally null, or short, 1-nerved, or well-developed, 3—5 nerved, broad and as much as ½ the length of the spikelet. Second glume obovate-truncate, glabrous, a little shorter than the anthoecium, 13—15 (17) nerved, 5 to 7 of the nerves dorsally excurrent below the apex, leaving an obtuse membranaceous apical margin internally. Lower floret male, the staminal filaments long but anthers often not developed. Sterile lemma deeply hooded, coriaceous, oblong and truncate-apiculate when seen from outside, acute when seen from inside, dorsally concave, length of the anthoecium, 7—9 nerved, the nerves of the keels excurrent. Sterile palea strongly developed, lanceolate-elliptical, thin in the centre, stout at the 2 submarginal nerves, the margins thinly membranaceous, forming broad flaps near the apex. Upper floret hermaphrodite. Fertile lemma elliptical-acute, firm, striolate,

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pale, the margins securing the entire length of the palea, areole thin, depressed, open U-shaped. Fertile palea elliptical-acute, punctulate between nerves, smooth towards margins, these becoming membranaceous and forming broad flaps near apex, inner surface covered with small but prominent tuberculate processes, particularly upwards. Lodicules of both florets broadly cuneate, truncate at apex, adaxial side becoming fleshy at a diagonal angle towards the base and forming a finger-like protuberance at posterior distal margin. Stamens 3, anthers violet; styles 2, stigma plumose.

Leaf-anatomy is of the kranz type, with the kranz sheath deriving from a mestome sheath (K, M. S. See BROWN 1975, 1977). The 13C/12 C ratio has not been determined.

Types: *Panicum juergensii* HACK. Brazil: Rio Grande do Sul, Lagão, Município de Soledade, in campis siccis 1912. C. JÜRGENS G 412 (W; US!).

Thrasyopsis rawitscheri PARODI. Brazil: Paraná, Estrada Ponta Grossa a Tibagí, em campos, 14 Fev. 1945. A. B. JOLY 17 (SPF!; K).

Icones: h. l. Fig. 3. — The figure in PARODI 1946 shows a complete inflorescence, a spikelet (lateral view) with a large first glume, and the anthoecium. This figure is reprinted without change in POTZTAL 1956.

Observations: Variation in the first glume is common in the boundary species between *Thrasya* and *Paspalum*, to which *Thrasyopsis* is close. PARODI described the first glume in *T. rawitscheri* as variable, but seemed to consider the developed form, which is often 5- and sometimes 3-nerved and about half as long as the spikelet, as normal. This form occurs irregularly in JOLY 17 (type of *T. rawitscheri*), and equally irregularly in SMITH & KLEIN 15287. HACKEL, on the other hand, described the first glume in *Panicum juergensii* as very short (ca. 0.8 mm), membranaceous, nerveless; this is the form which occurs in almost all the material examined for this work, and is taken to be the normal form, while the well-developed forms are an exception. This is commonly the case in the "unstable" species of *Thrasya* — *T. campylostachya* (HACK.) Chase, for instance.

The second glume is stated by HACKEL to have 9 prominent and percurrent nerves, and several lesser and incomplete intermediary nerves; the total number of nerves may come to as many as 15 (HACKEL 1915). PARODI referred to 13—15 nerves, of which 7 are excurrent to produce the "apice 7-dentata". The organization of nerves is as variable as these two opinions suggest, and would seem to support the notion of this species being relatively primitive and unspecialized. The midnerve and 2 or 3 pairs of lateral nerves may be produced to form the denticulate apex, while a further pair may be dorsally prominent without being excurrent. The intermediate nerves are often incomplete, and are irregular in occurrence. Unilateral suppression may result in an even total number of nerves for the entire organ. Thus the normal total varies between 13 and 17, of which 5 or 7 are particularly prominent and also excurrent. The ends of the nerves

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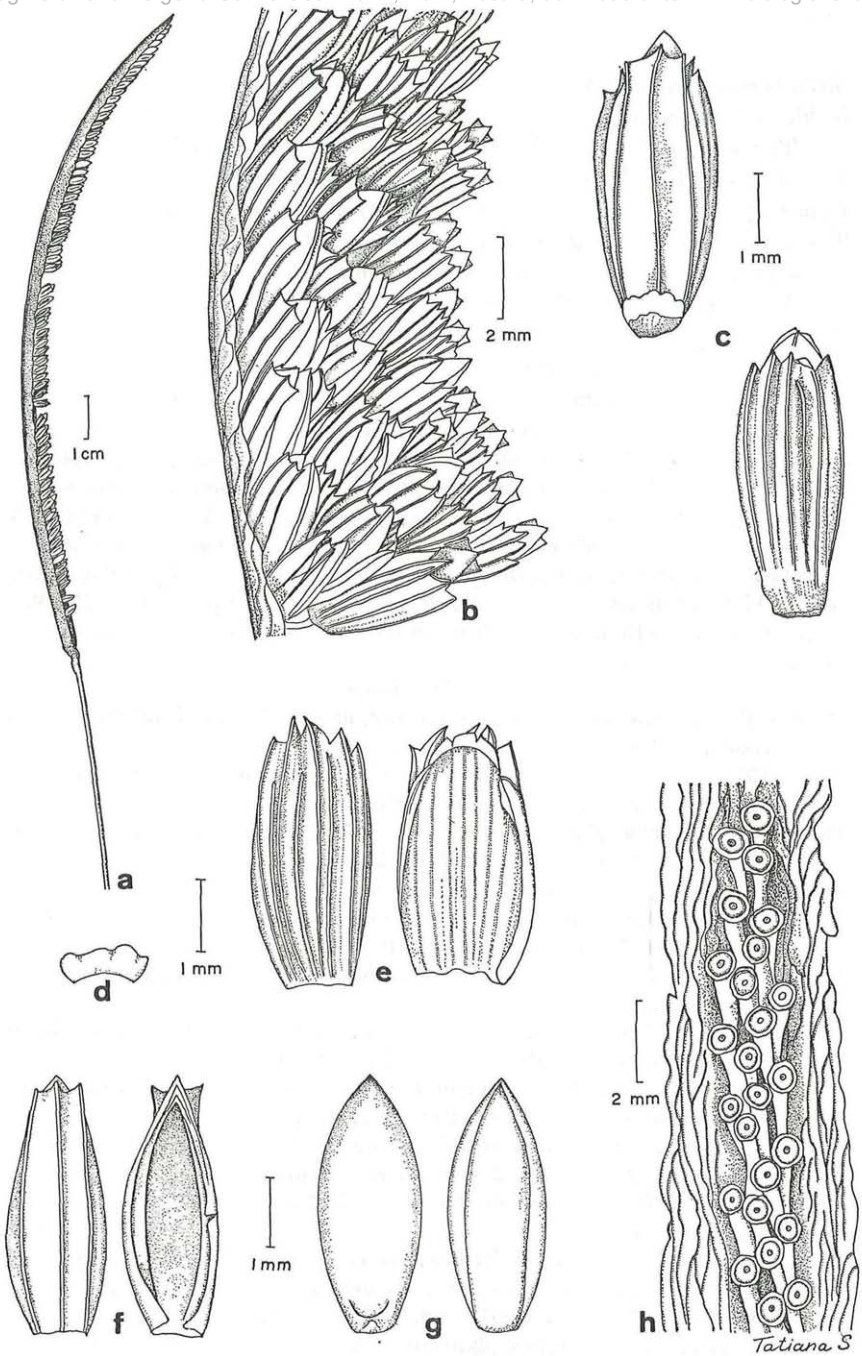

Fig. 3. *Thrasyopsis juergensii* (HACK.) SODERSTROM ex A. G. BURMAN. — a Culm with inflorescence. — b Spikelets on rachis. — c Spikelet from 1st and 2nd glume sides. — d First glume. — e Second glume, abaxial and adaxial views. — f Sterile lemma, abaxial and adaxial views. — g Anthoecium, fertile lemma side and fertile palea side. — h Section of rachis, showing discoid pedicel tips

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often become excurrent before the apex of the glume, and thus leave on the inside surface a nerveless fingernail-shaped terminal rim of thin tissue.

The lower lemma has 5, at times 7 or 9 nerves. The midnerve is rather tenuous, and the dorsal aspect of the organ presents a truncate, almost square apex, due to the prominence of the very strong pair of lateral nerves. The ventral aspect shows an acute apex, however, due to the convergence of the margins on the midnerve alone (see fig. 3f).

Material examined: Brazil: Rio Grande do Sul: JÜRGENS G 412 (type of *P. juergensii*; US, isotype); SENDULSKY, without number (SP); VALLS *et al.* 1899 (US); SMITH & KLEIN 15287 (US). Santa Catarina: KLEIN 4381, 4402 (US). Paraná: A. B. JOLY *et al.* 17 (type of *T. rawitscheri*, SPF).

Acknowledgments

This work was in part made possible by a visitor's grant, the provision of facilities, and the loan of material by Smithsonian Institution, Washington D. C. I am also grateful to the Instituto de Botânica, São Paulo, for working facilities, and to the Royal Botânic Gardens, Kew, the Museu Nacional, Rio de Janeiro, and the Jardim Botanico, Rio de Janeiro. I owe thanks for advice and assistance to Dr. T. R. SODERSTROM, Prof. H. SCHOLZ, Mr. T. S. FILGUEIRAS, Mr. S. A. RENVOIZE, and Tatiana SENDULSKY; to the last I owe particular gratitude for her fine illustrations.

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Jahr/Year: 1983

Band/Volume: 23_1

Autor(en)/Author(s): Burmann Alasdair G.

Artikel/Article: The Genus Thrasyopsis PARODI (Gramineae). 101-116