

A Revision of the Genus *Olyra*
and the New Segregate Genus *Parodiolyra*
(Poaceae: Bambusoideae: Olyreae)

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and
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ABSTRACT

Soderstrom, Thomas R., and Fernando O. Zuloaga. A Revision of the Genus *Olyra* and the New Segregate Genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae). *Smithsonian Contributions to Botany*, number 69, 79 pages, 46 figures, 2 appendices, 1989.—The herbaceous bambusoid genus *Olyra* is revised. Four new South American species are described: *Olyra amapana*, *O. latispicula*, *O. retrorsa*, and *O. tamanquareana*. Three species of *Olyra* were found to differ significantly from the rest of the genus in possessing the following combination of characters: weak, scandent culms; filiform female spikelet pedicels; female spikelets that fall entire, have a pulvinate internode between the inflated glumes, and a stipitate anthercium; and a hilum that does not extend for the entire length of the caryopsis. The segregate genus *Parodiolyra* is established to accommodate these species, and the new combinations *P. lateralis*, *P. luetzelburgii*, and *P. ramosissima* are proposed. The new genus may share affinities with *Raddiella* and *Diandrolyra* rather than *Olyra*.

Keys to the species in both genera are presented, as well as complete descriptions, field photographs, and distribution maps. Scanning electron microscope studies of the surface of the female anthercia yielded characters of taxonomic significance. These are illustrated and incorporated in the key. Two appendices account for all names that have been published in the genus *Olyra*.

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Preface

My first experience with *Olyra* came in 1962 on an expedition to Kaieteur Falls in the interior of Guyana (then British Guiana) in northern South America. Large clumps of *O. latifolia* were scattered here and there, mostly at the edge of the forest or in clearings where trees had fallen. The unusual grass *Pariana*, with yellow spike-like inflorescences and spikelets with multiple stamens, was also found here. Both genera looked like bamboos in the field, but when I returned to Washington I found *Olyra* filed in the herbarium in the Paniceae and *Pariana* in the Hordeae because of the spike-like inflorescence. I would now include *Olyra* and several other genera, including *Pariana*, in the Olyreae (Soderstrom and Ellis, 1987).

On a collection trip to Suriname in 1963, I was impressed by the growth habit of *Olyra luetzelburgii*, a clambering plant that grew abundantly at the forest edges abutting a granite outcrop. The plants appeared to be related to *Olyra* but differed from it. Later, as part of continuing studies on the different genera of the Olyreae, it became evident that this species and two others that had been included in *Olyra*, *O. lateralis* and *O. ramosissima*, formed a natural group that deserved recognition as a separate genus. Here, we name that genus *Parodiolyra* in honor of the Argentine agrostologist Lorenzo R. Parodi (1895–1966).

Several species of *Olyra* have been transferred to other genera (*Arberella*, *Cryptochloa*, *Piresia*, and *Sucrea*). With the transfer of three more species to the new genus *Parodiolyra*, and with the new species herein described, this leaves twenty-three species in *Olyra*.

The visit of Dr. Fernando O. Zuloaga of the Instituto Darwinion in San Isidro, Argentina, to the Smithsonian in 1982–1983, was a fortuitous event. Dr. Zuloaga came to Washington to continue his studies of New World *Panicum*. As part of his investigation he made extensive scanning electron microscope (SEM) studies of the surface of the anthercia of all species. He found significant differences in the surface texture and ornamentation, which were most useful in the taxonomy of the genus. An early key to *Olyra* that Cleofé E. Calderón and I had prepared was based in part on characters of the surface of the female anthercia, but only of those that could be seen with the light microscope. Because of the similar type of anthercium in *Olyra* and *Panicum*, Zuloaga decided to run SEM studies on all species of *Olyra*. These proved to be quite useful taxonomically, and he extended these studies to the anthercia of other taxa in the tribe Olyreae, including *Parodiolyra*. The present revision is based on classical and SEM studies. Characters from both approaches are incorporated in the keys.

T.R. Soderstrom
22 April 1987

A Revision of the Genus *Olyra* and the New Segregate Genus *Parodiolyra* (Poaceae: Bambusoideae: Olyreae)

Thomas R. Soderstrom
and *Fernando O. Zuloaga*

Introduction

The genus *Olyra* is found throughout the Neotropics. The most widespread species is also the type species, *O. latifolia*, based on a specimen from Jamaica. Kunth (1815), in his system of grass classification, regarded the genus as a distinct group with a relationship to the bamboos, but he was later influenced by Trinius (1826) who aligned the genus with *Panicum*. The reasoning of Trinius has persisted into this century, due primarily to the uncanny similarity of the female spikelets of the two genera; in both, the female antherium is usually white and indurate. In fact, while the female spikelet of *Olyra* has only one floret and two glumes, is monoecious, and has three lodicules, in *Panicum* two florets are present, with the lower usually male and the upper hermaphroditic, there are only two lodicules, and the spikelets are bisexual.

Following Kunth, one of the first to recognize the bambusoid affinities of *Olyra* was Sir Dietrich Brandis, who made an elegant anatomical study (1907) of woody bamboo leaves including broad-leaved herbaceous grasses such as *Olyra*, *Diandrolyra*, and *Pharus*. Later workers firmly established the bambusoid affinities of *Olyra*, especially on the basis of leaf anatomy characters. Other characters, such as seedling type, have also been useful in grass classification. The bambusoid type of seedling as defined by Soderstrom (1981:26) is shared by members of the Olyreae and Bambuseae. Along with the

woody bamboos (Bambuseae), four herbaceous tribes (Buergerioclaoeae of New Guinea, and Anomochloaeae, Olyreae, and Streptochaeteae of the New World) constitute the “core group” of the subfamily Bambusoideae as recognized by Soderstrom and Ellis (1987).

The woody bamboos differ from the herbaceous in their long-lived woody culms, generally strong rhizomatous nature and complex branching, and propensity to flower only at long intervals. *Olyra* and other herbaceous bamboos usually flower each year for longer or shorter periods of time, but, interestingly, one group of related species (*O. taquara*, *O. ecaudata*, and *O. standleyi*) apparently do not flower every year, and may be monocarpic, as are many woody bamboos. The phenomenon is like that of the woody bamboos and is worth studying in these herbaceous species since it may offer clues as to the origin of this unique phenomenon in the grasses.

METHODS AND MATERIALS.—Procedures of classical alpha taxonomy were used in this study. Field methods included photographing the live plants, collecting and drying them for herbarium specimens, preserving leaves, spikelets, and other structures in FAA (formalin-ethanol-acetic acid) and transferring them to 70% ethanol in the laboratory.

Laboratory studies were made using a Wild M5 dissecting microscope and Leitz Ortholux compound microscope. For the scanning electron microscope (SEM) studies antheria were removed from herbarium specimens, secured on stubs, carbon coated in a vacuum evaporator, and coated with a gold-palladium alloy. These specimens were then viewed in a Cambridge S4-10 or Cambridge Stereoscan 250 Mk 2 scanning electron microscope operating at 10–20 kV.

In addition to the large collections of material at US, we consulted specimens lent by the following herbaria: CEPEC, CR, F, GH, IAN, MO, NY, R, RB, U, UB, and WIS. The abbreviations of these herbaria, as well as others mentioned in

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Review Chairman: Mark M. Littler, Department of Botany, Smithsonian Institution. Reviewers: Gerrit Davidse, Missouri Botanical Garden; Lynn G. Clark, Iowa State University.

the text, follow Holmgren et al. (1981). Collection localities listed within each species discussion are quoted or paraphrased from specimen labels. Metric equivalents of English distances are provided in brackets.

ACKNOWLEDGMENTS.—Much of the early work on this revision was undertaken in collaboration with a student of the late Prof. Lorenzo R. Parodi (Facultad de Agronomía y Veterinaria, Universidad de Buenos Aires), Cleofé E. Calderón (resident of Washington, D.C.), who came to the Smithsonian from Argentina in 1964, working with Soderstrom on the *Olyreae*. Calderón subsequently made a number of field trips to tropical America and collected many species and specimens of *Olyra* and other bamboos. She is responsible for most of the field photographs in this paper. Much of the specimen material was collected by Calderón and Soderstrom on field trips sponsored by the Smithsonian Institution and National Geographic Society.

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The illustrations of *Olyra lorentensis*, *O. micrantha*, and *Parodiolyra lateralis* (Figures 24, 26, and 39) were made by Gesina Berendina Threlkeld, formerly National Museum of Natural History (NMNH), now resident of Los Alamos, New Mexico. Those of *P. luetzelburgii* and *P. ramossissima* (Figures 41 and 45) were made by Vladimiro Dudás, Instituto de Botánica Darwinion. The others were rendered by Alice R. Tangerini, NMNH. Most of the field photographs were taken by Calderón.

We also thank Mary Sangrey (NMNH) and Jon Ricketson (Missouri Botanical Garden) for valuable assistance, and Gerrit Davidse (Missouri Botanical Garden), Lynn G. Clark (Iowa State University), John Wurdack (NMNH), and Emmet J. Judziewicz (NMNH) for helpful advice and suggestions, the latter in particular for his assistance in preparing the manuscript for publication.

Olyra Linnaeus

Olyra Linnaeus, 1759:1261.

Mapira Adanson, 1763:2, 39, 574.

Cespitose, monoecious perennials, usually from creeping rootstocks. *Culms* erect and sometimes climbing, leaning on the vegetation, unbranched at the lower and median nodes,

branching at the upper nodes to produce inflorescences; internodes cylindrical, glabrous to pilose, the nodes thickened to compressed, glabrous or pilose. *Leaves* with ligules small to large, membranous, shortly ciliate at the apex; auricles present or absent; pseudopetiole short, densely pilose to nearly glabrous; blades flat, ovate-lanceolate to lanceolate, asymmetric to symmetric basally, glabrous or pilose, the margins ciliate to scabrous. *Inflorescence* with one to many panicles borne at the uppermost nodes, the panicles lax and diffuse to contracted, few- to many-flowered, with the lower branches whorled or alternate, the upper ones alternate, in a few cases the panicles composed of 2–8 conjugate branches; lower branches of the panicle with male spikelets and with or without terminal female spikelets, the upper ones with male spikelets below and 1–8 terminal female spikelets; pedicels of the female spikelets thickened, the spikelets disarticulating above the glumes (with the exception of *O. micrantha*). *Female spikelets* with 2 aristate to acuminate glumes, these subequal or unequal (in this case with the lower glume longer than the upper), 5–15-nerved, usually with transverse veinlets, pilose to glabrous; *anthercium* indurate, the lemma covering the palea with its borders, shorter than the glumes, pilose, with variable types of pubescence, to glabrous, smooth or pitted; *lemma* 5–11-nerved, whitish to olivaceous, shining; *palea* 2–4-nerved; *lodicules* 3, conduplicate; *ovary* glabrous, smooth; *stigmas* 2, plumose; *caryopsis* brownish; *hillum* linear, as long as the caryopsis, the embryo $1/5$ or less the length of the caryopsis. *Male spikelets* aristate to acuminate, shorter than the female spikelets (longer in *O. wurdackii*), glabrous to hispid, membranous; glumes absent; *lemma* 3–9-nerved; *palea* 2-nerved (4-nerved in *O. holttumi-ana*); *stamens* 3.

TYPE SPECIES.—*Olyra latifolia* Linnaeus.

DISTRIBUTION.—Twenty-three species, found throughout the Neotropics from Mexico and Florida, United States, south to Argentina; apparently introduced in Africa (including Madagascar) and Fiji. The species typically occur in lowland, wet, tropical forests. Exceptions are noted within species discussions and in the key, below.

DISCUSSION.—We consider two names in *Olyra* to be of uncertain application, and do not treat them further herein. First, *Olyra guineensis* Steudel, 1853:37, is an African taxon described from the island of Príncipe in the Gulf of Guinea. We have not seen the type, the current location of which is unknown. Second, we could not locate the type of *Olyra speciosa* Mez, 1921:7, thought to be in the Berlin Herbarium. We could not confidently make an identification from Mez's description.

Key to the Species of *Olyra*

1. Female anthercium pitted or granular over part or all of its surface with conspicuous, round to oblong excavations 2
2. Inflorescence conjugate, male and female spikelets on separate branches; female anthercium with rounded excavations and long, stiff hairs toward the apex, obovoid, $\frac{1}{4}$ the length of the spikelet 14. *O. longifolia*
(northern South America)
2. Inflorescence not conjugate, male and female spikelets together; female anthercium never with both rounded excavations and long hairs on its surface (occasionally with bicellular microhairs toward the upper surfaces of the lemma and palea, or unicellular retrorse hairs on the palea, as in *O. retrorsa*), ovoid to fusiform, greater than $\frac{1}{4}$ the length of the spikelet 3
3. Female spikelets disarticulating below the glumes, the pedicels thin, not thickened; lower and upper glumes separated by an internode; female anthercium 2.5–3.8 mm long, entirely covered by rounded excavations 17. *O. micrantha*
(South America)
3. Female spikelets disarticulating above the glumes, the pedicels thickened; lower and upper glumes not separated by an internode; female anthercium at least 6.8 mm long, granular or partly to entirely covered by rounded or oblong excavations 4
4. Female anthercium with deep, rounded excavations; leaf blades lanceolate, 11–14 cm long 7. *O. filiformis*
(Bahia, Brazil)
4. Female anthercium with shallow, slightly oblong to round excavations; leaf blades oblong to lanceolate, 13–35 cm long (10.5–13.2 cm in *O. retrorsa*), the female anthercium with a unique combination of slightly oblong excavations and retrorse hairs on the apex of the palea 5
5. Female anthercium stipitate, the stipe conspicuous, ~1 mm long; leaf blades asymmetric basally 6
6. Inflorescences numerous at the uppermost nodes, contracted, each with a terminal female spikelet and male spikelets below; female spikelets greater than 33 mm long 21. *O. tamanquareana*, new species
(Amazonas, Brazil)
6. Inflorescences 2 or 3 at the uppermost nodes, umbelliform or paniculiform, open, with 1–5 terminal female spikelets; female spikelets 13–33 mm long 7
7. Inflorescences paniculiform, the lower branches whorled, the upper ones alternate; female anthercium with oblong excavations; female spikelets 22–33 mm long, 2.9–3.2 mm wide; male spikelets glabrous 6. *O. fasciculata*
(Panama, Peru, Bolivia, Argentina, and southern Brazil)
7. Inflorescences umbelliform, with 2–8 conjugate branches; female anthercium with rounded to hexagonal, not oblong, excavations; female spikelets 13–17 mm long, 3.4–4 mm wide; male spikelets scabrous to densely hirsute 18. *O. obliquifolia*
(northern South America)
5. Female anthercium not stipitate; leaf blades symmetric basally 8
8. Palea of female anthercium with conspicuous retrorse hairs toward the apex; lemma with bicellular microhairs toward the apex; panicles 6–10 cm long, 1–2 cm wide; leaf blades 10.5–13.2 cm long,

- 2.7–3.4 cm wide; ligules conspicuous, 2.5–4 mm long
 19. *O. retrorsa*, new species
 (Mato Grosso, Brazil)
8. Palea of the female anthercium without retrorse hairs; lemma without
 bicellular microhairs; panicles 9–23 cm long, up to 30 cm wide;
 leaf blades 15–35 cm long, 4–8 cm wide; ligules small, 0.6–1.4
 mm long 9
9. Female spikelets ovate, acuminate to shortly aristate, 8–11.6 mm
 long, 3–3.8 mm wide, the anthercium 70–80% as long as the
 spikelet, ovate, with prickly hairs on the margins of the lemma
 5. *O. ecaudata*
 (Costa Rica to the Guianas, Peru, Bolivia, and Brazil)
9. Female spikelets lanceolate, attenuate to aristate, 16–25 mm long,
 the anthercium 8.4–9.5 mm long, 2.2–3 mm wide, at most 50%
 as long as the spikelet, lanceolate, without prickly hairs on the
 margins of the lemma 10
10. Female anthercium with numerous bicellular microhairs at the tip
 of the palea; spikelets without purple spots
 20. *O. standleyi*
 (cloud forests, Costa Rica to Venezuela)
10. Female anthercium glabrous; spikelets often with purple spots .
 22. *O. taquara*
 (gallery forests, central Brazil)
1. Female anthercium glabrous or pilose, not pitted or granular 11
11. Female anthercium glabrous (occasionally with a few bicellular microhairs at the
 tip of the palea or sparse prickly hairs at the margins of the lemma); ligules
 membranous, conspicuous, up to 10 mm long 12
12. Male spikelets (8.9–11.5 mm long) always longer than the female spikelets
 (7–7.5 mm); leaf blades symmetric basally, lanceolate; female anthercium
 a little shorter than the glumes, the palea with abundant bicellular microhairs
 and prickly hairs 23. *O. wurdackii*
 (Amazonian Venezuela and Brazil)
12. Male spikelets (5–11 mm long) always shorter than the female spikelets
 (14–50 mm); leaf blades asymmetric basally, ovate-lanceolate to lanceolate;
 female anthercium half as long as the glumes, the palea glabrous 13
13. Female anthercium ovate 14
14. Female spikelets 30–48 mm long, the glumes subequal, awns 20–30
 mm long; female anthercium 8.2–10 mm long, $\sim 1/4$ the length of the
 spikelet 3. *O. caudata*
 (Costa Rica to Bolivia)
14. Female spikelets 14–25 mm long, the glumes unequal, awns less than
 20 mm long, usually 10 mm or less; female anthercium 5.6–6.1 mm
 long, $\sim 1/2$ the length of the spikelet 12. *O. latifolia*
 (Florida to Argentina; introduced into the Old World tropics)
13. Female anthercium elliptical 15
15. Male lemma 7–9-nerved, the palea 4-nerved; male spikelet 10.2–10.9
 mm long, 0.8–1.2 mm wide, purplish, scabrous; female anthercium
 14.5–15.8 mm long; inflorescences with the lower branches in a
 verticil, the upper alternating 9. *O. holttumiana*
 (Panama)
15. Male lemma 3-nerved, the palea 2-nerved; male spikelet 5 mm long, 1
 mm wide, acute, brownish, hirsute; female anthercium ~ 10.7 mm long;
 inflorescence formed from a fascicle of terminal branches
 2. *O. buchtienii*
 (Mapiri region, Bolivia)

11. Female anthercium pilose, with cylindrical, flattened, or prickly hairs over the entire surface or at the base and apex of the anthercium; ligules various . . . 16
16. Female anthercium broadly ovate, the lemma gibbous, with conspicuous and caducous prickly hairs over the entire surface 13. *O. latispicula*, new species
(Bahia, Brazil)
16. Female anthercium elliptical, the lemma not gibbous, with cylindrical or flattened hairs but without prickly hairs over the entire surface 17
17. Inflorescence on reduced-leafy culms, showy, with white female spikelets terminating the branches 15. *O. loretensis*
(Amazonian Peru and Brazil)
17. Inflorescence on leafy culms, not showy, female spikelets various . . . 18
18. Female anthercium with long, appressed, cylindrical macrohairs covering the entire surface 19
19. Female glumes unequal, the lower glume long-aristate with an awn 10–12 mm long; female anthercium acuminate 4. *O. ciliatifolia*
(South America)
19. Female glumes subequal, acuminate to subulate, not aristate; female anthercium apiculate or acuminate 20
20. Inflorescences 1–4 (usually 1), borne at the uppermost nodes, open 11. *O. juruana*
(Amazonian Peru and western Brazil)
20. Inflorescences ~10, borne at the uppermost nodes, contracted and reaching about the same height 1. *O. amapana*, new species
(Amapá, Brazil)
18. Female anthercium with long, flat macrohairs toward the base and apex on the ventral surface, otherwise glabrous 21
21. Male spikelets 3.5–4.7 mm long, hispid; pseudopetiole scaberulous 16. *O. maranonensis*
(northern Peru)
21. Male spikelets 8.5–12 mm long, glabrous; pseudopetiole densely hispid on both surfaces 22
22. Panicles 4–9 cm long, 1–5.5 cm wide, the lower branches whorled to alternate; leaf blades ovate-lanceolate to lanceolate, 4.3–11.5 cm long, 1–2.2 cm wide 10. *O. humilis*
(southeastern Brazil, Paraguay, and Argentina)
22. Panicles 9–23 cm long, 5–18 cm wide, the lower branches whorled; leaf blades ovate-lanceolate, 17–27 cm long, 4–8.5 cm wide 8. *O. glaberrima*
(San Luis Potosí, Mexico to Honduras; Peru; eastern Brazil)

1. *Olyra amapana* Soderstrom & Zuloaga, new species

FIGURES 1, 2, 15

TYPE SPECIMEN.—BRAZIL, AMAPÁ: Rio Araguari, vicinity Camp 13, 1°45'N, 52°W, in shadow of upland forest, *J.M. Pires, W. Rodrigues, and G.C. Irvine 51536* (holotype, IAN; isotypes, NY, US sheet no. 2381088).

Gramen perenne, caespitosum, culmis erectibus; nodi incrassati, pilosi. Laminae lanceolatae, 14.5–17 cm longae, 3.5–4.2 cm latae, glabratae, basi asymmetricae, apice symmetri-

cae; pseudopetiolii 0.3–0.4 cm longi; ligulae membranaceae, 0.7 mm longae. Paniculae contractatae, parvae, 2.7–4 cm longae, 1–1.5 cm latae. Spiculae femineae lanceolatae, 11 mm longae, 2.3 mm latae, albidae, glumis inter se subaequalibus, anthoecio longioribus; gluma inferior subulata, 7-nervis; gluma superior subulata, 7-nervis, anthoecium lanceolatum, apiculatum, 9.7 mm longum, 2.4 mm latum, pilosum. Spiculae masculae lanceolatae, 3.3–4.8 mm longae, 0.7–0.8 mm latae, albidae; lemma subulatum, 3-nerve; palea 3–4 mm longa, 2-nervis.

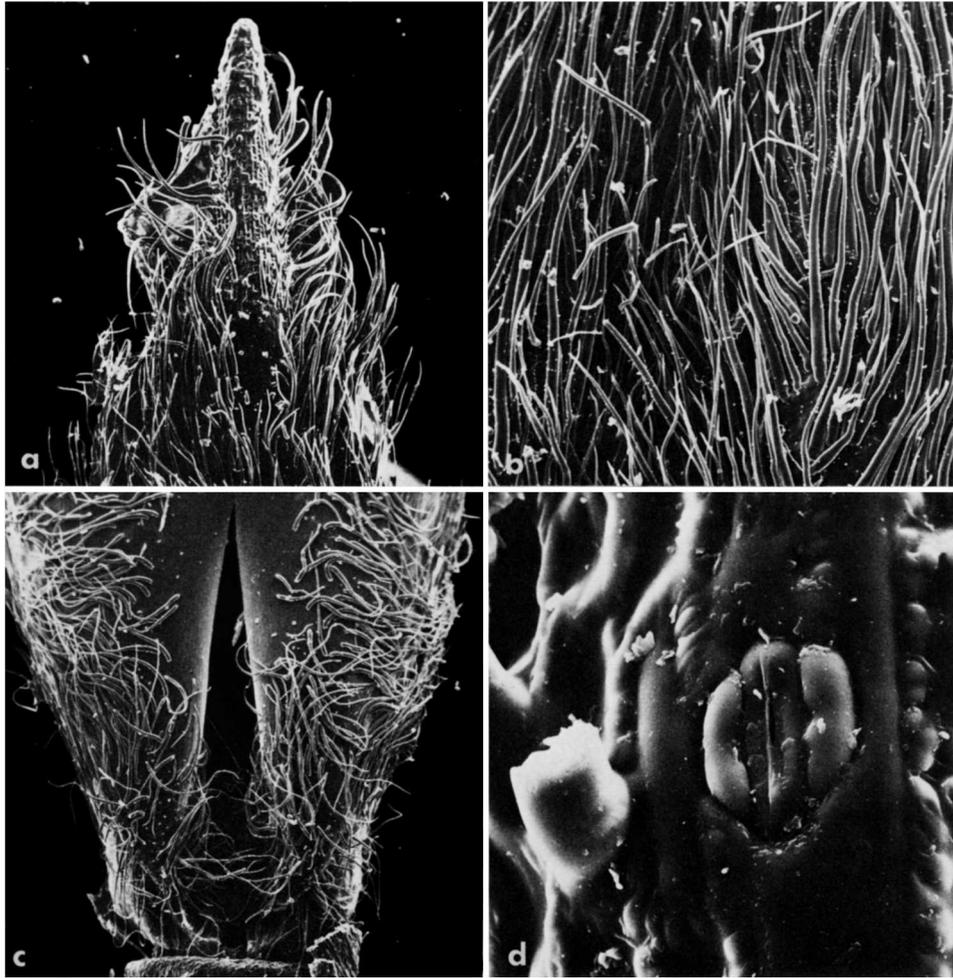


FIGURE 2.—Detail of female antherium, *Olyra amapana*: a, dorsal side ($\times 50$); b, detail of the ventral side showing hairs ($\times 100$); c, base of the dorsal side showing germination lid ($\times 30$); d, apex of the lemma, stomata ($\times 1000$). All micrographs of Pires *et al.* 51536 (US). (Reduced to 77% of indicated magnifications for publication.)

Cespitose perennials; *Culms* erect, these shortly pubescent, with whitish, appressed hairs toward one side of the culm; internodes cylindrical, hollow; nodes thickened, dark, short-

FIGURE 1.—*Olyra amapana*: a, flowering branch with inflorescences from upper nodes of culm ($\times 0.6$); b, simple inflorescence with terminal female spikelets and lateral male spikelets ($\times 3.5$); c, single inflorescence showing pedicels of spikelets ($\times 3.5$); d, lower glume of female spikelet ($\times 7$); e, upper glume of female spikelet ($\times 7$); f, lemma of female spikelet ($\times 7$); g, palea of female spikelet, inside view ($\times 7$); h, female antherium with internode and pedicel, palea side ($\times 7$); i, female antherium with internode and pedicel, lemma side ($\times 7$); j, palea of female antherium, dorsal view ($\times 7$); k, palea of female antherium, ventral view ($\times 7$); l, gynecium and lodicules ($\times 10$); m, male spikelet, side view ($\times 10$); n, lemma of male spikelet, inside view ($\times 10$); o, lemma of male spikelet, outer view ($\times 10$); p, palea of male spikelet, side view ($\times 10$); q, palea of male spikelet, inside view ($\times 10$); r, male flower ($\times 10$); s, pseudopetiole, lower surface ($\times 5.5$); t, pseudopetiole, upper surface ($\times 5.5$). All components based on Pires *et al.* 51536 (US). Illustration by A.R. Tangerini.

pubescent on one side. *Leaves* with sheaths stramineous, strongly ribbed, short-pubescent with appressed hairs, more densely so toward the borders, otherwise glabrous; ligules membranous, ~ 0.7 mm long, shortly ciliate at the tip; pseudopetiole 0.3–0.4 cm long, short-pubescent on both surfaces; blades lanceolate, 14.5–17 cm long, 3.5–4.2 cm wide, glabrous, narrowed to an asymmetric and truncate base, the apex symmetric, the upper margins scabrous, otherwise glabrous, the midnerve prominent and scabrous on the abaxial surface. *Inflorescences* ~ 10 , paniculiform, borne from the uppermost nodes, long-exserted with peduncles longitudinally ridged and scabrous to hispid, all the panicles reaching approximately the same height; panicles contracted, small, few-flowered, 2.7–4 cm long, 1–1.5 cm wide, the lower branches whorled to alternate, the upper ones alternate, with numerous long to short-pedicelled male spikelets arranged on tertiary branchlets, each panicle with 1, rarely 2 to 4, terminal

female spikelets; *axis* longitudinally ridged, scaberulous, the axis of the branches similar to the main axis; pedicels of the female spikelets thickened, smooth, glabrous, those of the male spikelets smooth and glabrous. *Female spikelets* fusiform, glabrous, whitish, 11 mm long, 2.3 mm wide, the glumes subequal, the antherium a little shorter than the glumes; *lower glume* subulate, 7-nerved, glabrous on the outer surface, shortly pilose toward the apex of the inner surface; *upper glume* subulate, 10.3 mm long, 7-nerved, scaberulous toward the apex of both surfaces; *antherium* fusiform, apiculate, 9.7 mm long, 2.4 mm wide, smooth and shiny, covered with long, whitish, cylindrical macrohairs. *Male spikelets* fusiform, 3.3–4.8 mm long, 0.7–0.8 mm wide, whitish, scaberulous on the outer surface to glabrous; *lemma* subulate, 3-nerved; *palea* 3–4 mm long, 2-nerved.

DISTRIBUTION.—Endemic to wet forests of Amapá, Brazil

(Figure 15); known only from the type collection.

DISCUSSION.—This species resembles *O. juruana*, from which it differs by the numerous, long-pedunculate axillary panicles present at the upper nodes, each panicle with one, rarely two to four, terminal, female spikelets.

2. *Olyra buchtienii* Hackel

FIGURES 3, 4

Olyra buchtienii Hackel, 1912:20. [Type: "Bolivia: In silvis ad San Carlos prope Mapiri, 750 m.s.m., 1907, leg. Dr. O. Buchtien no. 1157." Holotype, W, not seen; isotypes, F, US (sheets no. 1099260 and 2877960).]

Cespitose perennials, ~3 m tall. *Culms* erect, branched at the upper nodes; internodes cylindrical, hollow, glabrous; nodes thickened, dark brown, glabrous to shortly pilose. *Leaves* with sheaths glabrous, 13–20 cm long, striate, with membranous

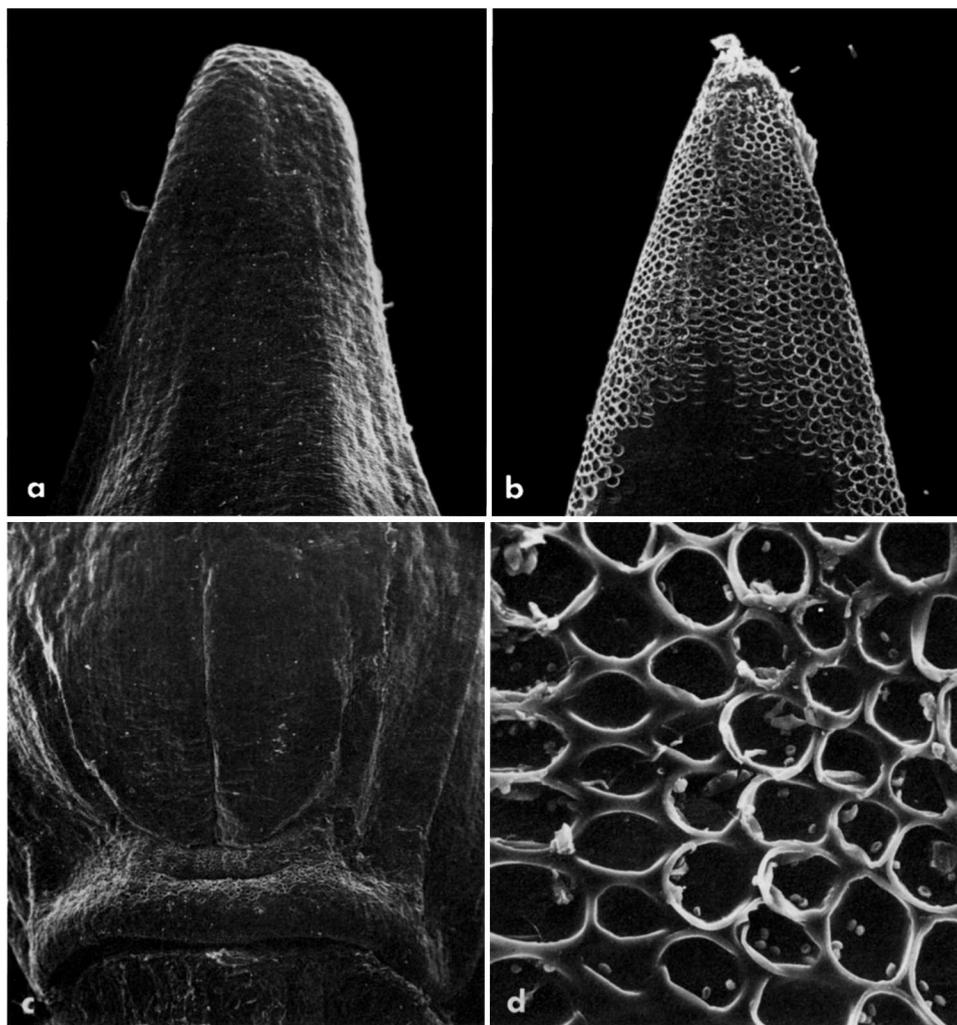


FIGURE 3.—Detail of female antherium, *Olyra buchtienii*: a, apex, dorsal side ($\times 50$); b, apex of palea showing rounded excavations ($\times 100$); c, dorsal base of the antherium showing germination lid ($\times 40$); d, detail of the excavations of the palea ($\times 700$). Micrographs a,c of Buchtien 1157 (US) and b,d of Buchtien 40 (US). (Reduced to 77% of indicated magnifications for publication.)

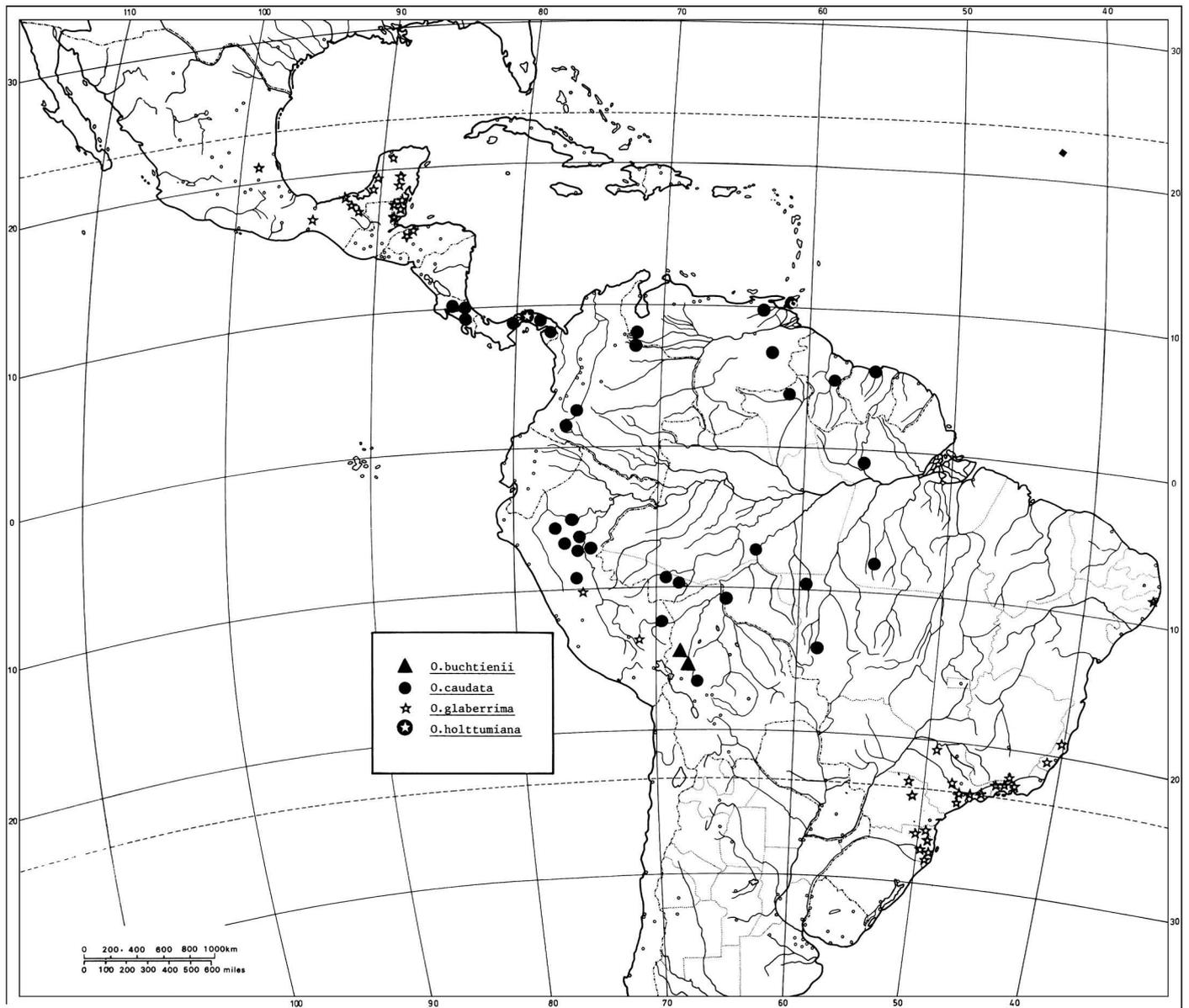


FIGURE 4.—Distribution of *Olyra buchtienii*, *O. caudata*, *O. glaberrima*, and *O. holttumiana*.

margins; auricles membranous, glabrous; ligules membranous, conspicuous, 3–5 mm long, brownish, glabrous; pseudopetiole 0.4–0.6 cm long, dark brown, sparingly pubescent or more frequently glabrous; blades lanceolate, 20–30 cm long, 3.5–7.3 cm wide, narrowing from an asymmetric base to a symmetric, subulate apex, glabrous on both surfaces, the margins scabrous, the midnerve prominent. *Inflorescences* umbelliform on the upper nodes; panicles lax, ~12 cm long, 15 cm wide, the branches spreading, conjugate to verticillate from the base of the panicle, with male spikelets in pairs on short pedicels, the pedicels congested in fascicles of 6–8 and alternate on either side of a triquetrous axis, 1 or 2 terminal

female spikelets on each branch; pedicels of the male spikelets short-hispid, those of the female spikelets thickened, 0.6–3 cm long, triquetrous, flattened toward the base, scabrous to short hispid; *main axis* hispid to scabrous, the axils of the branches dark brown, hispid. Axillary panicles similar to the terminal one. *Female spikelets* ellipsoid, subulate apically, 28–38 mm long, 3.6–3.9 mm wide, both glumes longer than the anthercium; *lower glume* long subulate to aristate apically, 9–15-nerved, pubescent to hispid on the outer surface, densely hispid on the inner surface with short hairs; *upper glume* subulate to aristate apically, 20–29 mm long, 7–9-nerved with transverse veinlets, pubescent to hispid on the outer surface,

with short appressed hairs on the inner one; *anthercium* lanceolate, acute apically, ~10.7 mm long, 3.3–3.5 mm wide, glabrous, smooth and shining, whitish to stramineous, with rounded excavations on the apex of the palea. *Male spikelets* lanceolate, 4.9 mm long, 1–1.2 mm wide, $1/7$ or less as long as the female spikelets, short- to long-hispid; *lemma* acute, 3-nerved, short-hispid on the outer surface, otherwise glabrous; *palea* 3.5–4.8 mm long, 2-nerved, sparingly hispid to glabrous; anthers 3, 2–4 mm long.

DISTRIBUTION.—Only known from Bolivia, in lowland forests of the Department of La Paz (Figure 4).

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, LA PAZ: San Carlos, *Buchtien 40* (NY, US); valley between Tipuani and Apolobamba, *Weddell 4581* (US). Nor Yungas, 13.5 km above San Pedro, *Gentry and Solomon 44515* (MO, US).

DISCUSSION.—*Olyra buchtienii* resembles *O. latifolia*, *O. caudata*, and *O. holttumiana*, from which it differs by the presence of noticeably umbelliform inflorescences similar to those of *O. obliquifolia* and the panicles with all branches whorled and reaching nearly the same height. The male spikelets are smaller than in these related species, measuring only about $1/7$ the length of the female spikelets, and are borne in discrete fascicles along the panicle branches, a distinctive character not seen in other species in the genus.

3. *Olyra caudata* Trinius

FIGURES 4, 5

Olyra caudata Trinius, 1836:292. [Type: "Peruvia, in sylvis densis, Tocache." Holotype, LE, not seen; fragment of the holotype, US sheet no. 2877958.]

Olyra dimidiata Hochstetter ex Steudel, 1853:36. [Type: "(Hrbr. *Hostm.* nr. 786a). Surinam." Holotype, P, not seen; fragment of the holotype, US sheet no. 2877957.]

Olyra pittieri Hackel, 1901:461. [Type: "Costa Rica: in planitie silvatica Cardoncillol (Cordoncillal, near Río Angel, Prov. Heredia), *Pittier 3639*." Holotype, W, not seen, fragment of the holotype, US sheet no. 2877933; isotype, MO.]

Cespitose perennials forming dense clumps, with thick adventitious roots. *Culms* erect, branching at the upper nodes, cylindrical, 1–2.5 m tall, arcuate; nodes thickened, short-pilose. *Leaves* with sheaths pubescent or densely papillose-pilose to glabrous, the margins short-ciliate; auricles present, membranous; ligules membranous and short-ciliate at the apex, conspicuous, 5–10 mm long, pubescent on the abaxial surface, the adaxial surface glabrous, smooth; pseudopetiole 0.5–0.8 cm long, brownish, short to densely pilose on its surface; blades ovate-lanceolate, 18–30 cm long, 6–10 cm wide, greenish, asymmetric and narrowed basally, symmetric and acuminate apically, short-pilose to scabrous, with a prominent midnerve and scabrous margins. *Panicles* umbelliform, lax, diffuse, 15–20 cm long, 10–20 cm wide, the lower branches whorled, spreading and reaching approximately the height of the upper ones, these alternate or verticillate, the male spikelets on short pedicels below, with the pedicels paired or in fascicles along

either side of a triquetrous axis, a single terminal female spikelet on each branch; main axis longitudinally ridged, scabrous, the axils of the branches densely pilose, the axis of the branches triquetrous, with one side flattened; pedicels of the male spikelets thin, short-pilose to scabrous, those of the female spikelets thickened, scabrous to short-pilose. Axillary panicles usually present, similar to the terminal one. *Female spikelets* ovoid, long-subulate apically, 30–48 mm long, 4.5–5.5 mm wide, the glumes subequal and longer than the anthercium (4:1); *lower* and *upper glume* long-subulate with a geniculate awn 20–30 mm long, 9-nerved with transverse veinlets, densely pilose on the inner surface, especially toward the apex, short-pilose on the outer surface; *anthercium* ovoid, acute apically, 8.2–10 mm long, 4–5.2 mm wide, stramineous, brownish to olivaceous at maturity, smooth and shining, glabrous, shortly stipitate at its base, the stipe ~0.4 mm long; *lemma* with prickly hairs on the upper margins; *palea* pitted toward the apex and on the basal margins. *Caryopsis* ovoid, brownish, 6–6.8 mm long, 3.2–3.8 mm wide; hilum linear, reaching the entire length of the caryopsis; embryo $1/6$ – $1/7$ the length of the caryopsis; germination lid rounded. *Male spikelets* lanceolate, brownish, 4–6.6 mm long, 0.7–1 mm wide, hispid; *lemma* short-aristate, 3–5-nerved, hispid, more so toward the apex and margins; *palea* 3.2–5.8 mm long, 2-nerved, sparingly pilose toward the middle, otherwise glabrous; anthers 3 mm long.

DISTRIBUTION.—Mesoamerica (Costa Rica and Panama) and the West Indies (Trinidad) to South America (Colombia, Venezuela, Surinam, Guyana, Peru, Bolivia, and Brazil), in forests between 150 and 1100 m elevation (Figure 4).

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, COCHABAMBA: Cantón Chuquioma, Campamento Isarsama de la UMSS al río del mismo nombre, *Beck 1562* (US).

BRAZIL, ACRE: Aldeota between Parangaba and Papagaio, *Maas et al. P13110* (F, US); Rio Branco, Colônia Penal, *Emygdio 1815* (R, US); Rio Branco, Zoobotanical Garden of the Universidade Federal do Acre, *Lowrie et al. 152* (MO). AMAZONAS: Near Três Casas, *Krukoff 6529* (F, MO, NY, US); Serra dos Surucucus, *Prance et al. 10168* (US). MATO GROSSO: Rio Aripuanã, Estrada Sta. Elena, *Cordeiro 127* (US); Paças Novas, afluente do Mamoré, *Kuhlmann 513* (RB, US). PARÁ: Parque Indígena do Tumucumaque, Rio Parú de Oeste, Missão Tiriyo, *Cavalcante 2334* (MO, US); Rio Vermelho, Serra do Cachimbo, BR 163 Cuiabá-Santarém, km 867, *Silva et al. 209* (MO, US), km 887, *Prance et al. 25311* (MO, US). RONDÔNIA: Entre Cururú y Vilhena, *Kuhlmann 1864* (RB). RORAIMA: Serra dos Surucucus, NW of Mission Station, *Prance et al. 10168* (US).

COLOMBIA, CAQUETÁ: 16 km from Florencia toward Belém, *Luteyn et al. 4899* (MO, US); Rio Ortezua, Metucha, *Woronow 6060* (US); Nova Granada, Salitre, *Andre 1141* (US).

COSTA RICA, LIMÓN: A few km west of Bribri, *Gómez et al. 20316* (CR, WIS). SAN JOSÉ: Vicinity of El General, *Skutch 4238* (NY, US).

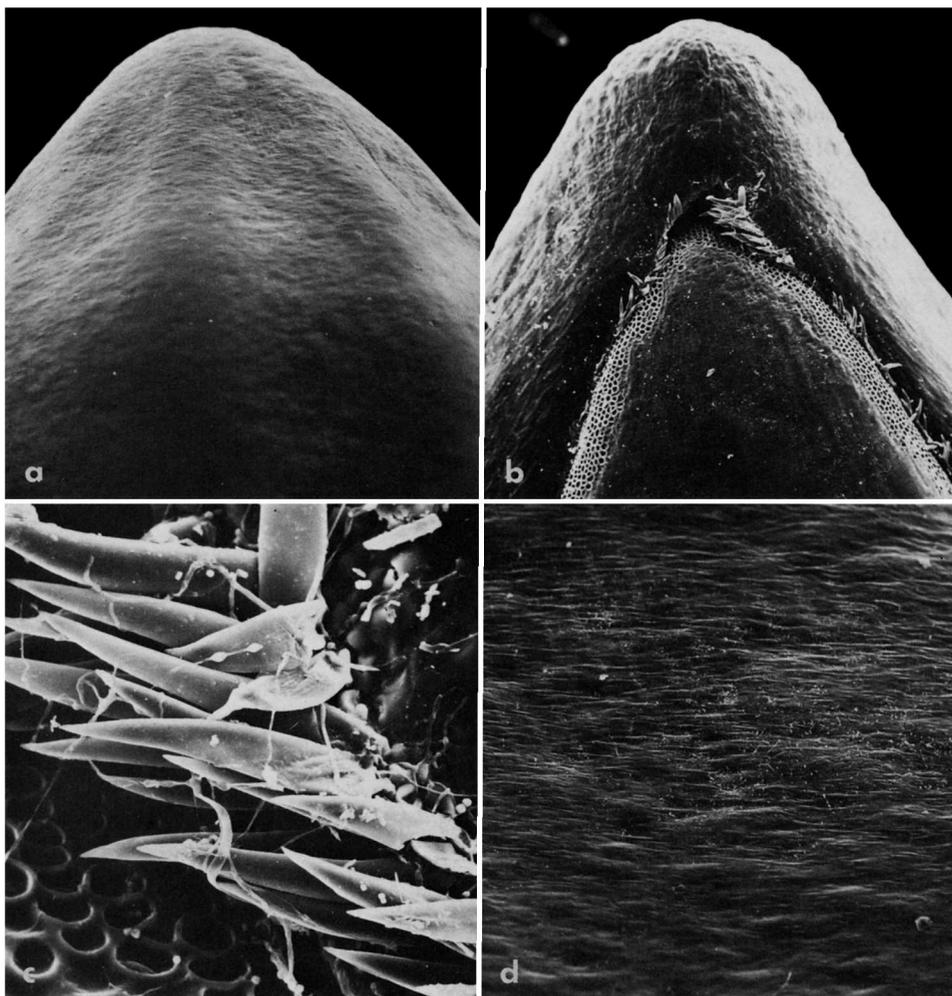


FIGURE 5.—Detail of female anthercium, *Olyra caudata*: a, apex of the anthercium, dorsal side ($\times 50$); b, apex of the anthercium, ventral side ($\times 50$); c, detail of macrohairs on the margins of the lemma ($\times 500$); d, surface of the lemma ($\times 200$). Micrographs a, d of Allard 20195 (US), b, c of Krukoff 6529 (US). (Reduced to 77% of indicated magnifications for publication.)

GUYANA: New Cabalebo, Courantyne River, *Jenman 134* (US).

PANAMA, COCLÉ: 16.7 km north of turnoff to Coclesito from Llano Grande, *Hammel 1857* (MO, US); forest around Limón, *Folsom 5835* (MO). DARIÉN: Cerro Pirre, *Bristan 577* (MO), *Gentry and Clewell 7119* (MO), *Mori and Kallunki 5447* (MO); vicinity of gold mine at Cana, *Croat 37649* (MO).

PERU, AMAZONAS: Alrededor de la comunidad Kusu, Río Numpatkin, *Ancash 76* (F, MO, US); quebrada Kayamas, Cenepa, *Ancash 171* (F, MO, US); vicinity of Quebrada Shimpunts, near upper Río Cenepa, *Berlin 881* (F, MO, US), *Kayap 1265* (F, MO); trail N of Cenepa to Tuhushiku Creek, *Berlin 1850* (F, MO, US). HUÁNUCO: Cueva de Las Lechuzas, cerca de Tingo María, *Ferreira 13222* (US); Tingo María, *Asplund 12308* (R, US), *Allard 20915, 22583* (US); al este de Tingo María, cerca al Cerro Quemado, *Schunke 10127* (U).

LORETO: Padre Abad, *Schunke 5468* (MO); Yurimaguas, lower Río Huallaga, *Killip and Smith 27975* (F, NY, US); al este de Tingo María, cerca al cerro Quemado, *Schunke 10127* (U); without locality, *Ule 6299* (US). MADRE DE DIOS: Tambopata Nature Reserve, *Barbour 4786* (MO); 39 km SW of Puerto Maldonado, *S.F. Smith et al. 160, 551* (US). SAN MARTÍN: Carretera al Río Tocache, *Plowman and Schunke 7461* (F, US), *Schunke 3587* (F, MO, US); Santa Rosa de Mishollo, *Schunke 6804* (F, MO, US); puente de Río Uchiza, *Schunke 7719* (WIS); Quebrada de Ishichimi, cerca de Tocache, *Schunke 10045* (F, MO, U); trail up Río Huallaga Valley toward Limón, *Gentry et al. 25552* (F, MO); trail to Schunte, 10 km W of Tocache Nuevo, *Plowman et al. 11368* (F, MO, US).

SURINAM: Maratakka River, without collector, Jan 2, 1915 (US 1914625); Paramaribo, *Wullschlaegel s.n.* (US).

TRINIDAD: Cedros, *Broadway s.n.*, Nov 4, 1916 (US); without locality, *Fendler 967* (US).

VENEZUELA, APURE: Selva de Cutufí, between Cutufí on the Río Cutufí and the Río Sanare, *Davidse and González 21724* (MO). BOLÍVAR: Near Campamento Las Pavas, *Steyermark 117188* (MO). MONAGAS: La Hormiga area, between La Pica and Caño Colorado, E of Maturín, *Wurdack and Monachino 39482* (NY, US). TÁCHIRA: Slopes of Cerro of Cuchilla La Pabellana, W of San Joaquina de Navay, *Steyermark 119386* (MO).

DISCUSSION.—The female spikelets of *Olyra caudata* resemble robust, long-awned versions of those of *O. latifolia*. As in *O. latifolia*, the female glumes disarticulate early, completely exposing the antherium, which becomes brownish to olivaceous at maturity. Davidse (1987) has postulated that the florets “may mimic edible berrylike fruits that are eaten by frugivorous birds.” As in some other species of the genus, a short internode is present at the base of the antherium.

4. *Olyra ciliatifolia* Raddi

FIGURES 6, 15

Olyra ciliatifolia Raddi, 1823:19. [Type: “prope Rio Janeiro.” Holotype: PI, not seen, fragment of the holotype, US sheet no. 2879005.]

Olyra cuneatifolia Desvoux, 1831:210. [Type: “Reperitur in Brasilio.” Holotype, P, not seen, fragment of the holotype, US sheet no. 2877953.]

Perennial in caespitose clumps with 10 to 20 culms in a fascicle. Culms erect-ascending, geniculate or not at the lower nodes, 50–130 cm tall, unbranched; internodes hollow, shortly pubescent with retrorse, whitish and appressed hairs; nodes purplish, shortly pilose and thickened. Leaves with sheaths mottled, sparsely pilose with short whitish hairs to glabrescent, the margins ciliate, more so toward the tip; ligule membranous-ciliate, small, 0.4 mm long; pseudopetiole 0.2 cm long, stramineous to greenish, pilose, the borders long-ciliate to scabrous; blades ovate-lanceolate, 9–24 cm long, 3.6–8.5 cm wide, ascending, asymmetric and truncate basally, the apex symmetric and acuminate, the margins ciliate, both surfaces scabrous, the midnerve prominent toward the base. Inflorescences borne at the uppermost nodes, long-exserted in hispid peduncles, paniculiform; panicles pyramidal, lax, 9.5–19 cm long, 3.5–10 cm wide, the lower branches whorled and with male spikelets paired, one short, the other long-pedicelled on spreading tertiary branchlets, the upper ones alternate and with male spikelets on pairs below and a single terminal female spikelet on each branch; axis longitudinally ridged, hispid to scabrous, the branches and branchlets slender, triquetrous, scabrous; pedicels of the female spikelets thickened, smooth, glabrous. Female spikelets lanceolate, aristate, 11.6–23 mm long, 1.8–3 mm wide, the glumes unequal; lower glume ~10–12 mm long, pilose on the apex of the inner surface and toward the outer margins, otherwise glabrous, 5–7-nerved with transverse veinlets, long-aristate with the awn scabrous; upper glume acuminate, 7.7–10.2 mm long, with a pubescence

similar to that of the lower glume, 5–7-nerved with transverse veinlets; antherium fusiform, acuminate, 6.5–7 mm long, 1.6–3 mm wide, smooth and shining, whitish, dark at maturity with black spots, sparsely pubescent with long cylindrical, whitish macrohairs, more densely so toward the apex and base; lemma 5–7-nerved. Caryopsis long-ellipsoid, brownish, 4.3–5 mm long, 1.4–2 mm wide; hilum linear, reaching the entire length of the caryopsis. Male spikelets fusiform, 5.4–10.7 mm long, reddish to purplish, scabrous to shortly pubescent on the outer surface, aristate, awn ~3 mm long; lemma aristate, 3–5-nerved, sparsely pubescent toward the apex, otherwise glabrous; palea acute, 4.7–8.6 mm long, 2-nerved, sparsely pubescent toward the apex, otherwise glabrous, anthers 2.7–3.7 mm long.

DISTRIBUTION.—Colombia, Venezuela, Guyana, Brazil, Paraguay, Bolivia, and Argentina (Figure 15), often growing in disturbed places, from 100 to 1200 m elevation.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA, CORRIENTES: Itatí, dense woodland on the bank of the River Paraná, *Pedersen 7013* (US); Perichón, *Quarín and González 3094* (US). MISIONES: Ruta 12, arroyo Aguaray Miní, *Fernández et al. 53* (US); arroyo Santo Pipó, *Schwarz 2595* (MO, US); Santo Pipó, *Schwarz 3445* (US, WIS); arroyo Yabebirí, *Schwarz 4530* (MO, US); Colonia Ñacanguazú, *Schwarz 1846* (MO); Corpus, *Schwarz 1928* (MO, US); Iguazú Falls, *Krapovickas and Cristobal 13701* (US); El Alcazar, *Schwindt 1456* (US); Loreto, *Ekman 675* (US), *Montes 1779* (F, US), *2047* (MO, US), *27410* (F, MO, US); Puerto Santo Pipó, *Schwarz 2641* (MO); Makako, *Schwarz 2917* (MO, US); Puerto Mani, *Schwarz 10295* (WIS); Puerto Aguirre, *Parodi 4395* (US); Puerto Iguazú, *Bridarolli 3619* (US); Puerto Leoni, *Schwarz 7699* (US, WIS); Puerto Mineral, *Schwarz 7579* (US); Caingúas, *Schwindt 592* (WIS); Santa María, *Montes 1645* (MO, US).

BOLIVIA, BENI: Huachi, head of Beni River, *White 1043* (F); Pampas near lake Rogagua, *Rusby 1669* (NY, US).

BRAZIL, ACRE: Beira do Rio Branco, ~5 km N de Boa Vista, *Black 51-13779* (IAN, US); without locality, *Ule 8047* (US). BAHIA: Rodovia BA-265, 6 km W of Caatiba, *Mori and Santos 11566* (MO, RB); 19 km N of Esplanada on road to Jaquera, *Calderón et al. 2411* (US). CEARÁ: Grangeiro Taboleiros, *von Luetzelburg 24257* (US). DISTRITO FEDERAL: altos do córrego ‘Mato Grande,’ afluente margem esquerda do Ribeirão Papuda, *Filgueiras and Pereira 850, 851* (US); ~30 km S of Brasília, on road to Belho Horizonte, *Irwin and Soderstrom 5623* (US); Córrego Landim, ~20 km NE of Brasília, *Irwin et al. 15679* (MO, US). Brasília, *Pires et al. 9324* (UB). GOIÁS: 12 km W of village of Presidente Kennedy, *Plowman et al. 8159* (MO); lower slopes of Serra Dourada, ~30 km E of Goiás Velho, *Irwin et al. 11868* (F, MO, US); 24 km NE of Catalão, *Irwin et al. 25106* (US); 75 km N of Corumbá de Goiás on road to Niquelândia, *Irwin et al. 19030* (F, MO, RB, US); Rio das Contrás, Araguaina, *Irwin et al. 21121* (F, MO, US); ~9 km S of Guara, *Irwin et al. 21535* (US); between

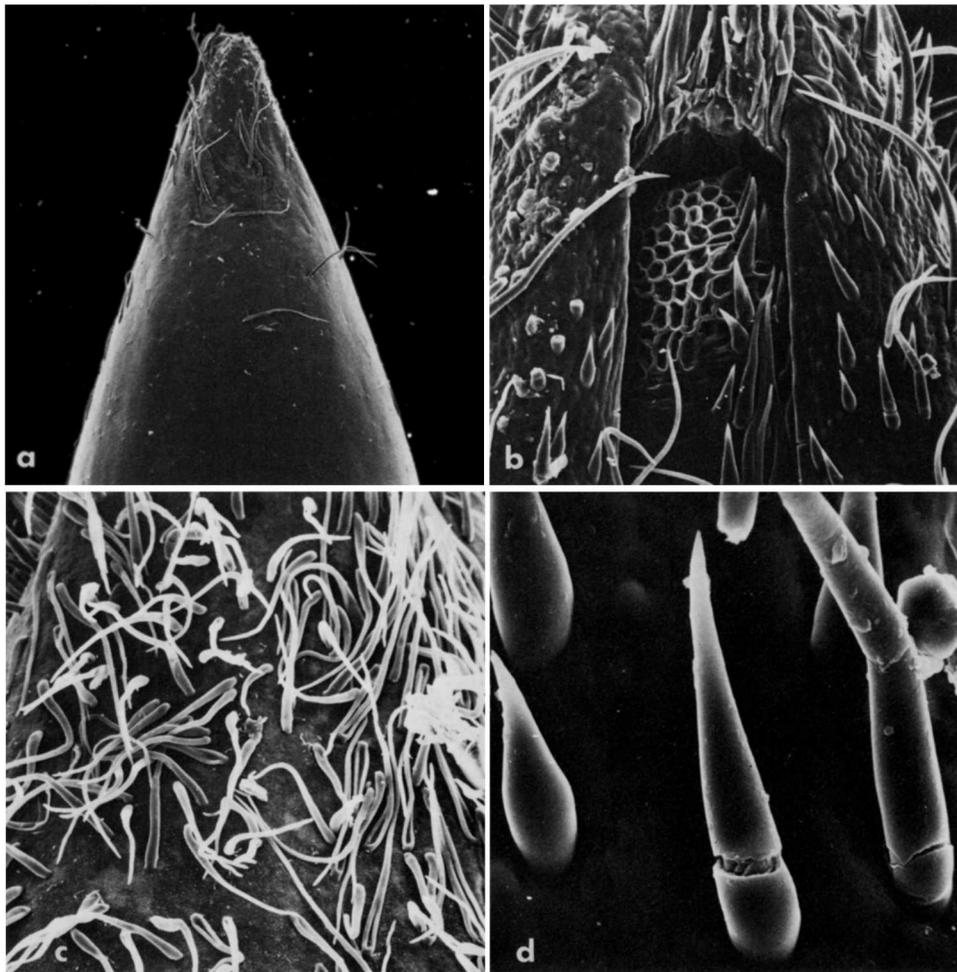


FIGURE 6.—Detail of female antherium, *Olyra ciliatifolia*: a, antherium, dorsal side ($\times 30$); b, antherium, ventral side showing the apex of the palea with rounded excavations and lemma ($\times 200$); c, apex of the lemma showing cylindrical macrohairs ($\times 200$); d, detail of a macrohair ($\times 1000$). Micrographs a,b,d of Chase 11146 (US), c of Chase 11487 (US). (Reduced to 77% of indicated magnifications for publication.)

Itabira and Goiabeira, Chase 11487 (US); between Viannópolis and Ponta Porá, Chase 11318 (F, MO, NY, RB, US); Goyandira, Chase 11575 (US); Santa Rita do Paranaíba, Chase 12098 (US); vicinity of Goiabeira, Chase 15022 (US); vicinity of Goiabeira, between Annópolis and Goiás, Chase 11506 (F, MO, US); Santa Rita do Araguaia, on Rio Araguaia, Chase 11818 (US). MARANHÃO: Castanheda, Sucre 9386 (US); Caxias to Barra do Corda, Swallen 3522 (NY, US), 3553, 3584 (US), 3555 (R, RB); Grajahú to Pôrto Franco, Swallen 3774 (US); south of main house of Fazenda Morros, about 35 km south of Loreto, Eiten and Eiten 3738A (MO, NY), 4306 (F, NY, US), 10633 (US); between the rios Balsas and Parnaíba, about 40 km south of Loreto, Eiten and Eiten 3827 (F, NY, US); 55 km due W of Barra do Corda, Eiten and Eiten 10276 (US). Perizes, Black et al. 54-16511 (IAN, US); Palmerinha, a 74 km de Tuntum, Silva and Santos 712 (US). MATO GROSSO:

Água Quente, prope Palmeiras, Lindman A2597 (US); along Rio São Lourenço, Barça, Chase 11975 (US); between Rondônopolis and São Lourenço, Chase 12001 (US); sitio do Dr. Alfredo Neder, Sucre 10380 (RB); without locality, H. Smith 206 (US). MATO GROSSO DO SUL: Dourados, Colônia Agrícola Federal, Swallen 9406 (US); Aquidauanã, Chase 11059 (US); vicinity of Dourados, Chase 10999, 11009 ¹/₂ (US), 11006 (RB, US); Urucum, Corumbá, on Rio Paraguay, Chase 11146 (US). MINAS GERAES: Caldas, Widgren 1215 (US); Faria, serra da Bocaina, Chase 10539 (US); Fundão, Macedo 1002 (US); Lavras, Chase 8749 (F, MO, NY, RB, US), 8788 (US); along railway between Lavras and Formiga, Dorsett 214b (US); Serra do Cipó, km 100, Chase 9291 (F, MO, NY, US); Serra do Cipó, in cleared field near Vaccaria, Chase 9136 (F, MO, NY, US); Serra do Curral, Acaba Mundo, Chase 8960 (F, MO, US); Barreiras, Kuhlmann s.n., Feb. 20

1926 (US); Buritys, near Rio São Francisco, *Chase 10469* (F, MO, US); ~10 km NE of Francisco Sá, road to Salinas, *Irwin et al. 23143* (F, MO, US); ~5 km SE of Paracatú, *Irwin et al. 26191* (F, MO, US); between Urubú and Cambuhy, valley of Rio Anzol, *Dorsett 154b* (US); São Miguel, NW of Formiga, *Chase 10550* (NY, US); Santa Terezinha, *Macedo 1661* (RB, US); between Uberlândia and Río Paranahyba, *Chase 11617* (US); without locality, *Widgren 914* (R, US); Morro do Pau Lavrado, *Heringer 3800* (UB); 30 km from Paraopeba, *Heringer 5901* (UB). PARÁ: 20 km W of Redenção, near Cârrego São João and Troncamento Santa Teresa, *Plowman et al. 8451* (F, MO). PARANÁ: Campo Morão, Río do Vargem, *Swallen 9001* (US); 7 km E of Londrina, *Swallen 8741* (US); Parque Nacional de Iguaçu, 9 km S of Jardinópolis along the road to Medianeira, *Davidse et al. 11222* (MO, US), *Falção 100* (R); Rio Ivaí, *Hatschbach 15729* (US); 6 km SE of São Luis, *Davidse et al. 11214* (MO). PIAUÍ: entre Piaba e Barrinha, *Sucre and Silver 9428* (US). RIO DE JANEIRO: Serra do Barata, represa do Piraquara, *Soderstrom and Sucre 1921* (CEPEC, RB, US), 1922 (CEPEC, US), *Sucre 7485* (RB). RORAIMA: 5 km ao N de Boa Vista, *Black 51-13779* (US); proximo a boca do Igarapé Iguapirá, *Pires et al. 14-633(103)* (US). SÃO PAULO: Fazenda Capi, *Clayton 4603* (US); Fazenda of Lauro Toledo, 1 km W of Rio São Mateus, *Clayton 4576* (US); Fazenda São José, 1 km W of Río São Mateus, *Eiten et al. 5889* (MO, US); Itapira, *Hoehne 20338* (US); Nova Europa, *Hoehne 13657* (US); Parque do Estado, São Paulo, *Clayton and Eiten 4186, 4188* (US); Ribeirão Preto, *Lofgren 1544* (US). STATE AND LOCALITY UNKNOWN: *Gardner 3523* (US), *Sellow*, Brasil (US), *Pohl*, Brazil (US), *Glaziou 14397* (US).

COLOMBIA, CAQUETÁ: 16 km from Florencia toward Belém, *Eiten and Eiten 10633* (MO). META: Ranch Menegua, about 100 km SE of Villavicencio, *Schiefer 795* (GH, US); without locality, *Moritz 685* (US).

GUYANA: Without locality, *Schomburgk 703* (US).

PARAGUAY: In regione lacus Ypacaray, *Hassler 12444* (F, NY, US), *13021* (US); Pedro Juan Caballero, *Morong 505* (MO, NY, US); Villa Elisa, *Pedersen 5909* (US); Estancia La Soledad, Santiago, *Pedersen 3200* (MO, US); Cordillera de Altos, *Fiebrig 480* (F, GH); Trinidad, *Rojas 3071* (US); Villa Rica, *Jorgensen 4098* (F, GH, MO, NY, US); in regione cursus superioris fluminis Apa, *Hassler 8194* (NY); without locality, *Anderson 1185* (US), *Balansa 258* (US), *Hassler 1587* (NY).

TRINIDAD: Port of Spain, Botanical Garden, *Hitchcock 10133* (US); without locality, *Broadway 1918* (NY, US), *5085* (MO), *9194* (US), *Fendler 968* (NY), *Purdie 26* (US).

VENEZUELA, BARINAS: Ticoporo forest reserve, *Breteler 4015* (US). BOLÍVAR: Near El Dorado, *Irwin et al. 25106* (MO); 1 km N of Paragua, *Liesner and González 5755* (US). GUÁRICO: Altigracia de Orituco-Taguay (carretera hacia Carmen de Cura), *Aristiguieta and Agostini 6439* (US).

DISCUSSION.—This is one of the commonest species in eastern Brazil, flowering between January and May. There are only female spikelets on the axillary panicles of *Eiten and Eiten*

3827 and 4306 from Brazil. Hunziker et al. (1982) have recorded a chromosome number of $n = 11$ for the species. The common name is recorded as “paja carruzo” in Venezuela.

5. *Olyra ecaudata* Doell

FIGURES 7, 8a, b, 34

Olyra ecaudata Doell in Martius, 1877:326. [Type: “In Guiana gallica (*Leprieur* n. 547).” Holotype, P, not seen, fragment of the holotype, US sheet no. 2877952.]

Robust perennials with large dense clumps of up to 50 culms. Culms up to 3 or 4 m tall, from a thick, short-rhizomatous base, geniculate-ascending and bearing fully developed leaves only toward the top, 5 or 6 of these ascending in a cluster, with the flowering culms usually separate from the vegetative ones; vegetative culms erect; flowering culms bladeless, to 2 m long; internodes thick, hollow, short-pubescent with whitish hairs to glabrous; nodes geniculate, thick, prominent, formed of the thickened basal rim of the sheath above and the thickened upper rim of the internode below, flared, dark brown and with retrorse hairs to glabrous. Leaves 5–7 per complement, clustered above the naked culms; sheaths with flattened, caducous, and brownish hairs along the overlapping margins, the rest of the surface sparsely pilose to glabrous; ligule a tiny brown membrane, 0.6–1.1 mm long, shortly ciliate at the tip; pseudopetiole dark brown, 0.3–0.5 cm long, with brown, thick, flattened hairs on the adaxial surface, the abaxial surface with or without these hairs; blades ovate-lanceolate, 21–35 cm long, 5–7.5 cm wide, rigid, dark green, fully developed on the upper nodes, gradually narrowed above to an acute or acuminate, symmetric tip and slightly cordate, symmetric at the base, glabrous on both surfaces to sparsely pilose on the adaxial surface, the midnerve prominent, the basal margins short-ciliate, otherwise scabrous to completely glabrous. Inflorescences paniculiform, 2 or 3 from each of the uppermost nodes, some inflorescences short and found only at the base of the plant; panicles 10–20 cm long, 10–25 cm wide, the lower branches verticillate, the upper ones alternate to opposite, stiffly spreading, the individual branches up to 15 cm long, usually with 2–6 female distal spikelets and below with male spikelets on short branchlets or in pairs, one long- and the other short-pedicellate, the panicles exerted on long, glabrous to sparsely pubescent peduncles; axis and branches sparsely hirsute, longitudinally ridged, scabrous, the axils of the branches densely pilose. Female spikelets ovoid, acuminate to occasionally shortly aristate, 8–11.6 mm long, 3–3.8 mm wide, the glumes subequal or the lower glume occasionally a little longer than the upper one, sparsely pilose toward the margins and nerves on the outer surface, shortly pilose toward the apex on the inner surface; lower glume apiculate to shortly aristate, 5–10-nerved with transverse veinlets; upper glume apiculate, 7–11-nerved with transverse veinlets; anthercium ovoid, 6.6–8.3 mm long, 2.7–3.4 mm

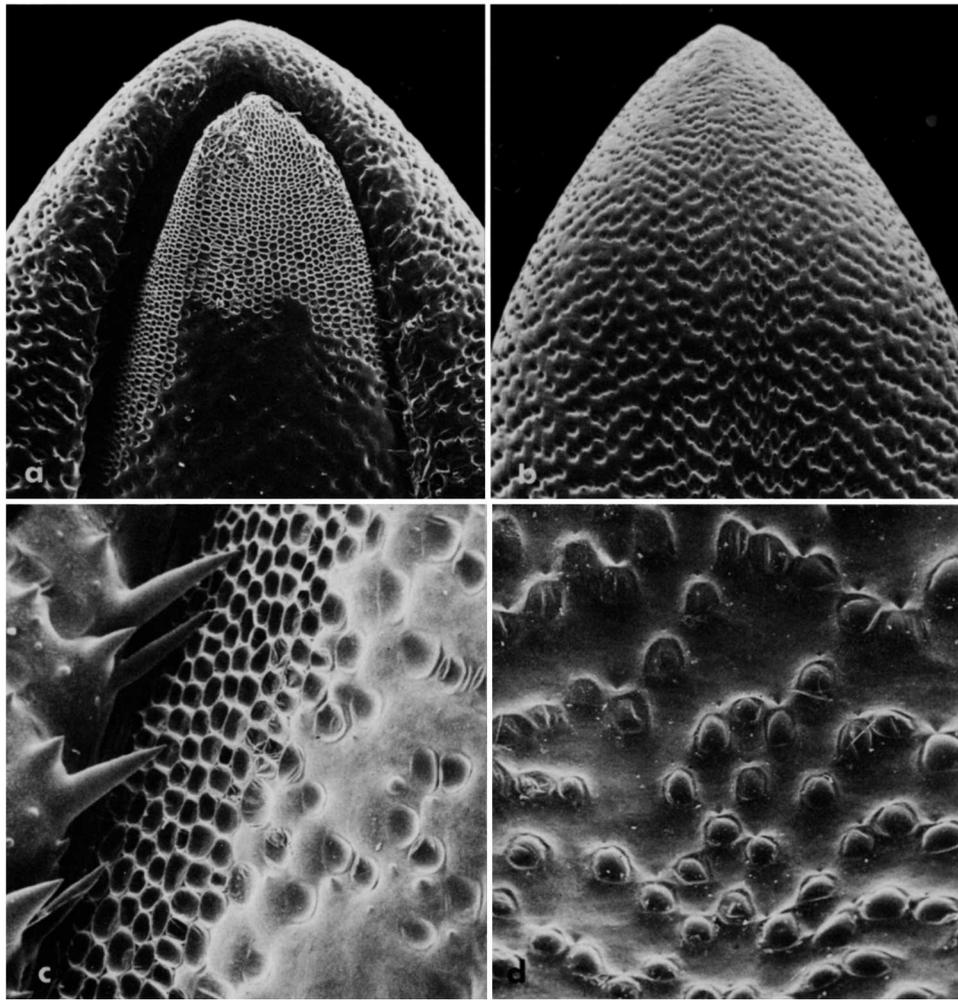


FIGURE 7.—Detail of female anthercium, *Olyra ecaudata*: a, anthercium, ventral side ($\times 50$); b, anthercium, dorsal side ($\times 30$); c, margin of the lemma with prickle hairs and palea with rounded excavations toward the margins ($\times 200$); d, surface of the lemma with excavations ($\times 200$). Micrograph a of Cremers 4478 (US), b-d of Soderstrom & Calderón 2292 (US). (Reduced to 77% of indicated magnifications for publication.)

wide, indurate, whitish, with small excavations all over the lemma and palea; lemma 7- or 8-nerved, the margins with conspicuous, rigid, and long prickle hairs; palea 4-nerved and with rounded excavations toward the apex and upper margins. Caryopsis ellipsoid, brownish, 4.8 mm long, 2.2–2.6 mm wide; hilum reaching the entire length of the caryopsis. Male spikelets lanceolate, aristate, 7.5–11 mm long, 0.6–1 mm wide, greenish, glabrous to scaberulous; lemma 3-nerved, aristate, the awn 5 mm long; palea 2-nerved; anthers yellow, 3.3–4.3 mm long.

DISTRIBUTION.—Ranging from Costa Rica and Panama in Mesoamerica to Colombia, Venezuela, Surinam, French Guiana, Peru, Bolivia, and Brazil in South America (Figure 34); growing in primarily humid forests, generally at elevations below 500 m, although *Smith 2700* from Peru was collected at 2000 m.

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, PANDO: Cobija, *Ule 9146* (US).

BRAZIL, ACRE: About 80 km from Rio Branco on road to Xapuri, *Calderón and Soderstrom 2292* (US); 125 km from Rio Branco on road to Pôrto Velho, *Calderón and Soderstrom 2305* (US); 8°54'S–72°51'W, *Calderón and Soderstrom 2353* (US). BAHIA: Bahia State Highway 2, 7 km N of Ibirataia City, Fazenda Santo Antonio, *Calderón and Pinheiro 2223* (CEPEC, US, WIS), 2259 (US); Parque Nacional Monte Pascoal, 14 km E of BR-101, 13 km N of Itamarajú, *Soderstrom et al. 2197, 2199* (CEPEC, US). ESPÍRITO SANTO: Reserva Florestal da Companhia Vale do Rio Doce, *Luna Peixoto 416* (RB, US). MATO GROSSO: Fazenda Cachimbo, *Cordeiro 1132* (MO). PARÁ: Alto Tapajós, Vila Nova, perto da Cachoeira do Chacorão, *Pires 3951* (IAN, US); Belém, Floresta do Utinga, *Pires 1432* (US); Castanhal, Colônia 3 de Outubro, *Fróes*

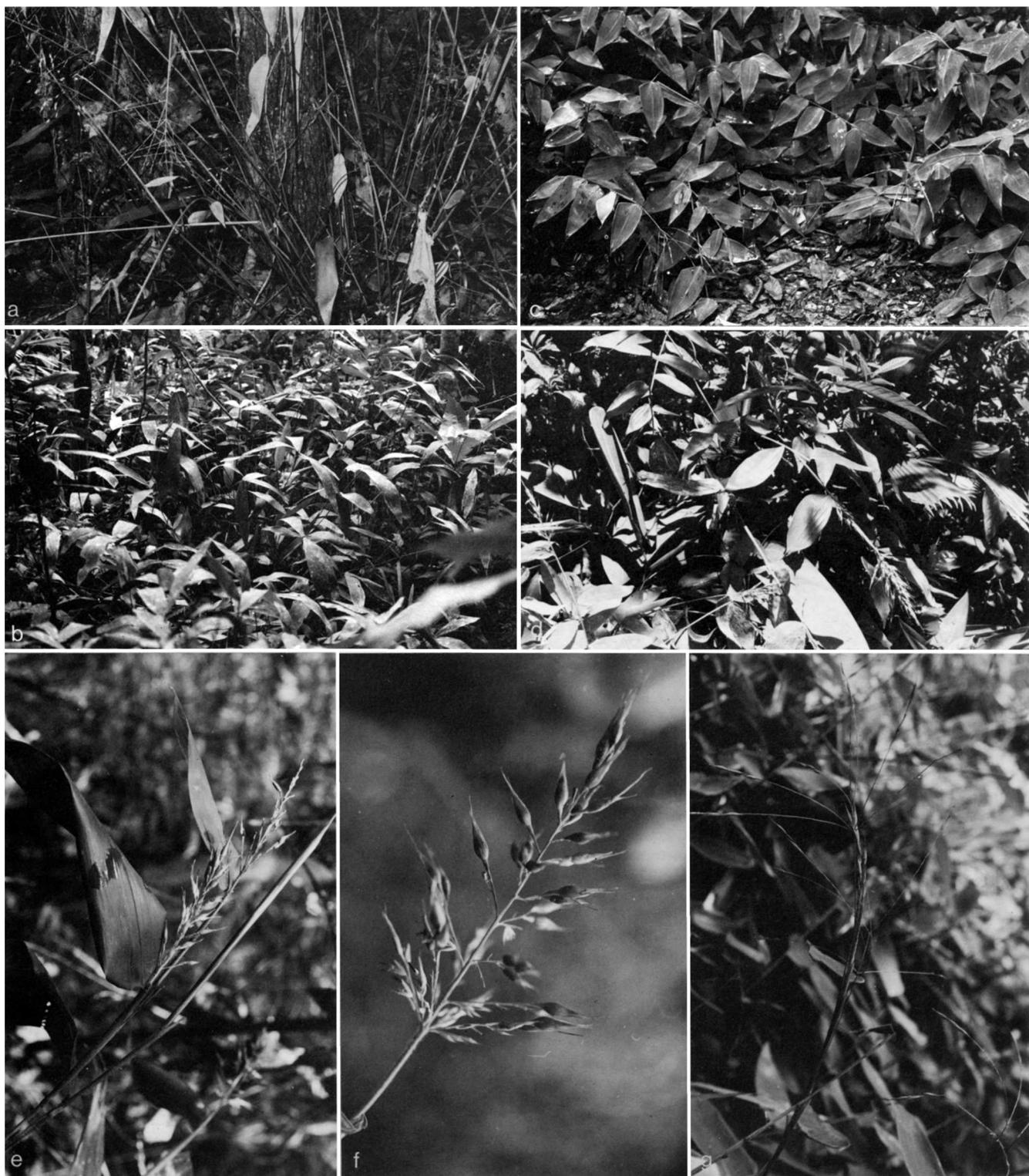


FIGURE 8.—Field photos of *Olyra* species. *Olyra ecaudata*: a, habit of plant (Brazil, 1972) showing dying culms after flowering; b, habit of plant showing plants before flowering. *Olyra fasciculata*: c, habit of plant (Brazil, 1968); g, detail of panicle. *Olyra latifolia*: d, habit of plant (Costa Rica, 1968); e, upper nodes with inflorescence; f, detail of panicle. All photographs by C.E. Calderón.

24873 (US), *Black 49-8609* (US); 50–65 km N of Gurupí, Belém-Brasília, *Prance and Silva 58683* (US); Serra dos Carajás, Azul, near camp at Serra Norte, *Daly et al. 1937* (US). RONDÔNIA: Pôrto Velho, *Silva 391* (US); Rio Contra, 6 km from Jaciparaná, *Calderón et al. 2814* (US, WIS).

COLOMBIA, VAUPÉS: Confluence of Macaya and Ajajú rivers, Puerto Hevea, *Grassl 10019, 10029* (US).

COSTA RICA, Borders of SAN JOSÉ and PUNTARENAS: Río Convento, on the Pacific slope, *Dodge et al. s.n.* (CR).

FRENCH GUIANA: Sur le Tampoc, Saut Koumakou Soula, *Cremers 4478* (US); without locality, *Leprieur 547* (US).

PANAMA, DARIÉN: Along ridge N of Ensenada El Guayabo that separates the Río Jaque Valley from the Pacific Ocean, *Knapp and Mallett 3181* (MO, US). PANAMÁ: Cerro Azul, 6–10 km del lago Goofy, *Calderón 2087* (US), *Croat 17289* (MO, US), *Soderstrom 2003* (MO, US); Cerro Jefe, *Calderón and Dressler 2122* (US); Zetek Trail 2100, Barro Colorado Island, *Judziewicz 4437* (MO, US, WIS).

PERU, LORETO: Bosque Nacional de von Humboldt, region of San Alejandro, *Gentry and Reville 16200* (MO, WIS). PASCO: 19 km W of Oxapampa, *D. Smith 2700* (MO, US).

SURINAM: 3 km S of Juliana Top, 12 km N of Lucie Rivier, *Irwin et al. 55055* (US); vicinity of Kayser airstrip, 25 km above confluence with Lucie River, *Maguire et al. 53950* (US); entre Hanover Savannah et Para, *Hooek 93* (NY, US); ~2 km below affluence of Oost Rivier, *Maguire et al. 54095* (MO, US); near Brownsweag along railway, *Wessels Boer 641* (US).

VENEZUELA, ZULIA: 3 km E of the Río de Oro settlement on the Río de Oro, *Davidse et al. 18620* (MO, US).

DISCUSSION.—*Olyra ecaudata* forms large clumps to $3/4$ m in diameter, of tall erect culms reaching 3–4 m in height, and is found only in shaded areas of good, often primary, forest, flowering between October and July. The full-sized leaves develop only on the upper nodes where 4–6 ascending blades are clustered, creating a plume-like effect. Generally the flowering culms are borne separately from the sterile ones and bear only bladeless sheaths at their nodes. Calderón noted on the label of one of her specimens (*Calderón and Dressler 2122*) that the plants on Cerro Jefe in Panama were all sterile. Dressler, who had visited the locality over the years, remarked that the colony had never been in flower as long as he visited it. Two years later I visited the locality in his company and the entire colony was in flower with the plants dying (see specimen of *Soderstrom 2003* from here). This same phenomenon was noted in plants collected in Bahia, Brazil (*Soderstrom et al. 2197*) and on Barro Colorado Island, Panama (*Judziewicz, 1983, pers. comm.*). All plants of this species had flowered and died in the region. In this case both tall and short inflorescences were found, as in another specimen from Acre, Brazil (*Calderón and Soderstrom 2353*). A possible explanation is that the plant remains sterile for many years and at time of flowering the tall mature shoots flower as well as new small shoots that have developed from a weakened base.

Flowering culms with fully developed leaves (*Soderstrom*

2003 from Panama and *Fróes 24873* from Pará, Brazil) are rarely encountered in herbarium specimens.

6. *Olyra fasciculata* Trinius

FIGURES 8c, g, 9, 11

Olyra fasciculata Trinius, 1834:25 [page 113 in published form, 1835]. [Type: "V. spp. Bahiens." Holotype, LE, not seen.]

Olyra heliconia Lindman, 1900:11, pl. 6. [Type: "Habitat in Brasilia centr., Matto Grosso, Matto do Curupira, in silva primaeva, mens. Febr. florens, Exp. I. Regnell., A., 3017." Holotype, S, not seen; fragment of the holotype, US sheet no. 2877949.]

Perennial, short-rhizomatous grass, in cespitose clumps with 20–50 culms in a fascicle, usually leaning on trees or shrubs. Culms erect, branching on the upper nodes, 1.5–3 m tall; internodes hollow, glabrous, cylindrical, up to 1 cm in diameter, the lower internodes with a sheath only or with a rudimentary or reduced blade; nodes glabrous, thickened, purplish. Leaves with sheaths short-pilose with retrorse hairs to glabrous, greenish to pale, the margins short-pilose to glabrous; ligule membranous, short-ciliate at the apex, 1–4 mm long, pilose on the abaxial surface; pseudopetiole 0.4–1.3 cm long, purplish to black, short-pubescent on both surfaces; blades ovate-lanceolate, 24–32 cm long, 5–13.2 cm wide, ascending, narrowed from an asymmetric base to a symmetric or asymmetric tip, the basal margins short-ciliate, otherwise scabrous, the midnerve prominent, abaxial surface pilose toward the base, otherwise glabrous. Inflorescences: 2 or 3 borne on the uppermost nodes; terminal panicles 20–30 cm long, 16–25 cm wide, the branches divergent from the axis, drooping, the lowermost whorled and almost reaching the same length as the upper branches, 16–25 cm long, the upper ones alternate, sometimes 3–10 branches in one fascicle; peduncles densely pilose; axis longitudinally ridged, scabrous, the branches spreading, triquetrous, flattened on one side, hispid toward the base, otherwise scabrous, with 4–6 male spikelets borne alternately on short, scabrous branches on the lower portion and 1–5 female spikelets at the summit of each branch, the pedicels of the female spikelets thickened, pilose. Female spikelets lanceolate, greenish to brownish, 22–33 mm long, 2.9–3.2 mm wide, aristate or not, the glumes unequal and strongly nerved, pilose to glabrous; lower glume as long as the spikelet, acuminate to long-aristate, rigid, 5–9-nerved with transverse veinlets, the inner surface densely pilose to pilose only toward the apex, the outer surface pilose to scabrous toward the apex, otherwise glabrous; upper glume 17–20 mm long, acuminate to subulate apically, 7–9-nerved with transverse veinlets, with pubescence similar to that of the lower glume, anthercium fusiform, acute, 9–11.5 mm long, 2.5–2.8 mm wide, glabrous, pitted, with oblong excavations over the entire surface, stipitate, the stipe 0.8–1 mm long; lemma 5-nerved. Caryopsis fusiform, 6.8 mm long, 2 mm wide; hilum linear, reaching the entire length of the caryopsis. Male spikelets fusiform, 8–13 mm long, 0.7–1 mm wide, glabrous,

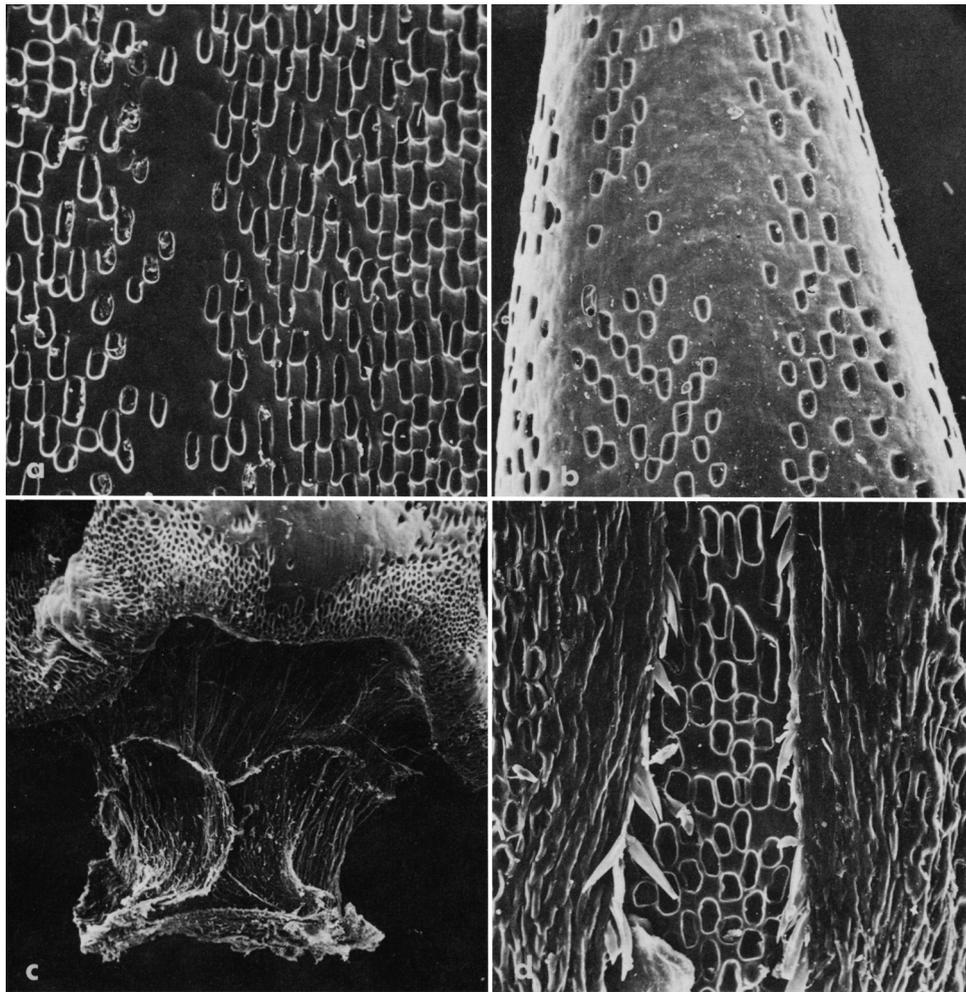


FIGURE 9.—Detail of female anthercium, *Olyra fasciculata*: a, surface of the lemma showing oblong excavations ($\times 100$); b, anthercium, dorsal side ($\times 50$); c, base of the anthercium showing stipe ($\times 50$); d, anthercium, ventral side ($\times 200$). Micrographs a,c,d of Killip & Smith 23452, b, of Pereira 2294 (US). (Reduced to 77% of indicated magnifications for publication.)

pink to purplish; *lemma* acuminate apically, purplish, scabrous, 3-nerved; *palea* 7–10 mm long, 2-nerved, scaberulous; anthers 3, 7.6–8.5 mm long.

DISTRIBUTION.—Panama; South America from Peru and Bolivia to Brazil and northwestern Argentina (Figure 11); found on edges of forests, usually in full sun, between 200 and 1600 m elevation.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA, SALTA: Quebrada del Acheral, *Castellanos 21* (LIL); Finca El Candado Grande, *Cuezzo and Legname 5728-C* (LIL); El Angosto del Río Pescado, *Meneses and Vervoorst 18* (LIL); Dept. Orán, Finca Yakulika, 1 km antes de Río Pescado, *Türpe 2790* (LIL, WIS); Río Pescado, 9 km de la finca Yakulika, *Vervoorst and Cuezzo 7841-C* (LIL).

BOLIVIA, BENI: Rurrenabaque, *White s.n.*, Aug 1921 (NY), *Beck 8219* (WIS); San Juan, *Williams 958* (NY). COCH-

ABAMBA: Antahuacana, *Buchtien 6433* (US). SANTA CRUZ: Buena Vista, *Steinbach 2010* (GH, US); Ascensión de Guarayos, *Krapovickas and Schinini 31702* (US). LA PAZ: Coroico, *Hitchcock 22720* (NY, US); Polo-Polo bei Coroico, *Buchtien 450* (F, NY), *3622* (US), *3623* (F); Yungas, *Rusby 31* (NY), *Bang 508* (NY, US).

BRAZIL, ESPÍRITO SANTO: Vargem Alta, Fruteira, *Pereira 2294* (US). GOIÁS: Santa Rita do Araguaya, on Rio Araguaya, *Chase 12046* (US). MINAS GERAIS: Without locality, *Macedo 4274* (IAN, US). PARANÁ: Capão Bonito, *Dusen 18000* (MO, US); 7 km E of Londrina, *Swallen 8737* (US); Quatro Portões, *Pereira 7905* (F, RB, US), *Hatschbach 10519* (F, US); Maringá, Orto Florestal, *Hatschbach 12929* (F, US); Parque Nacional do Iguazú, W bank of Rio Floriano, *Lindeman and Haas 3558* (US); Rio Ivaí, *Hatschbach 15720* (US). RIO DE JANEIRO. Rio de Janeiro, Avenida Niemeyer, *Chase 10003* (F,

MO, US); Leblón, *Rosengurt PE-3386* (US); Pão de Açúcar, *Chase 8404* (F, MO, NY, US), 9798 (US); Serra do Corcovado, Sumaré, *Calderón 2022* (US); Serra da Mendanha, 22°51'S, 43°32'W, *Soderstrom and Sucre 1952* (CEPEC, RB, US), *Sucre 6406* (RB, US); Strada de Gávea, próximo a São Conrado, *Calderón 2024* (RB, US); Vale de Bom Sucesso, "Caixa d'Água," *Soderstrom and Sucre 1982* (CEPEC, RB, US), *Sucre 2004, 2204* (US), *Braga 1955* (RB). SÃO PAULO: Ubatuba, *Soderstrom and Sendulsky 1994* (US); without locality, *Regnell 239* (NY), *Burchell 954* (US), *Gardner 137* (US). SANTA CATARINA: Aguas de Chapecó, *Smith and Klein 13107* (R, US), *Reitz and Klein 16713* (US); Nova Teutônia, *Plaumann 459* (RB). STATE AND LOCALITY UNKNOWN: *Burchell 6709* (US), *Pohl s.n.* (US), *Riedel 160* (US), 934 (GH, US), *Spruce 4807* (US).

PANAMA, COLÓN: Headwaters of the Río Boquerón near fork with Río Nombre de Diosito, *Hammel 3951* (MO, US). SAN BLAS: El Llano-Cartí road, 9°19'N, 78°55'W, *de Nevers et al. 5254* (MO, US).

PERU, CUZCO: Cerro San Pedro, *Vargas 8498* (US); Quitemi, *Chavez Alfaro 3387* (MO). HUÁNUCO: Huánuco to Tingo María, km 100, Río Chinckao, *Seibert 2297* (MO, US); Puente Durand, N of Huánuco, valley of Chinckao River, *Stork and Horton 9574* (F, US), *Vargas 5388* (US); along road between Chinchao and Puente Durand, *McClure 21458* (US). JUNÍN: Colonia Perené, *Hitchcock 22056* (NY, R, US), 22070 (US); 28 km N of San Ramón, on road to Oxapampa, *Dillon and Turner 1439* (F, MO); La Merced, *Killip and Smith 23452* (US), 23788 (F, NY, US); Río Paucartambo, near junction with Río Perené, *Seibert 2194* (MO, US); San Ramón, *Killip and Smith 24755* (NY). SAN MARTÍN: Juan Jui, Alto Río Huallaga, *Klug 4197* (F, MO, NY, US); Lamas, *Williams 6449* (F, US); San Roque, *Williams 7792* (US); without department, Pozuzo, *Macbride 4572* (US); Santa Ana, *Cook and Gilbert 1653* (US); in montibus secus flumen Mayo, prope Tarapoto, *Spruce 480* (NY). STATE AND LOCALITY UNKNOWN: Andes, Peru, *Poeppig s.n.*, 1834 (US), *Gardner 137* (NY).

DISCUSSION.—*Olyra fasciculata* bears some resemblance to *O. obliquifolia* but can be distinguished by its paniculate inflorescence bearing longer female spikelets on less thickened pedicels. Common names include "tacuarilla" (Bolivia) and "taquaril" (Brazil). Chromosome numbers of $2n = 14$ (Calderón and Soderstrom, 1973) and $n = 7$ (Hunziker et al., 1982) have been recorded. It usually flowers between October and April.

7. *Olyra filiformis* Trinius

FIGURES 10, 11, 17a,b

Olyra filiformis Trinius, 1834:27 [page 115 in 1835 published form]. [Type: "V. spp. Bahiens." Holotype, LE, not seen, fragment of the type, US sheet no. 2877951; isotype, GH.]

Cespitose perennials, short-rhizomatous, with 10–25 culms in a fascicle. Culms geniculate-ascending, occasionally decum-

bent and rooting at the lower nodes, climbing and arching, 40–125 cm tall, many-noded, unbranched, sparingly branching at the upper nodes; internodes cylindrical, hollow, sparingly pilose to glabrous, the lowest short, followed by two elongated internodes bearing a culm leaf without blade; nodes thickened, purplish, pilose with whitish retrorse hairs to glabrous. Leaves with sheaths strongly ribbed, greenish to purplish, the margins membranous, pilose toward the upper portion, otherwise glabrous; auricles conspicuous, membranous; ligule membranous, 0.5–1.8 mm long, glabrous on the adaxial surface, short-pubescent on the abaxial one; pseudopetiole ~0.2 cm long, pale to purplish, densely pilose; blades oblong-lanceolate, 11–14 cm long, 1.2–2.8 cm wide, narrowed and asymmetric at the base, the apex symmetric, scaberulous to scabrous on both surfaces, the abaxial surface short-hispid, the midnerve prominent on the abaxial surface, the margins scabrous. Inflorescences paniculiform, contracted, one to several on the upper nodes, long exserted, peduncles glabrous; panicles 5–10 cm long, 0.7–2 cm wide, the branches alternate, spaced and appressed to the axis, each branch with male spikelets below and a single terminal female spikelet; axis longitudinally ridged, scaberulous, the axis of the branches flattened, hispid to scabrous, the male spikelets in pairs or in short branchlets, one subsessile, the other short-pedicellate, the female spikelets on thick, short-pubescent pedicels. Female spikelets fusiform, 17–24 mm long, aristate, whitish, glabrous to scaberulous, the glumes unequal, the antherium approximately 1/3 the length of the spikelet; lower glume as long as the spikelet, long-aristate, the awn ~6 mm long, 7–9-nerved with transverse veinlets, scaberulous on the outer surface, shortly pubescent toward the apex on the inner surface; upper glume 13–20 mm long, aristate, 7–9-nerved with transverse veinlets and pubescence similar to that of the lower glume, antherium fusiform, acute, 6.8–8.5 mm long, 2.4–2.6 mm wide, pitted, with rounded excavations over the entire surface, glabrous; lemma 5-nerved. Caryopsis fusiform, brownish, 4.8–5.5 mm long, 1.8–2 mm wide; hilum linear, reaching the entire length of the caryopsis. Male spikelets lanceolate, acuminate, 4.3–5.7 mm long, 0.5–0.8 mm wide, 1/3–1/6 the length of the female spikelets, hispid to glabrous, whitish; lemma 3-nerved; palea 3.7–5.5 mm long, 2-nerved; anthers 1.8–2.5 mm long.

DISTRIBUTION.—Endemic to lowland forests in Bahia, Brazil (Figure 11).

ADDITIONAL SPECIMENS SEEN.—BRAZIL, BAHIA: Rodovia Camaçã-Canavieiras, 3 km E de Camaçã, *Belém and Aguiar 1389* (US); Lagoa Itaipé, at 1 km from the lake and 25 km SE of Uruçuca, *Calderón and Pinheiro 2172* (US, WIS); Fazenda João Elias, cacao plantation 3 km E of Camaçã on road to Canavieiras, *Soderstrom et al. 2123* (CEPEC, US); road from Una to Santa Luzia, 10 km SW of Una: Rio da Pimenta o Pimenteira, Fazenda S. Jorge, *Calderón and Pinheiro 2267* (CEPEC, US); 9 km from Una on the road to Santa Luzia do Salobro, *Soderstrom et al. 2229* (CEPEC, US); 6 km N of

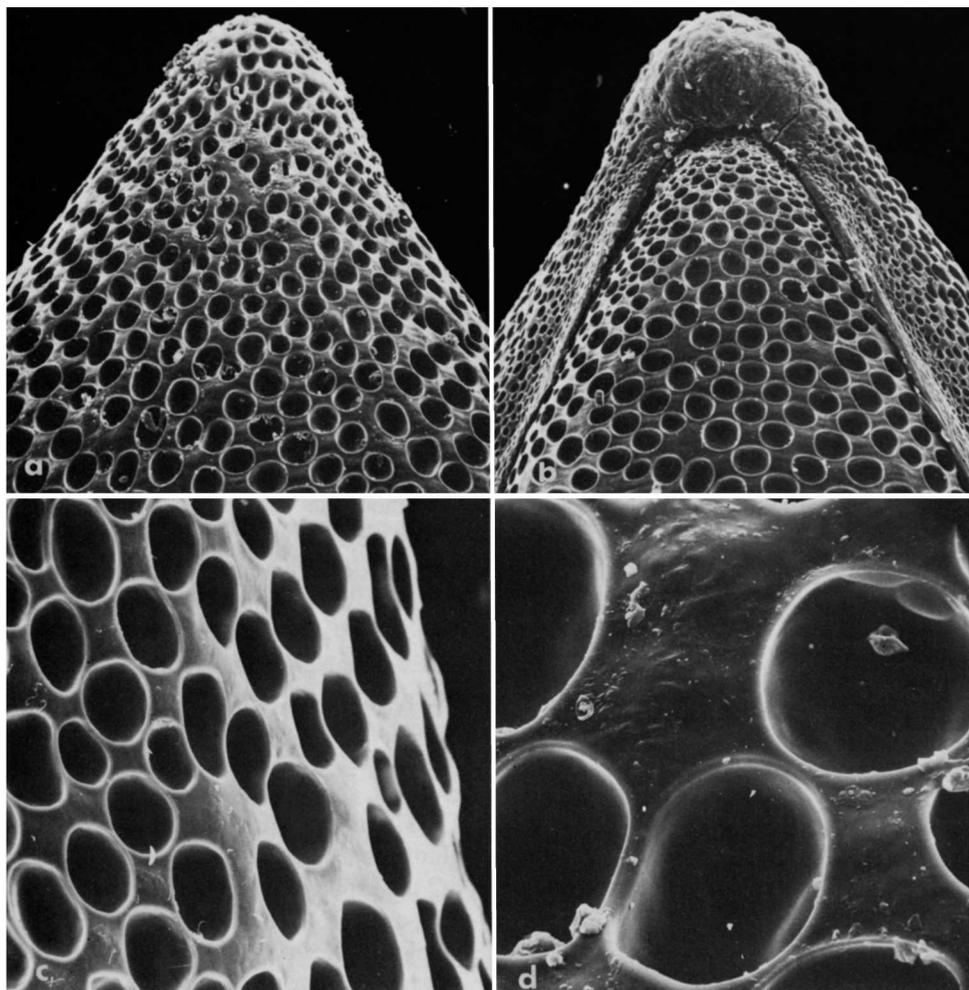


FIGURE 10.—Detail of female anthercium, *Olyra filiformis*: a, apex of the anthercium, dorsal side ($\times 100$); b, apex of the anthercium, ventral side ($\times 100$); c, detail of the lemma ($\times 260$); d, detail of the excavations ($\times 700$). All micrographs of *Soderstrom et al.* 2123 (US). (Reduced to 77% of indicated magnifications for publication.)

Apuarema on road Apuarema-Jaguaquara, *Calderón et al.* 2373 (US).

DISCUSSION.—This delicate species, growing among weedy vegetation in semi-shaded forests, is quite unlike any other in the genus. In some areas of Bahia the plants are abundant on sandy soil and have a weak, more or less cespitose base. They appear to be annuals (not known in the Bambusoideae); certainly none of the plants look older than a year. The species is easily distinguished by the linear inflorescences with appressed female spikelets that consist of very long and acuminate glumes that far exceed the anthercium in length. The female anthercia are very deeply and conspicuously pitted. Apparently, after final flowering the flowering node may produce a tuft of new branches causing the topheavy culm to bend over to the ground where it takes root to produce a new plant (*Soderstrom et al.* 2123). In flower between March and July.

8. *Olyra glaberrima* Raddi

FIGURES 4, 12, 30e,f

Olyra glaberrima Raddi, 1823:19. [Type: "Invenitur in Monte nuncupato Corcovado non procul ad Urbe Rio de Janeiro." Holotype, PI, not seen, fragment of the holotype, US sheet no. 2877950.]

Olyra semiovata Trinius, 1826:249. [Type: "V. sp. Brasil (*Langsdorff*)." Holotype, LE, not seen, fragment of the holotype, US sheet no. 2877927.]

Olyra obliqua Desvaux, 1831:210. [Type: "Habitat in Brasilio." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877938.]

Olyra corcovadensis Wawra, 1866:180, pl. 95. [Type: "Corcovado an feuchten schattigen Orten; Wwr u. *Maly* coll. n. 504," not seen, current location unknown.]

Olyra semiovata var. *pubiflora* Hackel, 1904:276. [Type: "In silvis in regione cursus superioris fluminis Apa, Dec. n. 8194 (*Hassler*, Paraguay)." Holotype, W, not seen, fragment of the holotype, US sheet no. 2877925; isotypes, MO, P.]

Olyra yucatanana Chase, 1908:178. [Type: "*Gaumer* 2372, No. 125941 Herb. Field Columbian Museum." Holotype, F, not seen, fragment of the holotype, US sheet no. 2877920.]

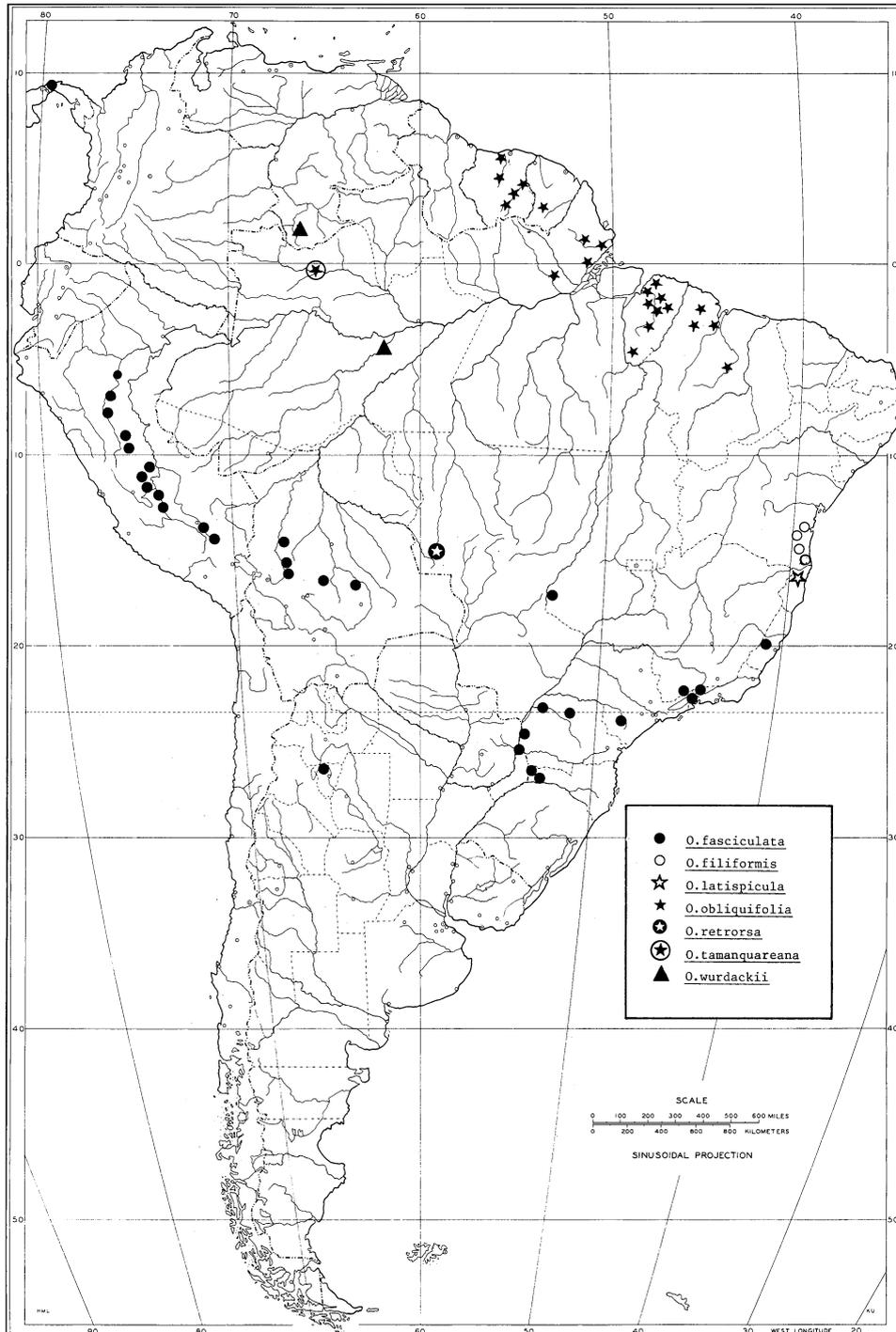


FIGURE 11.—Distribution of *Olyra fasciculata*, *O. filiformis*, *O. latispicula*, *O. obliquifolia*, *O. retrorsa*, *O. tamanquareana*, and *O. wurdackii*.

Olyra semiovata var. *pubescens* Hackel, 1910:46. [Type: "Paraguay septentr. a 1909 leg. Fiebrig n. 5299 in Herb. Hassler." Holotype, W, not seen, fragment of the holotype, US sheet no. 2877926.]

Cespitose perennials, short-rhizomatous, with 10–20 culms in a fascicle. Culms 60–200 cm tall, erect, geniculate at the

lower nodes, unbranched; internodes cylindrical, glabrous to shortly pubescent with retrorse hairs; nodes thickened, glabrous, purplish. Leaves with sheaths greenish to purplish, strongly ribbed, shortly hispid, the margins long-ciliate, more densely so toward the upper portion; auricles membranous;

ligule membranous-ciliate, small, 0.5–0.8 mm long; pseudopetiole 0.3–0.7 cm long, stramineous to purplish, densely pubescent with short, appressed whitish hairs on both surfaces; blades ovate-lanceolate, 17–27 cm long, 4–8.5 cm wide, ascending, asymmetric and truncate at the base, symmetric at the acuminate tip, glabrous, the margins scaberulous to shortly ciliate, the midnerve inconspicuous or prominent toward the base; *Inflorescences* paniculiform, borne from the uppermost nodes, long-exserted, the peduncles longitudinally ridged, glabrous; panicles lax, diffuse, pyramidal, 9–23 cm long, 5–18 cm wide, the branches spreading, the lower ones verticillate and with numerous male spikelets only or occasionally with a terminal female spikelet, the upper branches alternate, with male spikelets below and a single terminal female spikelet in each branch; *axis* and branches longitudinally ridged, scabrous, the axils of the branches glabrous; pedicels of the female

spikelets thickened, sparsely scabrous; pedicels of the male spikelets scabrous. Axillary panicles similar to the terminal one. *Female spikelets* fusiform, aristate, 15–23 mm long, 2.5–3 mm wide, the glumes unequal and longer than the anthercium; *lower glume* long-aristate, scabrous on both surfaces or the inner surface glabrous, 5–9-nerved with transverse veinlets, the awn 5–11 mm long; *upper glume* acuminate to long-aristate, 10–14 mm long, scaberulous on both surfaces, 5–7-nerved; *anthercium* broadly ellipsoid, acute, 6.5–8.6 mm long, 2.2–3 mm wide, whitish to stramineous with black spots at maturity, smooth and shining, densely pubescent toward the lower margins of the lemma, with long, flat, whitish to brownish macrohairs, shortly pubescent toward the apex; *lemma* 5-nerved; *palea* 2-nerved, with sparse, flat hairs toward the apex to completely glabrous. *Caryopsis* ellipsoid, brownish, 4.5–5.4 mm long, 2.8 mm wide; hilum

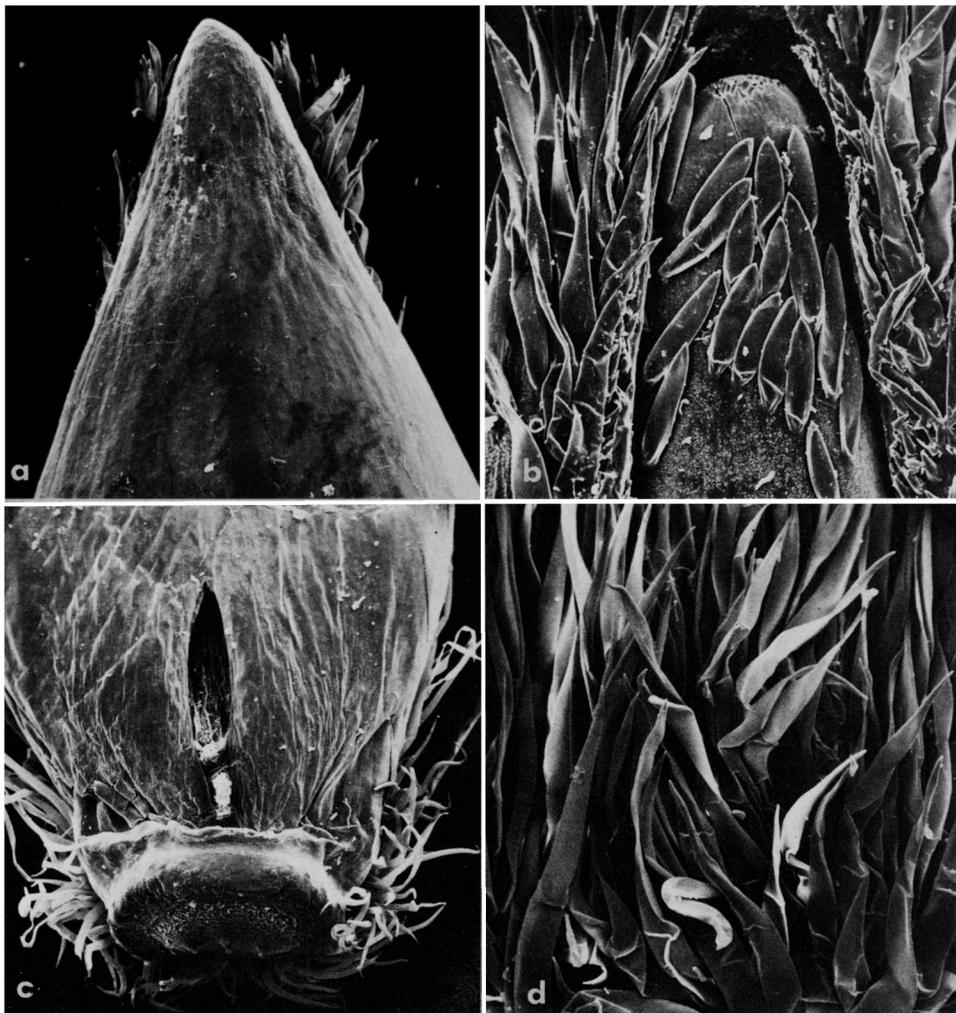


FIGURE 12.—Detail of female anthercium, *Olyra glaberrima*: a, apex of the anthercium, dorsal side ($\times 50$); b, apex of the anthercium, ventral side showing flattened macrohairs ($\times 100$); c, base of the anthercium showing the germination lid ($\times 40$); d, detail of the hairs on the base of the lemma ($\times 100$). All micrographs of Chase 12171 (US). (Reduced to 77% of indicated magnifications for publication.)

as long as the caryopsis. *Male spikelets* fusiform, brownish to purplish, 7.3–12 mm long, 0.6–0.9 mm wide; *lemma* 3-nerved, aristate, the awn scabrous, ~1 mm long, the rest of the surface glabrous; *palea* 6–9 mm long, acuminate to short-aristate, 2-nerved, glabrous, purplish; anthers orange, 3–6 mm long.

DISTRIBUTION.—Disjunct between northern Mesoamerica (Mexico, Belize, Guatemala, and Honduras) and eastern Brazil (Figure 4), growing in moist forests from sea level to 700 m elevation; also two collections from southern Peru.

ADDITIONAL SPECIMENS SEEN.—BELIZE, BELIZE: Gracie Rock, 1.5 mi [2.5 km] S of mile 22 on Western Highway, *Croat* 23894 (MO, US), *Liesner and Dwyer* 1511 (US); Gracie Rock, Sibun river, *Gentle* 1639 (US, WIS). COROZAL: San Antonio, *Gentle* 4759 (NY, US, WIS). EL CAYO: El Cayo, River bluffs, *Bartlett* 11475 (NY, US); 9.5 mi [15 km] S of Georgeville on road to Augustine, *Croat* 23478 (US); Belize-Cayo road, high ridge, 41 mi [65 km] section, *Gentle* 9681 (US); vicinity of Cuevas, S of Millionario, *Croat* 23604 (MO); Valentin, *Lundell* 6210 (NY, US); Rio Frio Cave, near Augustine, *Spellman* 1586 (MO), *Swallen* 1580 (MO). TOLEDO: In high ridge, near Condemn Branch Hills, *Gentle* 5253 (US); Yellow flowers, in high ridge, near San Antonio, *Gentle* 5503 (US). DISTRICT UNKNOWN: Tower Hill Estate, *Karling* 56 (US); Roaring Creek, *Lundell* 8729 (US).

BRAZIL, ESPÍRITO SANTO: Vargem Alta, Fruteira, *Pereira* 2259 (RB, US); Reserva Florestal do Rio Doce, *Sucre* 8476 (RB); without locality, *Kuhlmann* 143 (US). GOIÁS: Without locality, *Gardner* 3523 (US). PARANÁ: Road BR-2, Ribeirão do Cedro, *Hatschbach* 8719 (US); Fazenda no Ró Vermelho, 18 km ao noroeste de Bela Vista, *Tessmann* 3842 (US); high bank of Rio Ligeiro, S of Rio Ivaí, ~15 km E of São Tomé, *Lindeman and Haas* 914 (US); without locality, *Dusen* 4416 (US). PERNAMBUCO: Tapera, *Pickel* 2354 (WIS). RIO DE JANEIRO: Andaraí, *Freire* 423 (US); Camino dos Macacos, *Chase* 9971 (F, MO, NY, US); Corcovado, *Luetzelburg* 109 (NY), *Chase* 8183 (F, MO, NY, US), 8185 (F, MO, US), 9749 (F, US); Estrada Velha, Rio de Janeiro-Petrópolis, União Indústria, *Soderstrom and Sucre* 1867a (CEPEC, US); Excelsior, *Brade s.n.*, Dec. 2, 1928 (R, US); Fabrica das Chitas, *Schwacke s.n.* (US); Floresta da Covança, Jacarepaguá, *Duarte* 5043 (US); Gávea, Parque da Cidade, *Calderón* 2010 (RB, US); Mata da Tijuca, *Kennedy and Sucre* 872 (US); Morin, Petrópolis, *Chase* 12171 (US); Petrópolis, *Gães* 804 (R), 94 (R); Pico da Tijuca, *Chase* 8487 (F, US); Bico do Papagaio, *Emygdio* 379 (US), *Almeida and Laroche* 1368 (RB), *Almeida* 1537, 2069 (RB), *Lutz* 1759 (R, US); Rio de Janeiro, Alto da Boa Vista, *Black* 54-18122 (IAN); Serra do Corcovado, entre Vista Chinesa e Mesa do Imperador, *Calderón* 2013 (US), Serra do Corcovado, Sumaré, *Calderón* 2021 (US) Estrada da Vista Chinesa, *Sucre* 2132 (US); Tijuca, *Chase* 12146 (US), *Brade s.n.*, Dec. 2, 1928 (US), *Kennedy and Sucre* 872 (US); Tijuca, Bom Retiro, *Rosa* 80 (R); Tinguá, Boa Esperança, *Mello Filho* 1125 (US); without locality, *Beetle* 190 (US), *Glaziou* 18640 (NY); without locality and collector, Jan. 21,

1886 (US 2463835). SANTA CATARINA: Brusque, Azambuja, *Calderón* 2001 (US), *Reitz and Klein* 870 (NY, US); Blumenau, *Ule* 979 (US); Braço Joaquin, Luis Alves, Itajaí, *Klein* 929 (US), *Reitz and Klein* 3342 (F, US); Guaramirim, *Reitz and Klein* 2395 (US); Ibirama, *Luederwald s.n.*, 1903 (US); Horto Florestal I.N.P., Ibirama, *Klein* 949 (US), *Reitz and Klein* 1169 (US), *Smith and Klein* 7535 (US), 7537 (R, US); Isla de Santa Catarina, *Gaudichaud* 94 (US); Jaragua, *Hoehne* 24387 (US); Mato de Malucher, Brusque, *Smith* 5782 (R, US); Morro do Bau, *Lourteig* 2359 (US); Morro do Bau, Ilhota, *Reitz and Klein* 18180 (US); Morro Costa da Lagoa, *Klein* 7001 (US); Morro do Ribeirão, *Klein* 6968, 6971 (US); Parque Estadual do Turvo, Tenente Portela, *Klein* 11885 (US); Paulo Lopes, costa do Morro de Paulo Lopes, *Klein* 9814 (US); Sabiá, Vidal Ramos, *Klein* 2285 (NY), *Reitz and Klein* 4285 (US); Três Barras, Garuva, S. Francisco do Sul, *Reitz and Klein* 5560 (US). SÃO PAULO: Alto da Serra, *Usteri* 9972 (US); Morro das Pedras, *Brade* 7859 (R, US); Parque do Estado, *Hoehne* 28592 (NY, US); Piassaguera, *Hoehne* 7966 (US); Pindorama, Estação Experimental, *Carvalho* 165 (US); 10 km S of center of city of São Paulo, Instituto de Botânica, Parque do Estado, *Eiten* 5592 (SP), *Sendulsky* 276 (US); São Paulo, *Pickel* 5880 (US); São Paulo, Serra da Cantareira, *Pickel* 5894 (US), *Coelho s.n.*, May 10, 1947 (US); without locality, *Skvortzov* 3 (US). STATE AND LOCALITY UNKNOWN: *Riedel* 935 (US), *Burchell* 3320 (US), *Glaziou* 505 (US).

GUATEMALA, ALTA VERAPAZ: Montana Yxocubvain, 2½ mi [4 km] W of Cubilquitz, *Steyermark* 44967 (F, US). PETÉN: El Paso, *Lundell* 1574 (US); Hiltum, *Lundell* 3586 (US); La Libertad, *Lundell* 3375 (US, WIS); Tikal, *Cook and Martin* 116 (US), in ramonal covering the ruins, *Lundell* 15441, 15808 (US), ruina templo Las Inscripciones, *Molina* 15774 (US); along road to Aguada Seco, *Lundell* 15689 (US); between Main Plaza and Aguada Corriental, *Contreras* 3841 (US); Lake Yaxha, *Gentry* 8303 (MO); north shore of Lake Yaxha, *Croat* 24671 (MO); 2 mi [3.2 km] S of entrance of Tikal National Park, *Croat* 24712 (MO); NW of Jungle Inn, *Contreras* 3901 (US); in ramonal on Remate Road, *Contreras* 293 (US); vicinity of archeological camp on N shore of Lake Yaxha, *Croat* 24671 (US); Uaxactum, *Bartlett* 12167 (NY, US).

HONDURAS, CORTÉS: Calán, *Dickson* 1405 (US).

MEXICO, CAMPECHE: Tuxpeña, *Lundell* 1061 (F, US, WIS); 4 km S of Xpujil, *Sheperd* 32 (WIS). CHIAPAS: Hacienda San Pablo, near Champotón, *Collins* 58, 73 (US); Pixoyal, *Ross s.n.*, 18 May 1954 (US); 19 mi [30 km] E of Zapata on the Zapata-Balancán road, *Davidse* 9425 (US); 17 km SE of Palenque, on the road to Bonampak, *Davidse et al.* 20395 (MO). OAXACA: El Cerro de Nacimiento, E of Cosolapa, *Vera Santos* 2437 (US). QUINTANA ROO: Coba, *Lundell* 7694 (US); 9 km S of San José de la Montaña, *Davidse et al.* 20268 (MO); 8 km N of Union, 110 km SW of Chetumal, *Davidse* 20162 (MO); 15 km N of Dzuich, *Roe et al.* 1340 (WIS); Tanchah, *Swallen* 2825 (US). SAN LUIS POTOSÍ: Tamazunchale, *Lundell*

and Lundell 7238 (NY, US). TABASCO: La Palma, Balancán, *Matuda* 3244 (US); 5 km del rancho Punta de Montaña, *C. Cowan* 3375 (MO). YUCATÁN: Chichen Itzá, *Bequaert* 47 (US), *Steere* 1511 (US), *Swallen* 1580 (NY, WIS), 2443 (US); Lake Chichankanab, *Gaumer and Sons* 23683 (US), *Swallen* 2758 1/2 (US); Peto, *Swallen* 2720 (US).

PERU, MADRE DE DIOS: Province of Manú, road from Salvación to Shintuya, 600 m, *Plowman and Davis* 5085 (US). PASCO: Province of Oxapampa, Isocacín, Palcazú Valley, trail to Villa América, *Foster* 9527 (MO).

DISCUSSION.—Mesoamerican plants have long been known as *Olyra yucatanica*, but we can find no way to differentiate them from the Brazilian populations of *O. glaberrima*. *Olyra glaberrima* was formerly known only from Atlantic Brazil, from Espírito Santo to Santa Catarina. Conspecificity with *O. yucatanica*, which occurs from southern Mexico to Honduras, leaves open the question as to how such a disjunct distribution came about.

The *Plowman and Davis* 5085 collection from Peru may possibly represent a new species. It differs from typical *O. glaberrima* in its more delicate habit with thinner leaves, papillose-pilose sheaths, sparsely pubescent pseudopetioles, awnless female glumes, and shorter (4 mm), awnless, male spikelets. However, female anthecia were not available and further study is required to determine whether this plant is indeed different from *O. glaberrima*. Flowering in Mesoamerica is from December to July, and in South America from October to April.

9. *Olyra holttumiana* Soderstrom & Zuloaga

FIGURE 4

Olyra holttumiana Soderstrom & Zuloaga, 1986:722. [Type: "Panama. Prov. Panamá, La Eneida, region of Cerro Jefe," 3 March 1973, *Dressler* 4288. Holotype, US, sheet no. 2685261; isotypes, K, LE, MO.]

Perennial. *Culms* arching, ~2 m long, branching from the upper nodes; internodes cylindrical, hollow, glabrous; nodes compressed, purplish, glabrous. *Leaves* with sheaths stramineous with short-ciliate borders, otherwise glabrous, with conspicuous membranous auricles, the neck purplish black, short-pubescent; ligule membranous, conspicuous, 7–8 mm long, purplish black, short-ciliate above, shining and glabrous on the inner surface, short-pubescent on the outer; pseudopetiole 0.4–0.7 cm long, purplish, short-pubescent on both surfaces; blades oblong-lanceolate, acuminate, 24–35 cm long, 6.8–9 cm wide, with an asymmetric base and apex, ascending, the upper surface greenish, the lower bluish green, both surfaces short-ciliate, the midnerve manifest on both surfaces, with scabrous borders. *Panicles* lax, 15–18 cm long, 20 cm wide, with the branches diverging from the axis, the lower ones verticillate, the upper alternate along the axis; axis longitudinally ridged, scabrous, the branches triquetrous, flattened, hispid and scabrous toward the upper part, the base

of the branches densely hispid and purplish black, the male spikelets in pairs and short-pedicellate, appressed to the flattened side, the pedicels thin, hispid, the female spikelets terminal, single; pedicels of the female spikelets thickened, short-hirsute. Axillary panicles similar to the terminal. *Female spikelets* fusiform, aristate, 35–50 mm long, 5.5–6.2 mm wide, greenish, the glumes unequal and longer than the anthercium; *lower glume* aristate, 15-nerved, the nerves tessellate, the inner surface hispid toward the apex, the outer surface scaberulous, the awn markedly hirsute; *upper glume* 11-nerved, the nerves tessellate with a pubescence similar to that of the lower glume; *anthercium* long-ellipsoid, acute, 14.5–15.8 mm long, 5.6–6 mm wide, glabrous, smooth, shining, white; *lemma* 11-nerved; *gynecium* with a single style and 2 plumose stigmas; lodicules 3, ~1.8 mm long. *Male spikelets* lanceolate, 10.2–10.9 mm long, 0.8–1.2 mm wide, purplish, scabrous; *lemma* acuminate, 7–9-nerved, scabrous on the outer surface; *palea* 8.2–9.7 mm long, 4-nerved, glabrous, purplish; stamens 3.

DISTRIBUTION.—Known only from Panama (Figure 4).

ADDITIONAL SPECIMEN SEEN.—PANAMA, PANAMÁ: Cerro Jefe, *Nee* 13970 (WIS).

DISCUSSION.—*Olyra holttumiana* is distinguished by its very large female spikelets with long-awned, many-nerved glumes and male spikelets with an unusually large number of nerves in the lemma and palea. Although somewhat resembling *O. fasciculata* and *O. obliquifolia*, the habit and smooth female anthercium of this species suggest that it is more closely related to *O. latifolia*, *O. caudata*, and *O. buchtienii*.

10. *Olyra humilis* Nees von Esenbeck

FIGURES 13, 15

Olyra humilis Nees von Esenbeck, 1829:304. [Type: "Habitat ad ripas Taquari fluminis (*Sellow*. Vidi in Herb. Reg. Berol.)." Holotype, B, fragment of the holotype, US sheet no. 2877946.]

Olyra humilis var. *angustifolia* Doell in Martius, 1877:321. [Type: "A cl. *Riedel* (n. 1938) in umbrosis siccis prope S. Carlos prov. S. Pauli lecta." Holotype, not seen, current location unknown; isotype, US sheet no. 2877947.]

Olyra humilis var. *latifolia* Doell in Martius, 1877:321. [Type: Based on *Olyra humilis* Nees von Esenbeck, 1839:304.]

Olyra glaberrima var. *humilis* (Nees von Esenbeck) Mez, 1912:28. [Type: Based on *Olyra humilis* Nees von Esenbeck, 1839:304.]

Short- to long-rhizomatous perennial grass in cespitose clumps, with 10–20 culms in a fascicle. *Culms* geniculate-ascending or erect, many-noded, 25–100 cm tall; internodes short-hispid with whitish hairs to glabrous, hollow, cylindrical, the basal ones with a sheath only; nodes thickened, dark, glabrous. *Leaves* with sheaths pale with greenish spots, ribbed, glabrous or with papillose-pilose hairs, the margins ciliate; auricles absent; ligule membranous, short-ciliate at the tip, small, 0.4 mm long; pseudopetiole 0.2 cm long, stramineous to brownish, densely hispid, with long and whitish hairs; blades ovate-lanceolate to lanceolate, 4.3–11.5 cm long, 1–2.2 cm wide, asymmetric and truncate at the base, symmetric at the

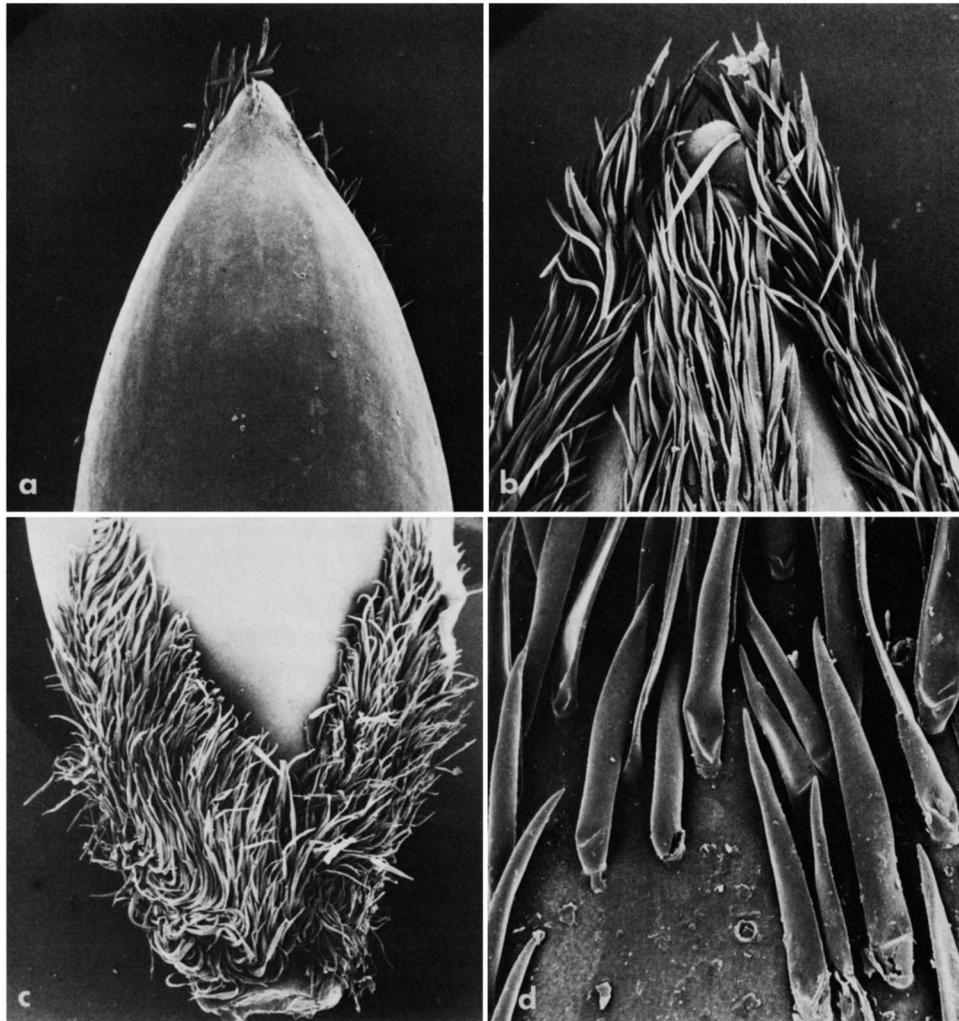


FIGURE 13.—Detail of female antherium, *Olyra humilis*: a, antherium, dorsal side ($\times 30$); b, apex of the antherium, ventral side ($\times 50$); c, base of the antherium, ventral side ($\times 30$); d, portion of the palea showing flattened macrohairs ($\times 200$). All micrographs of Valls et al. 1804 (US). (Reduced to 77% of indicated magnifications for publication.)

tip, scabrous on the adaxial surface to completely glabrous, the abaxial surface glaucous, the margins scabrous, the midnerve inconspicuous. *Inflorescences* borne from the uppermost nodes, with 1–6 panicles at each node, the panicles lax, pyramidal, 4–9 cm long, 1–5.5 cm wide, few-flowered, the branches spreading, the lower ones whorled to alternate, the upper ones alternate, each branch with numerous male spikelets in pairs (one short- and the other long-pedicellate) below and one single terminal female spikelet; *axis* longitudinally ridged, scabrous, the branches triquetrous, scabrous; pedicels of the female spikelets thickened, smooth, glabrous. Axillary panicles similar to the terminal one. *Female spikelets* fusiform, aristate, 14–21 mm long, 2.3–2.8 mm wide, both glumes shortly pilose to scabrous on the inner surface, and glabrous to scaberulous on the outer one; *lower glume* aristate, 5–7-nerved with

transverse veinlets, the awn geniculate and variable in length, 4–10 mm long; *upper glume* acuminate to shortly aristate, 11–11.5 mm long, 5–7-nerved with transverse veinlets; *antherium* long-ellipsoid, acute apically, 6–9.8 mm long, 2.3–2.7 mm wide, whitish, smooth and shining, pilose; *lemma* 5-nerved, pilose toward the apex and base on the ventral surface, the base covered by long, whitish or brownish, flattened unicellular macrohairs, the apex with flattened, unicellular macrohairs and prickle hairs, the dorsal surface of the lemma with sparse hairs toward the apex and base to glabrous; *palea* 2-nerved, with flat hairs toward the apex, otherwise glabrous. *Caryopsis* ellipsoid, brownish, 5 mm long, 2.8 mm wide; hilum reaching the entire length of the caryopsis. *Male spikelets* fusiform, aristate, 8.5–11 mm long, 0.6–0.8 mm wide, purplish, glabrous; *lemma* 3-nerved, aristate, the

awn scabrous, 2–2.5 mm long, the rest of the surface glabrous; *palea* 5.5–7.8 mm long, 2-nerved; anthers 3, 3.6–5.2 mm long.

DISTRIBUTION.—Northwestern Argentina, Brazil, and Paraguay (Figure 15); from sea level to 1250 m elevation.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA, CORRIENTES: Arroyo Chimiray y ruta 40, *Quarín* 3413 (US); 5 km E of Gdor. Virasoro, *Schinini and Carnevali* 10490 (US). MISIONES: Concepción, *Parodi* 6944 (US); San Javier, *Quarín* 3456 (US); Santa Ana, *Montes* 1181 (MO, US); Sierra Imán, *Bertoni* 1964 (US); 5 km ruta 101 desde Deseado al SW, *Hunziker et al.* 11028 (SI, US).

BRAZIL, DISTRITO FEDERAL: Acampamento do D.V.O., Brasília, *Belém and Mendes* 60 (US); Fazenda Vargem Bonita, ~10 km S of Brasília, *Irwin et al.* 12287 (F, RB, US); Parque Nacional do Gama, *Clayton* 4959 (US); Parque Municipal do Gama, 25 km W of Brasília, *Irwin et al.* 19480 (F, US); 3 km N of Sobradinho, *Irwin et al.* 10096 (MO, US); tributary of Rio Sobradinho, *Clayton* 4871 (US). GOIÁS: Serra dos Pirenéus, 20 km E of Pirenópolis, *Irwin et al.* 34307 (MO). MINAS GERAES: Barreiros, *Kuhlmann s.n.*, Feb 20, 1926 (RB, US); Caxambu, *Sampaio* 5946 (IAN, R); Chapeo de Sol, Serra do Cipó, *Chase* 9198 (F, US); Morro do Pilar, *Black and Magálhaes* 51-12125 (IAN, US); Sabará, *Hoehne* 6680 (IAN, R); Serra do Cipó, entre os km 130 e 132, *Black et al.* 51-11989 (IAN); Serra do Cipo, km 103, *Chase* 9286 (F, MO, US); Serra do Curral, *Chase* 8934 (F, MO, NY, US), 8965 (IAN, RB, US). PARANÁ: Florestal, 29 km E de Curitiba, estrada Curitiba-Paranagua, *Tessmann* 2786 (US); Papão Grande, *Dusen* 7752 (US); Ponta Grossa, *Swallen* 8455 (US); São João do Triunfo, *Hatschbach* 14863 (US); Vila Velha, *Hatschbach* 14666 (US). RIO GRANDE DO SUL: Chicuta Oliveira, Pelotas, *Klein et al.* 916 (US); Colônia São Pedro, ~8 km from the ocean, *Soderstrom et al.* 1991 (RB, US); Colônia São Pedro, estrada BR-101 a Colônia São Pedro, *Valls et al.* 1828 (US); Fazenda da Palma, *Swallen* 7016 (US); Fazenda Leitão, Rio Pardo, *Jurgens* G122 (US); Hamburger Berg, *Lindman* A485 (US), *Malme* 190 (US); Morro da Policia, near Pôrto Alegre, *Rambo* 37864 (US); Morro do Sabiá, near Pôrto Alegre, *Rambo* 43745 (US, WIS); Pôrto Alegre, *Canisio* 840 (US); Pareci Velho, prope Cai, *Rambo* 43790 (US); Rodovia Santa Rosa-Girua, 13 km apos S. Rosa, *Valls et al.* 1804 (US); Santa Barbara do Sul, estrada Carazinha-Cruz Alta, apos S. Marinho, *Valls et al.* 1676 (US); São Leopoldo, *Dutra* 551 (R), *Leite* 2081 (GH); Três Cachoeiras, 6 km from ocean, *Soderstrom et al.* 1988 (CEPEC, US); Panambi, rodovia BR-285, km 300, *Quarín* 1163 (RB). SANTA CATARINA: Forest Seminário Diocesano, W of Chapecó, *Smith and Reitz* 12521 (US); W of Chapecó, on road to Guatambú, *Smith and Reitz* 12529 (F, MO, R, US); Pinheiral, Faxinal dos Guedes, *Smith and Reitz* 9777 (US); Linha Coqueiro, by Rio Peperi-Guaçu, *Smith and Reitz* 12662 (US); Passo d'Anta, S of Abelardo Luz, *Smith and Reitz* 12892 (R, US); Peperi, forest above Rio Peperi-Guaçu, *Smith and Reitz* 12782 (R, US); Pinheiras by new airport E of Pôrto União, *Smith and Reitz* 8848 (R, US); Ribeirão, Morro

da Tapera, Ilha de S. Catarina, *Klein and Bresolin* 8766 (US); Salete, *Klein and Bresolin* 11580 (US); Vargem Grande, Lauro Muller, *Reitz and Klein* 7233 (US); Vila Rica, by Rio do Peixe, *Smith and Reitz* 12930 (R, US).

PARAGUAY: In regione fluminis Alto Paraná, *Fiebrig* 5436 (US); in altaplanicie Sierra de Amambay, *Hasler* 12051 (US).

DISCUSSION.—This species resembles *O. glaberrima*, from which it differs by the size of plants, inflorescences, and panicles. The common name in Brazil is “bambu-fraço.” It flowers between October and May.

11. *Olyra juruana* Mez

FIGURES 14, 15, 17e

Olyra juruana Mez, 1917:45. [Type: “Brasília: Dept. Amazonas ad flumen Juruá prope Minas Geraes (*Ule* n. 5469).” Holotype, B, not seen, fragment of the holotype, US sheet no. 2877945.]

Perennial, short-rhizomatous in cespitose clumps with 5–10 culms. Culms simple, 35–110 cm tall, geniculate-ascending; internodes compressed, hollow, glabrous, the lower internodes with a sheath only; nodes compressed, dark brown and shortly hirsute. Leaves 5–7 per complement; sheaths strongly ribbed, hispid over the entire surface to ciliate toward the margins, with or without long hairs toward the upper portion; ligule membranous, 0.4–0.7 mm long, shortly ciliate at the apex, brownish; pseudopetiole 0.3–0.5 cm long, ~0.2 cm wide, densely to sparsely pubescent with short, appressed hairs, brownish to purplish; blades ovate-lanceolate, 14–20 cm long, 4.5–5.9 cm wide, narrowing from an asymmetric and truncate base to a symmetric or asymmetric, apiculate apex, glabrous, occasionally hispid toward the base on the adaxial surface, the midnerve prominent toward the base, the margins ciliate or not. Inflorescences paniculiform, 1–4 borne from the uppermost nodes or usually a single terminal panicle present, the peduncles hirsute; panicles pyramidal, 6–14 cm long, 1–4 cm wide, the branches alternate, with numerous male spikelets short-pedicelled on tertiary branchlets, 5 to numerous terminal female spikelets present on each panicle; axis and branches densely hispid to scabrous, longitudinally ridged; pedicels of the female spikelets thickened, smooth. Female spikelets fusiform, 13.5–18.5 mm long, 2.5–3.5 mm wide, whitish to stramineous, with the lower and upper glume subequal, subulate apically, scabrous toward the apex, otherwise glabrous; lower glume as long as the spikelet, 7–11-nerved with transverse veinlets; upper glume 12–16 mm long, 7–11-nerved with transverse veinlets; antherium fusiform, 8.8–10.7 mm long, 2.2–3.2 mm wide, whitish, acuminate apically, pilose all over the surface with long, appressed, cylindrical macrohairs; lemma 5-nerved, rugose at the upper margins; palea 2-nerved, excavated at the apex. Caryopsis long-ellipsoid, 6–6.5 mm long, 2 mm wide, brownish. Male spikelets fusiform, 4.2–6.7 mm long, 0.6–0.8 mm wide,

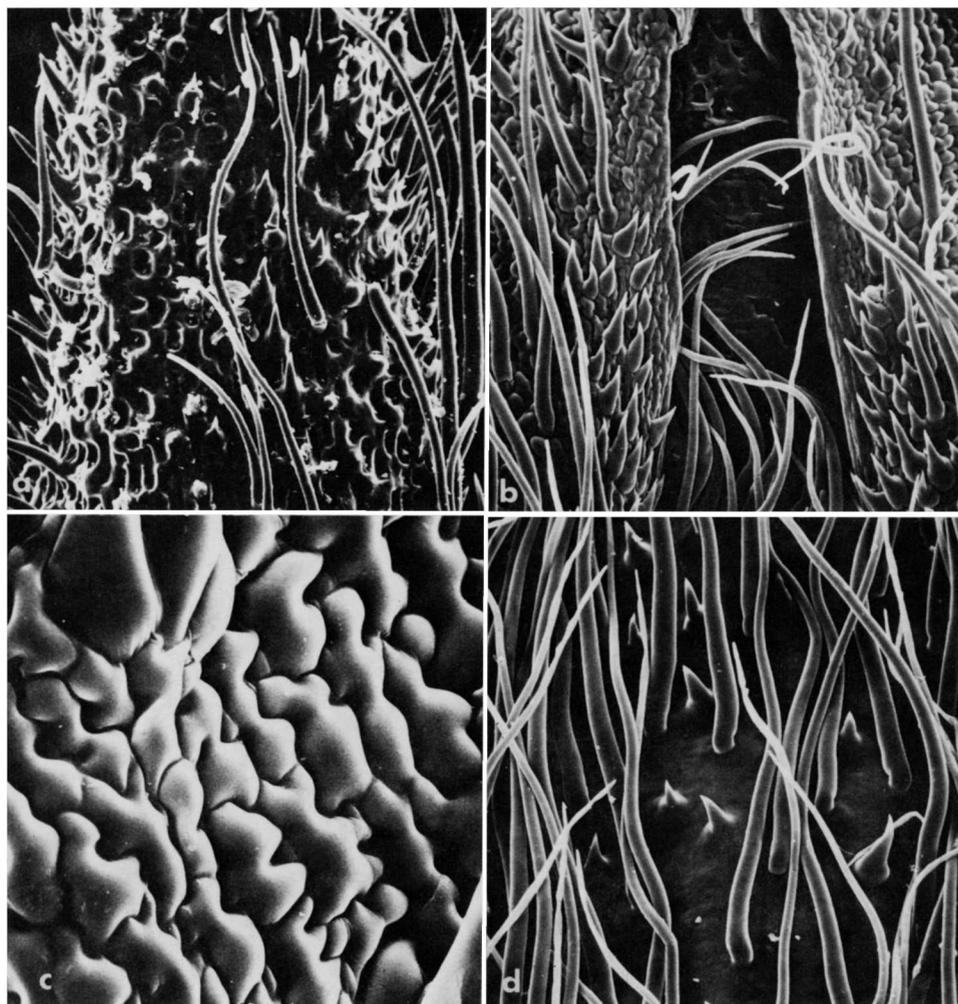


FIGURE 14.—Detail of female antherium, *Olyra juruana*: a, apex of the lemma showing prickly hairs, long macrohairs, and excavations ($\times 200$); b, antherium, ventral side ($\times 200$); c, upper portion of the lemma with rugose surface ($\times 1000$); d, detail of macrohairs and prickly hairs ($\times 400$). Micrograph a of Vargas 15246 (US), b-d, of Schunke 19 (US). (Reduced to 77% of indicated magnifications for publication.)

whitish to stramineous, hispid, occasionally glabrous; *lemma* 3-nerved, subulate apically; *palea* 2-nerved.

DISTRIBUTION.—Growing in forests of eastern Peru and western Brazil (Acre); occasional as far east as Pará (Figure 15); found at 120–800 m elevation.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, ACRE: 52 km from Rio Branco on road to Sena Madureira, Calderón and Soderstrom 2290 (US); $8^{\circ}54'S$, $72^{\circ}51'W$, Calderón and Soderstrom 2352 (US); Porangaba, Rio Juruá-Mirim, Maas et al. P12957 (US). PARÁ: Aguas Boas, Rio Pixuna, Kuhlmann 1958 (RB, US).

PERU, CUZCO: Entre Pilcopata y Keres, Vargas 15246, 16353 (US). LORETO: Prov. Maynas, Explorama Tourist Camp, Río Amazonas above mouth of Río Napo, Gentry et al. 27478 (MO, US), 28975 (MO, US), 37167 (US, MO); Gamitana-cocha, Río Mazán, Schunke 19 (F, NY, US). PASCO: Prov.

Oxapampa, Iscozacín, Palcazú Valley, Foster 7968 (MO).

DISCUSSION.—Flowers between January and July. The Gentry et al. collections from northern Peru differ from typical material of *O. juruana* in having pseudopetioles densely pubescent over the entire surface; (1–) 4–7 panicles borne on the uppermost nodes, these small (2–3 cm long) and short-exserted; female spikelets sparsely hispid on the outer surface; and male spikelets only 4.2 mm long. More collections are needed to determine if these plants represent a new species.

12. *Olyra latifolia* Linnaeus

FIGURES 8d-f, 16

Olyra latifolia Linnaeus, 1759:1261. [Type: "Jamaica," not seen, current location unknown.]

Olyra paniculata Swartz, 1788:21. [Type: "Incolit Jamaicae." Holotype, S, not seen, current location unknown.]

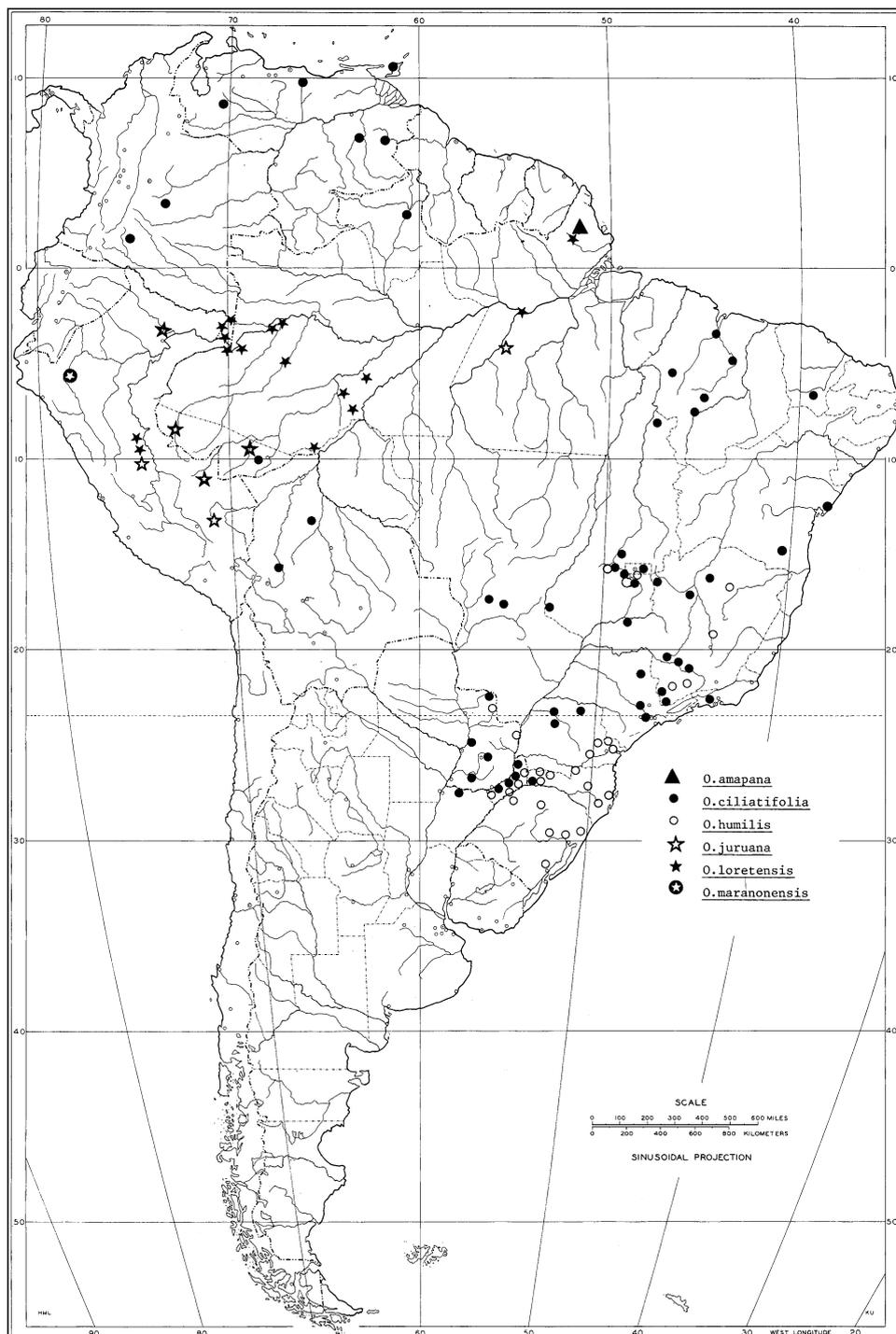


FIGURE 15.—Distribution of *Olyra amapana*, *O. ciliatifolia*, *O. humilis*, *O. juruana*, *O. loretensis*, and *O. maranonensis*.

Olyra arundinacea Humboldt, Bonpland & Kunth, 1816:197. [Type: "Crescit in crepidinibus opacatis Andium Quinduensium prope El Azufra." Holotype, P.]

Olyra cordifolia Humboldt, Bonpland & Kunth, 1816:198. [Type: "Crescit in convalle frigida Bogotensi inter Santa Fe et Zipaquira." Holotype, P, not seen.]

Olyra pubescens Raddi, 1823:18. [Type: "In montibus ubique in Provincia Rio-Janeiro." Holotype, PI, not seen, fragment of the type, US sheet no. 2877930.]

Olyra brevifolia Schumacher, 1827:176. [Type: "Guinea, Africa." Holotype, not seen, current location unknown; fragment of the holotype, US sheet no. 2877961.]

Olyra scabra Nees von Esenbeck, 1829:306. [Type: "ad Almadem prov. Bahiensis (Martius)." Holotype, M, not seen, fragment of the holotype, US sheet no. 2877928.]

Olyra brasiliensis Desvaux, 1831:210. [Type: "Ex Brasili." Holotype, P, not seen.]

Olyra media Desvaux, 1831:106. [Type: "Crescit in Brasilio." Type, P, not seen.]

Olyra latifolia var. *arundinacea* Grisebach, 1864:535. [Type: Based on *O. arundinacea* Humboldt, Bonpland, and Kunth, 1816:197.]

Olyra latifolia var. *glabriuscula* Doell in Martius, 1877:316. [Type: Based on *O. arundinacea* Humboldt, Bonpland, and Kunth, 1816:197.]

Olyra latifolia var. *pubescens* Doell in Martius, 1877:316. [Type: Based on *O. pubescens* Raddi, 1823:18.]

Olyra cordifolia var. *scabriuscula* Doell, in Martius, 1877:317. [Type: "A beato Martio in silvis provinciae Minarum lecta." Holotype, M, not seen, fragment of the holotype, US sheet no. 2877954.]

Olyra latifolia var. *vestita* Henrard in Amshoff and Henrard, 1948:321. [Type: "Suriname R., Berg en Dal (Focke n. 358)." Holotype, U.]

Cespitose perennials, with the plants forming clumps of up to 20 culms from a hard, knotty crown. Culms 1–6 m tall, erect, climbing and leaning in shrubs, or decumbent, branching usually from the middle and upper nodes; internodes hollow, cylindrical, up to 1 cm in diameter, glabrous to shortly pilose, with or without retrorse hairs just above the nodes; nodes constricted, dark, shortly pilose with retrorse, appressed hairs, to glabrous. Leaves with sheaths covered by papillose-pilose hairs to glabrous, the margins short- to long-ciliate, the lower ones deciduous, the upper ones usually persistent; auricles present, membranous; ligules membranous, shortly pilose at the apex, 0.7–5 mm long, glabrous on the adaxial surface, shortly pilose on the abaxial; pseudopetiole dark brown, 0.4–0.7 cm long, shortly pilose; blades lanceolate, 13–30 cm long, 2–10 cm wide, asymmetric and narrowed to subcordate at the base, symmetric to slightly asymmetric and acuminate apically, densely hispid over the entire surface to glabrous, the basal margins short-ciliate to glabrous, the midnerve prominent, hirsute or not toward the base, the lateral nerves anastomosing. Inflorescences lax and diffuse, pyramidal, 12.5–21 cm long, 4–14 cm wide, with a ridged, hispid to glabrous peduncle, the branches divergent from the axis, the lower ones verticillate and only with male spikelets, the upper ones alternate and with male spikelets below and 1 to many terminal female spikelets; pedicels of the male spikelets thin, scabrous to densely hispid, those of the female spikelets thickened, purplish, short-pilose; axis longitudinally ridged, scabrous to densely hirsute, the branches triquetrous, hirsute to scabrous, the axils of the branches densely pilose. Female spikelets broadly lanceolate, aristate, 14–25 mm long, 2.8–3.1 mm wide, the glumes unequal, pubescent on the inner surface, the outer surface short-pilose, with the margins hirsute, to scabrous or glabrous; lower glume long-aristate, 5–11-nerved, with transverse veinlets; upper glume 9.4–12 mm long, short-aristate, 5–9-nerved, with transverse veinlets; anthercium ovate, obtuse to acute apically, 5.6–6.1 mm long, 2.6–3.1 mm wide, whitish, olivaceous at maturity, smooth and shiny, with rounded excavations toward the upper margins of the

palea and lower margins of the lemma; lemma with short prickly hairs on the lower margins. Caryopsis ellipsoid, 4–4.5 mm long, 2.3–2.5 mm wide; hilum as long as the caryopsis; embryo $\frac{1}{6}$ the length of the caryopsis. Male spikelets fusiform, aristate, greenish to purplish, 5.5–8.1 mm long, 0.7–0.9 mm wide; lemma aristate, 3-nerved, with strong nerves, glabrous on the inner surface, scabrous on the outer; palea 4.4–6.4 mm long, glabrous, purplish, 2-nerved.

DISTRIBUTION.—This is the most widespread and weedy of any species in the genus, and is found essentially throughout the Neotropics from Florida (not verified in recent times), the West Indies, and central Mexico (Nayarit and Tamaulipas) south to northern Argentina (Corrientes and Misiones). *Olyra latifolia* is found in forest margins, mostly below 1000 m elevation. The species has also become naturalized in Africa, including Madagascar.

ADDITIONAL NEW WORLD SPECIMENS SEEN.— ARGENTINA, CORRIENTES: Desembocadura del arroyo Garapé en el Río Parané, 45 km E de Ituzaingó, *Quarín et al.* 2852 (US). MISIONES: Loreto, *Mutinelli s.n.*, Jan 1940 (US).

BELIZE, EL CAYO: Over Cohune River, *Bartlett 11566* (US); Cohune Ridge, *Lundell 6428* (NY, US); Hummingbird Highway, S of Belmopan, *Gentry 8585* (US); Mountain Pine Ridge, San Agustín, *Lundell 6755* (NY); Pine Ridge, Duck Run, *Bartlett 11538* (US); Reed Broken Ridge, *Gentle 9661* (US). STANN CREEK: Little Cocquericot, Belize River, *Lundell 3874* (US); Maskall, Northern River, *Gentle 1020* (NY, US, WIS); Maya Mounds, vicinity of Cockscomb Mountains, *Shipp 531* (NY); Stann Creek Valley, Big Eddy Ridge, *Gentle 3406* (NY, US); Temash River, *Schipp 1374* (NY). TOLEDO: Between Machaca and Camp 2, *Gentle 6930* (US); between Orange Point and Moho River, *Gentle 7683* (US); Edwards Road beyond Columbia, *Gentle 7370* (US); Swasey Branch, Monkey River, *Gentle 3983* (NY, US).

BOLIVIA, BENI: Guayamerín, *Krapovickas and Schinini 35105* (US). LA PAZ: Charopampa, *Buchtien 1155* (US); Mapiri, *Rusby 209* (US); San Carlos, *Buchtien 7* (US). PANDO: SW of Cobija on Río Naraneda, *Sperling and King 6446* (US). SANTA CRUZ: Ichilo, Montero to Puerto Grether, *Renvoize and Cope 3948* (MO).

BRAZIL, AMAPÁ: Around Pôrto Platon, *Pires et al.* 51024 (US); Rio Amapari, frequent along road to Pôrto Terezinha, *Cowan 38486* (RB). AMAZONAS: Santa Isabel, Rio Negro, *Baldwin Jr. 3401* (US); Suomata, Tabatinga, *Pires and Black 837* (US). BAHIA: Área do CEPEC, *Hage 210* (CEPEC, US), *Santos 3421* (RB); vicinity of Salvador, *Chase 7862* (US); Brotas, *Chase 7878* (US); ramal que liga a rodovia Ilhéus-Itabuna ao povoado de Japú, km 1, *Santos and Mattos Silva 3223* (CEPEC); rodovia Olivença-Marumim, 12 km S de Olivença, margem do Rio Acuipe, *Mattos Silva et al.* 1503 (CEPEC). CEARÁ: Serra do Baturité, *Eugenio 281* (RB). ESPÍRITO SANTO: Morro Bom Retiro, *Soderstrom and Sucre 1958* (US); Reserva Florestal de Linhares, *Soderstrom and Sucre 1885* (US); Jaticoba, *Brade 18499* (RB). GOIÁS: Estrada

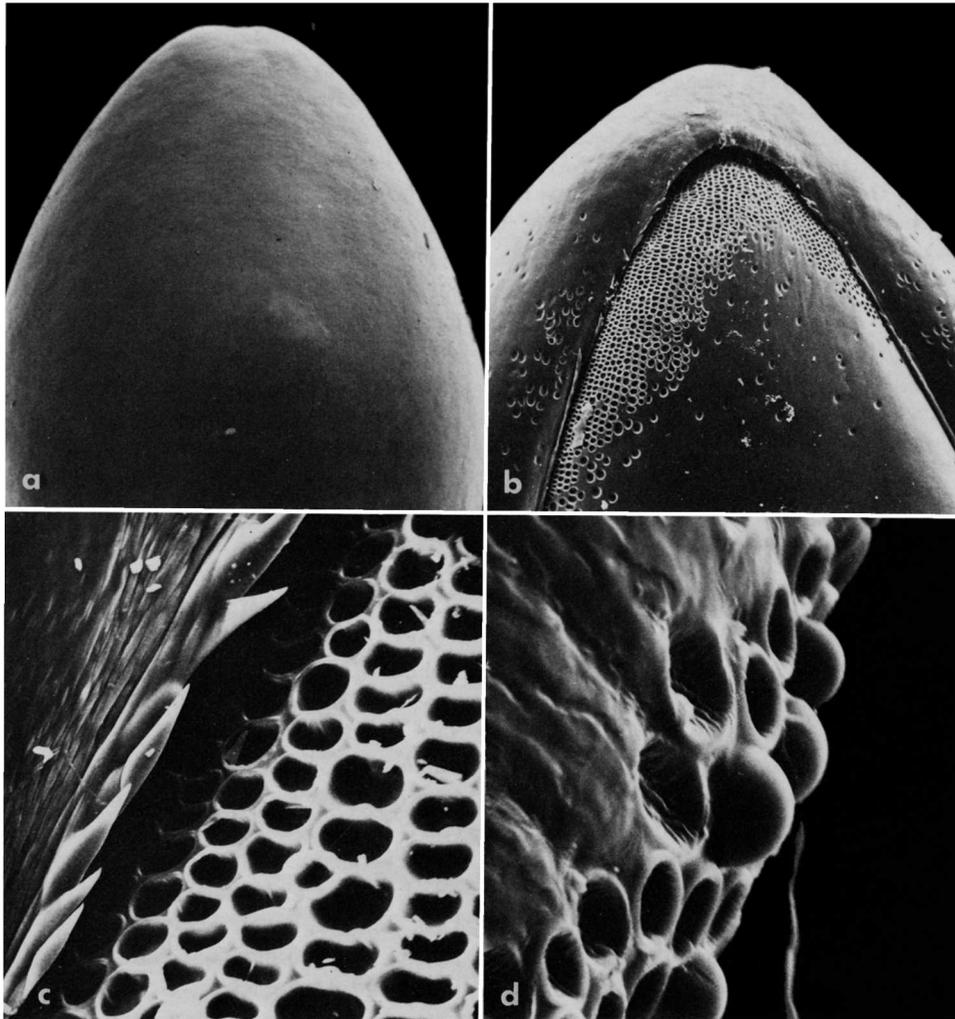


FIGURE 16.—Detail of female antherium, *Olyra latifolia*: a, antherium, dorsal side ($\times 30$); b, antherium, ventral side showing excavations on apex of palea ($\times 50$); c, detail of prickly hairs on margin of the lemma and rounded excavations on the tip of the palea ($\times 500$); d, base of the antherium showing rounded papillae and excavations ($\times 1000$). Micrograph a of Reeder & Reeder 2422 (US), b-d of Schunke 1930 (US). (Reduced to 77% of indicated magnifications for publication.)

Leonino-Mozarlândia, prox. a Leonino, *Guimarães* 89 (US); between Annópolis and Goyaz, *Chase* 11497 (US). MARANHÃO: Carolina to San Antonio de Balsas, *Swallen* 4041 (RB, US). MATO GROSSO: Entre 17 de Febrero e Mingão, *Kuhlmann* 2676 (RB); 20 km S of Xavantina, *Irwin et al.* 17038 (RB); km 274 of Xavantina-Cachimbo road, *Philcox et al.* 3115 (RB); km 264 of Xavantina-Cachimbo road, *Philcox and Ferreira* 4234 (RB); 30 km ENE of Barra do Garças, *Anderson* 9778 (RB); Bandalita, *Pereira et al.* 467 (RB). MINAS GERAIS: Fazenda da Cachoeira, Municipio Tombos, *Barreto* 1646 (US); Fazenda da Tabunha, Dist. Ilhéu, *Mexia* 4963 (WIS); without locality, *Widgren* 914 (US). PARÁ: Belém, *Archer* 7977, 8200 (US), *Black* 54-16154 (US), *Pires and Black* 164 (RB, US); margem esquerda do Rio São Manoel, abaixo Cachoeira do

Caldeirão, *Pires* 3855 (US); Castanhal, woods along Braganza railway, *Goeldi* 302 (US); colônia 3 de Outubro, *Guedes* 282 (US). PARANÁ: Hórto Florestal near Maringa, *Lindeman and Haas* 13233 (US); Morretes, *Dombrowski* 7269 (US); Parque Nacional Iguassú, *Duarte* 1878 (RB). PARÁÍBA: Preia (Escola), *Vasconcellos* 5859 (US). PERNAMBUCO: Tapera, *Pickel* 1642 (WIS); Bonito, *Tenorio* 67-247 (US). RIO DE JANEIRO: Cosme Velho toward Corcovado, *Soderstrom et al.* 1857 (CEPEC, US); Alto da Boa Vista, *Sucre* 2112 (RB); Jardim Botânico, *Sucre* 2062, 2126 (RB, US); Campo Grande, Serra do Mendanha, *Lima* 67 (RB), *Sucre et al.* 6388 (US); Floresta da Covanca, Jacarepaguá, *Duarte* 5042 (RB); Itaipuaçu, Pico Alto Moirão, *Andreata* 163 (RB); Sumaré, *Sucre* 6234 (RB). RIO GRANDE DO SUL: Tôres, Três Cachoeiras, *Mattos* 20 (US);

Steinkopf, pres São Leopoldo, *Rambo* 42283 (WIS). RONDÔNIA: Rio January, *Kuhlmann* 1865 (RB); km 214-215 Madeira-Mamoré railroad near Abunã, *Prance et al.* 5973 (US); vicinity of Santa Barbara, 15 km E of km 117, *Prance and Ramos* 7170 (US); 1 km N of Ribeirão, road Abunã to Guajará-Mirim, *Prance et al.* 6450 (US); track between Mutumparana and Rio Madeira, *Prance et al.* 5491 (US). RORAIMA: Fernando Costa, *Black* 51-13719 (US); Canto Galo, Rio Mucajá, *Prance et al.* 3960 (US). SANTA CATARINA: S. Ludjero, *Orth* 3100 (US). SÃO PAULO: Loreto, *Sampaio* 15948 (US); vicinity of São Vicente, *Smith* 2082 (US).

COLOMBIA, ATLÁNTICO: Los Rendales, near laguna de Sábalo, *Dugand and Jaramillo* 2714 (US). ANTIOQUIA: Vicinity of Planta Providencia, valley Río Anori between Dos Bocas and Anori, *Denslow* 2296 (MO). BOLÍVAR: Island of Mompos, Lands of Loba, *Curran* 370 (US). CALDAS: Santa Cecilia, *van Sneidern* 5247 (US). CAQUETÁ: Río Orteguzza, *Woronow and Juzepczuk* 6136 (US). CHOCÓ: Bahia Solano, near Ciudad Mutis, *Killip and Garcia* 33597 (US); Río San Juan, *Cuatrecasas* 21382 (US). GUAJIRA: S of Carraipia, *Haught* 4276 (US). MAGDALENA: Río Frio to San Andres de la Luna, *Pittier* 1700 (US); Sierra de Perijá, *Grant* 10898 (US, WIS); Santa Marta, *Smith* 2173 (US). META: 4 km NW of Villavicencio toward Bogotá, *Luteyn et al.* 4799a (US). PUTUMAYO: Puerto Ospina, *Schultes and Cabrera* 18946 (US, WIS). SANTANDER DEL SUR: Vicinity of Puerto Berrio, *Haught* 1809 (US). TOLIMA: Mariquita, *Uribe* 3324 (MO). VALLE DEL CAUCA: Cisneros, Dagua Valley, *Killip* 11481 (US); El Aguacate, Río Yurumangui, *Cuatrecasas* 16147 (US). VAUPÉS: Yurupari, *Allen* 3282 (MO, US); Puerto Hevea, *Grassl* 10032 (US).

COSTA RICA, ALAJUELA: Vicinity of Los Chiles, Río Frio, *Holm and Illis* 967 (US); La Catarata de San Pedro de San Ramón, *Brenes* 20579 (NY); Río Naranjo, *Tonduz* 7641 (US); 2 km W of La Marina, *Pohl and Davidse* 11266 (US). CARTAGO: Vicinity of Pejivalle, *Standley and Valerio* 47133 (US); Turrialba, near Reventazón River, *Calderón* 2104, 2105 (US), *Holm and Illis* 57 (NY), *King* 5347 (US), *Pohl and Davidse* 10827, 10836 (US). GUANACASTE: Bebedero, *Brenes* 12586 (NY); between Bebedero and Paso Hondo, *Brenes* 13110 (NY); Bebedero, Hacienda Catalina, *Jiménez* 719 (US); 5 km N of Cañas, Finca La Pacífica, *Pohl and Davidse* 10542 (US); 1 km W of Cañas Dulces, *Pohl and Davidse* 10575 (US); between Colônia Carmona y Buena Vista, *Jiménez* 377 (US); along the Río Corobici, about 4 km NW of Cañas, *Taylor* 18049 (US); 10 km S of La Cruz along the Carretera Interamericana, *Pohl and Davidse* 10600 (US); 6 km NE of Las Juntas, *Pohl and Davidse* 10962 (US); Naranjos Agrios, *Standley and Valerio* 46451 (US). HEREDIA: On road to Puerto Viejo, 20 mi [32 km] N of San José, *Lathrop* 5557 (US). LIMÓN: Near Río Barbilla, *Cufodonti* 659 (US); Río Hondo, *Calderón* 2114 (US); 4 km SW of Río Hondo, *Soderstrom et al.* 1211, 1215 (US, WIS); Río Madre de Dios, *Calderón* 2112 (US). PUNTARENAS: Finca Los Helechales, between

Buenos Aires and Cerro Pittier, *Hatheway* 1685 (US); 5 km NW of the Carretera Interamericana in Boruca area, *Pohl and Davidse* 11148 (US); Finca Volcán Angel, *Schubert and Rogerson* 770 (US); 5 km SW of Rincón, Osa Peninsula, *Pohl and Davidse* 10715 (US); Santo Domingo de Golfo Dulce, *Tonduz* 10082 (US). SAN JOSÉ: 22 km E of Dominical, *Pohl and Davidse* 11233 (US); vicinity of El General, *Skutch* 4055, 4237 (NY, US); San José, *Hitchcock* 8503 (US).

CUBA, CAMAGÜEY: Vicinity of La Gloria, *Shafer* 13 (US); Sierra Cubitas, *Shafer* 528 (US). HABANA: Caibarien, *Ansovin* 387 (US); Junto, *Baker and Wilson* 584 (US); Loma de Coca, *Ekman* 1000 (US), 1217 (US); Anafe, *Ekman* 1040 (US). ISLA DE PINOS: Sierra San Juan del Mar, *Britton et al.* 14648 (US); Nueva Gerona, *Curtiss* 293 (US); Sweetland Ranch, San Francisco de las Piedras, *Killip and Sweetland* 41637 (US); La Ceiba region, *Killip* 43647 (US); Sierra Las Casas, *Killip* 44181 (US); Managua, *Palmer and Riley* 1058 (US). MATANZAS: San Miguel de los Baños, *Killip* 13864 (US). ORIENTE: El Cristo, *Ekman* 1450 (US); Baracoa, *Pollard et al.* 53 (US); Río Matamoros S of Holguín, *Shafer* 1348 (US); Alto Cedro to Paso Estancia, *Shafer* 1630 (US); Piedra Gorda, *Shafer* 3488 (US); Coastal cliffs near Río Yamurí, *Shafer* 7840 (US); La Perla, *Shafer* 8537 (US). PINAR DEL RÍO: Vinales, *Killip* 13533 (US); Sierra San Juan, above San Blas, *Morton* 4140 (US); Santa Cruz to Rangel, *Morton* 4436 (US); El Guama, *Palmer and Riley* 216 (US); Limestone hills between Río Cayaguateje and Sierra Guane, *Shafer* 10455 (US); vicinity of Sumidero, *Shafer* 13499 (US); Buenaventura, *Wilson* 9247 (US); Sierra de Anafe, *Wilson* 11582 (US). SANTA CLARA: Limones, *Jack* 6234 (US), *Pringle* 70 (US); Banao, *León* 3990 (US); Sancti Spiritus, Sierra de Gavilanes, *León and Clement* 6621 (US). PROVINCE UNKNOWN: Herradura, 16 Mar 1906, *Hitchcock s.n.* (US); Marianao, *Leon* 583 (US).

DOMINICAN REPUBLIC, AZUAY: Without locality, *Rose* 3986 (US). BARAHONA: Paradis, *Abbott* 1636 (US). DUARTE: Los Franceses, near Gaspar Hernández, *Jiménez* 2451 (US). LA VEGA: Cotuy, *Abbott* 737b (US); Piedra Blanca, *Allard* 13331 (US), 13602 (US); Sierra Prieta, *Jiménez* 1169 (US); El Pino, *Jiménez* 4404 (US). PUERTO PLATA: La Rosa, *Eggers* 2466 (US). SAMANÁ: Sánchez, *Abbott* 145 (US), *Rose* 4343 (US); Pilon de Azucar, vicinity of Laguna, *Abbott* 429 (US). SANTO DOMINGO: Río Ozama, *Ekman* 12522 (US). SEIBO: San Pedro de Macoris, *Rose* 4203 (US). TRUJILLO: Valdesia valley, *Allard* 17315 (US); La Nassa, *Faris* 269 (US).

ECUADOR, AZUAY: Balao, *Eggers* 14407, 14669 (US). BOLÍVAR: 5 km W of Echeandia on road to Guaranda, *Young* 11 (US). ESMERALDA: Environs of Lita, on the Ibarra-San Lorenzo railroad, *Madison et al.* 5049 (US). GUAYAS: Río Guayas, west of Guayaquil, *Hitchcock* 19962 (US). LOS RÍOS: Hacienda Clementina on Río Pita, *Asplund* 5403 (US); Río Palenque Biological Station, *Dodson and McMahon* 5032 (US). MANABÍ: El Recreo, *Eggers* 15068 (US); near Guale, *Haught* 3065 (US). NAPO-PASTAZA: Without locality, *Asplund* 8917 (NY); environs of Limoncocha, *Madison et al.* 5446

(US). ORO: Between Santa Rosa and La Chorita, *Hitchcock 21126, 21134* (US); Portovelo, *Holway and Holway 1002* (US). SANTIAGO-ZAMORA: Río Upano valley, *Camp 1438* (US); hills W of Río Upano, along Río Chupianguas, *Prieto 12* (US).

EL SALVADOR, CHALALTENANGO: along road to Chalaltenango, 3 km E of Hwy. 4, *Pohl and Davidse 11879* (MO). CUSCATLÁN: Hacienda Chanqueso sudl. Suchitoto, *Bachufer and Lehmboden 2430* (MO). LA UNIÓN: Vicinity of La Unión, *Standley 20810* (US). SAN SALVADOR: San Salvador, *S. Calderón 491* (US), *Hitchcock 8856* (US), *Standley 23199* (US); Volcán de Guazappa, *Pohl and Gabel 13626* (MO). SANTA ANA: Santa Ana, *Hitchcock 8842* (US); 2 km SE of Metapán, *Pohl 12593* (MO). SAN VICENTE: Vicinity of San Vicente, *Standley 21691* (US). SONSONATE: Vicinity of Sonsonate, *Standley 22355* (US). PROVINCE UNKNOWN: Cerro de La Olla, near Chalchuapa, *S. Calderón 1047* (US); San Andrés, *Kovar 1002* (US); Santa Carlota, *S. Calderón 941* (US).

FRENCH GUIANA: Chemin des Emerillons, km 6, *Lescure 204* (US); Maroni, *Melinon 121* (WIS).

GUATEMALA, ALTA VERAPAZ: S of Cubilquitz, *Steyermark 44545* (US); Cubilquitz, *von Turckheim II 845, 4037, 8619* (US), *8478* (NY); vicinity of Secanquim, *Pittier 256* (US). HUEHUETENANGO: Between Ixcán and Río Ixcán, Sierra de los Cuchumatanes, *Steyermark 49332* (US). IZABAL: Vicinity of Puerto Barrios, *Standley 24813* (US); vicinity of Quiriguá, *Standley 24676* (US); N of Quiriguá, *Weatherwax 84* (US); Sierra del Mico, between Los Amates and Izabal, *Kellerman 7346* (US). JUTIAPA: 8 mi [13 km] SW of San Cristobal, *Dunn et al. 23274* (MO). LIVINGSTON: Livingston, *von Turckheim II 1224* (US). PETÉN: Dolores, on Río Mopán trail, *Contreras 3052* (US); La Libertad, *Aguilar 47* (US, WIS), *Lundell 3610* (US); Tikal National Park, Tikal, *Contreras 3725* (US), *Lundell 15741* (US). RETALHULEU: Retalhuleu, *Kellerman 6274* (US). SUCHITEPEQUEZ: Mazatenango, *Heyde and Lux 6400* (US).

GUYANA: Kanuku Mountains, near Moco-Moco village, *Maas et al. 3921* (US); Kanuku Mountains, forest trail to Mt. Iramakipang, *Goodland and Maycock 471* (US).

HAITI: Massif de la Selle, Rivière Froide, *Ekman 6622* (US); Gonave Island, *Eyerdam 127* (US); La Table, vicinity of Anse Galette, Gonave Island, *Leonard 3241* (US); vicinity of Pikmi, Gonave Island, *Leonard 5122* (US); vicinity Port-au-Prince, *Holdridge 1868* (US), *Leonard 5269a* (US); vicinity Cap-Haitien, *Leonard 5292* (US); vicinity Michel de l'Atalaye, *Leonard 7273* (US), *8039* (US); vicinity of La Vallée, Tortue Island, *Leonard and Leonard 11452* (US).

HONDURAS, ATLÁNTIDA: Lancetilla Valley, *Chickering 191* (US); vicinity of La Ceiba, *Yuncker et al. 8285* (NY, WIS), *8476* (NY), *8822* (NY); Puerto Sierra, *Wilson 352* (NY, US); near Tela, *Standley 52707, 52937, 54131* (US); 3 mi [5 km] S of Tela, *Miller 12677* (US). CHOLUTECA: 1 km W of El Corpus, *Pohl and Davidse 12383* (MO). COLÓN: 4.5 mi [7 km] NE of Trujillo on road to Castilla, *Saunders 588* (MO). COMAYAGUA: Esquias, 75 km E of Comayagua, *Hernández*

112 (MO); alrededores del lago Yojoa, *Duenas 86* (MO). COPÁN: Hacienda Ocotesecco, 20 km NE de Santa Rosa de Copán, *Portillo 1* (MO); 4 mi [6.5 km] NE of Santa Rita, *Molina and Molina 30834* (MO). CORTÉS: NE shore of Lake Yojoa, *Williams and Williams 18741* (US); San Pedro Sula, matorrales of Río Piedras, *Molina 5227* (US); road San Pedro Sula-cortes, near Choloma, *Molina 6669* (US); Pimienta, Río Ulua, *Molina 5640* (US). EL PARAÍSO: Road to Danlí, woods along Río San Francisco, *Swallen 11245* (US). FRANCISCO MORAZÁN: Río Orilla, faldas del Cerro Majicarán, *Molina 1534* (MO). ISLAS DE LA BAHIA: Roatán Island, 4 km E of Coxenhole, *Molina 20740* (US). OLANCHO: 5 km de Juticalpa, *Pereira 44* (MO); 22 km ENE of Juticalpa, *Pohl and Davidse 12420* (MO). VALLE: Amapala, *Valerio Rodríguez 3397* (US). PROVINCE UNKNOWN: Cuyamel, *Carleton 445* (NY, US).

JAMAICA: Ferry River, *Harris 11320* (US); above Gordon Town, *Harris 11346* (US), *11436* (US); Louis River, near Castleton, *Harris 11537* (US); Troy, *Harris 12571* (US); Bog Walk to Spanish Town, *Hitchcock 9298* (US); Ewarton to Linstead, *Hitchcock 9410* (US); near Ipswich, *Hitchcock 9623* (US); Bath, *Maxon 2367* (US); near Ipswich, St. Elizabeth, *Maxon and Killip 1522* (US); Stoney River Base camp, Portland, *Morley and Whiteford 680* (US).

LEEWARD ISLANDS, ANTIGUA: McCarthy valley, *Box 77* (US). DOMINICA: Near Carholm Estate, Layou River Valley, *Ernst 1943* (US); banks of Layou River across from Clarke Hall, *Stern and Wasshausen 2391* (US); Clyde River Valley, SW of Melville Hall airfield on road to Governor Estate, *Ernst 1037* (US); Layou River Valley, Clarke Hall Estate, *Ernst 1712* (US). GUADELOUPE: Without locality, *Duss 3147* (US); Ste. Rose, *Questel 851* (US); Petite Montagne, *Questel 4097* (US); Roche Blanche, *Stehle 1787* (US); Côte de Baillif, *Stehle 5942* (US); Calumet, *Stehle 6244* (US). MARTINIQUE: Without locality, *Hitchcock 16442* (US); Montagne, *Stehle 3731* (US).

MEXICO, CHIAPAS: Escuintla, *Matuda 341* (US); Finca Irlanda, *Purpus 7401* (NY, US); N of Mapastepec, *Sharp X-176* (US); near the junction of the Río Perlas and Río Jatate at San Quintín and near Laguna Miramar, *Sohns 1705* (US); Sierra Madre, *Tateoka 1133* (US). GUERRERO: Carretera a El Paraíso, 21 km al NE de Atoyac, near Río Santiago, *Koch et al. 79303* (US). JALISCO: 12 km NE of Nacastillo, *Iltis and Nee 1536* (IBUG, US, WIS); 10–13 km SE of El Tuito, *McVaugh 25405* (US); 5 km W of Puerto Vallarta, *Soreng 2186* (US). MICHOACÁN: Aquila, *Hinton et al. 16137* (NY, US); 32 km N of Playa Azul, *King and Soderstrom 4924* (NY, US). NAYARIT: 6–7 mi [~10 km] S of Las Varas, road to La Cucaracha, *McVaugh 19192* (US); 1–1.5 mi [~2 km] above La Cucaracha, 12–13 mi [~20 km] S of Las Varas, *McVaugh 19218* (US); along the road to Miramar and Santa Cruz, 15 km SE of San Blas, *Feddema 1006* (US); vicinity of San Blas, trail to Ensenada de Matanchen, *Ferris 5366* (US); 5 mi [~8 km] E of San Blas, *Reeder and Reeder 2421, 2422* (US). OAXACA: Vicinity of Cafetal Concordia, *Morton and Makrinius 2700*

(US); Chiltepec, *Martínez-Calderón* 45 (US); Huantla de Jiménez, *Schultes* 824 (US); 5 km N of Matías Romero, *King* 799 (US, WIS); between Ojillán and Jalapa de Díaz, *Conzatti* 3764 (NY, US); San Pedro de Tepinapa, Santiago de Jocotepec, *Vera Santos* 3410 (US), 3411 (NY, US); Ubero, *Williams* 9335 (US). QUINTANA ROO: Coba, *Lundell* 7698 (US). SAN LUIS POTOSÍ: Micos, *Pringle* 3795 (NY, US); between Narango-Platinito-Salto de Agua, *Sohns* 1412, 1413 (US); Tamasopo, *Pennell* 18013 (US). TABASCO: Arroyo de Tapijuhiya, *Rovirosa* 43 (US). TAMAULIPAS: Rancho El Cielito, valle del Río Sabinas, *McDonald* 890 (MO). VERACRUZ: Misantla, *Purpus* 5976 (US); Barranca de Pancaya, *Purpus s.n.* (US); vicinity of Río Tonto, *Vera Santos* 2270 (NY). YUCATÁN: Chichen Itzá, *Swallen* 2428, 2467 (US).

NICARAGUA, BOACO: N slope of Cerro Mombacho, *Stevens and Grijalva* 14711 (MO); 1–2 km SE of Santa María, along Río Fonseca, *Nee et al.* 28009 (MO). CARAZO: 13 km SW de Diriamba, *Moreno* 24314 (MO). CHINANDEGA: Ameya, *Maxon et al.* 7190 (NY, US). CHONTALES: Hacienda Veracruz, including Cerro La Batea and Cerro Los Charcos, *Stevens* 22253 (MO), 23277 (MO). GRANADA: Low hills near Granada, *Maxon et al.* 7611 (NY, US); Finca Cutirre, NW de Volcán Mombacho, *Sandino* 1272 (MO); 5 km N de Nandaime, *Moreno* 9905 (MO). LEÓN: Quesalguague, *Baker* 2105 (US). MANAGUA: Vicinity of Managua, *Garnier* 817 (US); camino a Salamina, Hacienda Santa Cruz, *Guzmán and Castro* 151 (MO). MATAGALPA: 11 km NE de Muy Muy, *Moreno* 24431 (MO); Quebrada Santa Cruz, between Puertas Viejas and Esquipulas, *Stevens* 22343 (MO). NUEVA SEGOVIA: 7 km NE de El Jícaro, *Moreno* 1672 (MO). RÍO SAN JUAN: 5 km SE of Río Oyate, *Nee and Miller* 27584 (MO). RIVAS: Isla de Ometepe, *Moreno* 22064 (MO), *Robleto* 961 (MO), 1349 (MO). ZELAYA: Río Escondido, Bahía de Bluefields, *Molina* 1909 (US). PROVINCE UNKNOWN: Jinotepe, *Hitchcock* 8721 (US); El Rodeo, *Garnier* 1518 (US).

PANAMA, BOCAS DEL TORO: Isla Colón, vicinity of Chiriquí Lagoon, *von Wedel* 1343 (US). CHIRIQUÍ: 2 mi [3.2 km] SW of Puerto Armuelles, *Croat* 22060a (MO); San Bartolo Arriba, *Croat* 26697 (MO). COCLÉ: El Valle, *Croat* 25272 (MO). COLÓN: Vicinity of Ancón, *Piper* 5226 (US); Balboa, *Standley* 25437 (US); Barro Colorado Island, *Bailey and Bailey* 17 (US), *Calderón* 2101 (US), *Ebinger* 145 (US), *Standley* 31335, 41009 (US), *Stimson* 5288 (US); Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper* 5229 (US), *Maxon and Harvey* 6580 (US); Pedro Miguel to Culebra, *Hitchcock* 7919 (US); around Frijoles, *Pittier* 2686, 3759 (NY, US); hills N of Frijoles, *Standley* 27533 (US); Gatún, *Hitchcock* 7983 (US); Madden Dam, *Dwyer and Elias* 7486 (US); vicinity of Río Cocolí, Road K-9, *Stern et al.* 310 (US); along the Río Culebra, above Santa Isabel, *Pittier* 4151 (US); Río Pedro Miguel, near East Paraíso, *Standley* 29937 (US); trail toward Chico, *Steyermark and Allen* 17458 (US); Portobello, Las Cruces Trail, *Ebinger* 106, 114 (US, WIS); vicinity of Palenque, *Pittier* 4126 (NY, US). DARIÉN: Vicinity of Campamento Buena Vista, Río

Chucunaque above confluence with Río Tuquesa, *Stern et al.* 854 (US); near helipad at Hydro Camp on Río Mortí, *Duke* 15418 (US); vicinity of Paya, Río Paya, *Stern et al.* 207 (US). HERRERA: 10 km N of Las Minas on road to El Toro, *Sytsma and D'Arcy* 3242 (MO); 18 km W of Las Minas, N slope of Cerro Alto Higo, *Hammel* 4224 (MO). PANAMÁ: Agricultural Experimental Station at Matías Hernández, *Pittier* 6643 (US); Alhajueta, *Dwyer* 1038 (US), *Pittier* 2339 (NY, US), 3470 (US); 3 km from Cañitas toward the Bayano Dam, *Calderón and Dressler* 2151, 2157 (US); Juan Díaz, *Killip* 4089 (US), *Standley* 30607 (US); vicinity of Panama, *Hitchcock* 8101 (NY, US); Pedro González, Panama Bay, Perlas Islands, *Allen* 2596 (US); ~2 mi [3.2 km] up Río La Maestra, *Kennedy* 1183 (US); about 3–4 mi [5–6 km] upstream on Río Pasiga, *Kennedy* 1205 (US); near Río Mato Puerco, *Erlanson* 185 (US); San José Island, Pearl Archipelago, East Harbor, *Erlanson* 250 (NY, US), 305 (US), *Johnston* 100, 462 (US), *Stimson* 5316 (US). SAN BLAS: Cangandí, *de Nevers and Herrera* 5665 (MO). VERAGUAS: 4 km W of Colonia Penal, *Antonio* 2230 (WIS); vicinity of Santiago, *Stern et al.* 991 (US). PROVINCE UNKNOWN: Vicinity of Bella Vista, *Piper* 5290 (US); road to Corozal, *Gervais* 143 (US); Camino de Las Sabanas, *Heriberto* 194 (NY, US); near Old Fort Lorenzo, mouth of Río Chagres, *Piper* 5949 (NY, US); vicinity of San Félix, eastern Chiriquí, *Pittier* 5206 (NY, US).

PARAGUAY: Picada Chiriguelo, Sierra de Amambay, *Rojas* 6861 (US); Santa Teresa, *Bertoni* 1718 (US).

PERU, AMAZONAS: Quebrada Huampami, *Berlin* 703 (US). AYACUCHO: Río Apurímac Valley, near Kimpitiriki, *Killip and Smith* 22985 (US). CUZCO: Cordillera Vilcabamba, 15 km walking distance from Río Apurímac and Hacienda Luisiana, *Dudley* 10055 (MO). HUÁNUCO: Bosque Nacional de Iparia, Río Pachitea, near campamento, Miel de Abeja, *Schunke* 1306, 1364, 1930, 2919 (US); Tingo María, *Asplund* 12226 (US). JUNÍN: E of Quimiri bridge, near La Merced, *Killip and Smith* 24002 (US); Río Paucartambo valley, near Perené bridge, *Killip and Smith* 25330 (US). LORETO: Iquitos, *Williams* 3752 (US); Río Nanay, upland forest near Zamito, *Plowman* 2513 (US); Santa María, about 25 km below Yurimaguas on Río Huallaga, *Allard* 22484 (US); trocha Yurimaguas-Tarapoto, *Ferreyra* 4959 (US); Río Ampiyacu, environs Puca urquillo, *Davis et al.* 811 (US). MADRE DE DIOS: Explorer's Inn, 30 km SW of Puerto Maldonado, *Londoño* 15 (US). SAN MARTÍN: Alto Río Huallaga, *Williams* 5824 (US); Gamitanacocha, Río Mazán, *Schunke* 210 (US); Lamas, *Williams* 6465 (US); lower Río Huallaga, *Williams* 3802, 4375 (US); San Roque, *Williams* 7682 (US); Tarapoto, *Williams* 5491, 5873 (US); camino al Pueblo Viejo de Tocache, *Schunke* 3777 (US). UCAYALI: Pucallpa, *Soukup* 3060 (US). DEPARTMENT UNKNOWN: La Merced, *McBride* 5521 (US).

PUERTO RICO: Vicinity of Mayagüez, *Chase* 6175 (US), 6177 (US), *Heller* 4583 (US), *Sintenis* 138 (US), *Soderstrom* 1802 (US); vicinity of Maricao, *Chase* 6200 (US); NE of Arborito, *Chase* 6334 (US); vicinity of Vega Alta, *Chase*

6416 (US); vicinity of Quebradillas, *Chase* 6570 (US); between Guainabo road and Bayamón, vicinity of San Juan, *Chase* 6645 (US); Sierra de Luquillo, slopes of El Yunque, *Chase* 6732 (US); Toa Baja, *McKee* 10601 (US); Cayey, *Sintenis* 2396 (US); Panuelas, in montibus Llano, *Sintenis* 4764 (US); Santa Marta Hills near San Germán, *Stimson* 1229 (US); Río Piedras, *Wetmore* 172 (US).

SURINAM: Kayser airstrip, 45 km above confluence with Lucie Rivier, *Irwin et al.* 55986, 57696 (US); 3 km S of Juliana Top, 12 km N of Lucie Rivier, *Maguire et al.* 54423, 54424, 54441, 54858 (US).

TOBAGO: Scarborough, *Broadway* 4362 (US), Main Ridge, *Cowan* 1488 (US), 1528 (US), *Hitchcock* 10221 (US), 10264 (US); Green Hill, *Purseglove* 6261 (US); Bacolet, *Sandwith* 1629 (US).

TRINIDAD: North Post to Maqueripe, *Britton et al.* 876 (US); Caparo Woods, *Broadway* 4933 (US); Arima Valley, *Cowan and Simmonds* 1195 (US); Tabaquite, *Cowan and Foster* 1340 (US), *Soderstrom* 1072 (US); Port-of-Spain, *Hitchcock* 9968 (US), 9981 (US), 10195 (US), 10326 (US), 10327 (US); San Fernando, *Hitchcock* 10105 (US); Aripo Valley, beginning of trail to Aripo Caves, *Kennedy et al.* 1705 (US); near Simla, *Smith* 10085 (US); St. Joseph Savannah, *Soderstrom* 1088 (US); Erin Savanna, *Soderstrom* 1127 (US).

UNITED STATES, FLORIDA: Tampa Bay [mixed with *Pharus lappulaceus*], Herb. Chapman (photograph at US of herbarium sheet from unknown source).

VENEZUELA, AMAZONAS: between Río Mawariuma and Río Baria, *Gentry and Stein* 47240 (US). ANZOÁTEGUI: Cerro La Danta, NE of Bergantín, *Steyermark* 61101 (US). APURE: Departamento Páez, 25 km by car E of El Nuba, *van der Werff and Gonzalez* 4821 (MO). ARAGUA: Trail behind Biological Station at Rancho Grande, *Luteyn and Luteyn* 5182 (US); northern slope of Parque Nacional Rancho Grande, *McClure* 21264 (US); near Maracay, *Soderstrom* 1359 (US). BOLÍVAR: 17 km W of Río Caura along Hwy. between Caicara and Ciudad Bolívar, *Davidse* 4442 (WIS); Río Reforma, *Steyermark* 88060 (US). CARABOBO: Guaremales, road from Puerto Cabello to San Felipe, *Pittier* 8923 (US). COJEDES: Río Pao, Paraima, *Trujillo* 5435 (MO); entre Hacienda Mata Clara y El Baula, *Aymard et al.* 2303 (MO). DELTA AMACURO: 13 km ESE of town of Sierra Imata, *Davidse and González* 16620 (MO). DISTRITO FEDERAL: Cerro Naiguatá, *Steyermark* 92143 (US). FALCÓN: Maparari, 11 km E de Churuguara, *Wingfield* 6509 (MO). MÉRIDA: near Bolero, along Río Onia, *Steyermark* 56708 (US). MIRANDA: 3 km SW of Aragaita, *Davidse* 4105 (WIS); Guinand Estate, Siquire Valley, *Pittier* 5941 (US). MONAGAS: Quiri Quiri to Caripito, *Chase* 12581 (US). NUEVA ESPARTA: Juan Griego Trail, Isla Margarita, *Johnston* 314 (US). PORTUGUESA: 30 km W of Guanare by air, along Río Tucupido, *Liesner et al.* 12638 (MO); 17 km NW of Tucupido, *Davidse et al.* 21469 (MO). SUCRE: Cerro Patao, N of Puerto Hierro, *Steyermark and Agostini* 91165 (US). TÁCHIRA: The Balcon,

vicinity Cristobal Colón, *Broadway* 445 (US). YARACUY: Departamento San Felipe, Municipio Veroes, 5 km S de Bella Vista, *Agostini et al.* 795 (MO). ZULIA: Vicinity of Mene Grande, *Pittier* 10647 (US). STATE UNKNOWN: Eleanor Creek, lower Orinoco, *Rusby and Squires* 357 (US).

VIRGIN ISLANDS, ST. THOMAS: *Eggers* 289 (US), 673 (US). TORTOLA: *Britton and Shafer* 835 (US).

WINDWARD ISLANDS, GRENADA: Morne Delice, *Beard* 571 (US); Azimar Mountains, 18 Oct 1905, *Broadway s.n.* (US). SANTA LUCIA: *Hitchcock* 16357 (US), 16479 (US). SAINT VINCENT: Kingshill, *Beard* 1371 (US).

ADDITIONAL OLD WORLD SPECIMENS SEEN.—ANGOLA: Dundo, proximum flumen Luachimo, *Gossweiler* 14211 (US); River Luovwa, Moxico District, *Milne-Redhead* 4176 (US).

BURUNDI: Bururi, Rumonge, foret de Kigwena, *Reekmans* 1519 (MO), 4849 (MO).

CAMEROON: Mbalmayo, *Jacques-Félix* 9142 (US); Mimbia, *Zenker* 164 (US); Yaoundé, *Zeuillen* 220 (US).

CENTRAL AFRICAN REPUBLIC: Manovo-Gounda-St. Floris National Park, 0.5 mi [1 km] downstream of Koumbala-Pende confluence, *Fay* 6061 (MO); Niao River 4 km S of Sakala Road, *Fay* 7412 (MO).

COMORO ISLANDS: Mayottem Hachiroungou massif, *Lorence and Saida* 2861 (MO).

CONGO: Paysoles M'brous, *Chevalier* 5766 (US).

ETHIOPIA: 6 km SE of Tippi, 7°09'N, 35°23'E, *Meyer* 8026 (US).

GABON: Ndjole, *Thollon* 723 (US).

GHANA: Ejura, *Vigne* 3454 (US); Kumasi, *Yamoah* 623 (US).

GUINEA: Mt. Nimba, *Adam* 3155 (MO); Dendano, *Adam* 3619 (MO); Nzerekore, *Adam* 5343 (MO); Bogbozou, *Adam* 5564 (MO); Mt. Kouyo, *Adam* 5798 (MO); Singuedou, *Adam* 6205; Kindia, Seguea, *Adam* 12635-1 (MO).

IVORY COAST: Several km SE of Zie-Noa bridge, near Kange Yanze, *Fosberg* 40485 (US).

KENYA: Meru Dist., lower Imenti Forest, on Meru-Mikinduri road, *Faden and Faden* 78-894 (MO).

LIBERIA: Nyaake (Webo), Webo Dist., *Baldwin* 6086; Jabroke (Palipo), Webo Dist., *Baldwin* 6698 (US); near Soplina, Vonjama Dist., *Baldwin* 10059.

MADAGASCAR: Bassin de la Manampanihy, *Humbert* 6042 (US).

MALAWI: Lujeri Estate, Mlanje, *Wiehe* 714 (US).

MOZAMBIQUE: Amatongas forest near Gondola, *Fisher and Schweickhardt* 271 (US); Garuso, *Fisher and Schweickhardt* 288 (US); Tzengannedose, *Gómes and Sousa* 4375 (US); Vila de João Belo, Chipenhe, na floresta de Chirindzene, *de Lemos and Balsinhas* 49 (US).

NIGERIA: Abugi, Kabba Prov., *Clayton* 623 (US).

SENEGAL: Tambacounda, Niokolo koba, *Adam* 17425 (MO); Ziguinchor, Bayottes, *Adam* 13713 (MO).

SIERRA LEONE: Jala, 20 Jan 1927, *Fairchild s.n.* (US).

SOUTH AFRICA: Ngoya, Zululand, 18 Apr 1895, *Wyllie*

s.n. (US).

TANZANIA: Magenga forest, *Faulkner 1201* (US); Languga, Usambaras Dist., *Greenway 424* (US); Amani, *Hitchcock 24509* (US); Moshi, *Hitchcock 24555* (US).

UGANDA: Musole forest, *Barkley 3231* (US); Kyewaga forest, Busiro County, *Dawkins 369* (US); Nipayo, *Dümmer 667* (US); Budongo forest, *Loveridge 168* (US).

ZAIRE: Yambata, *De Giorgi 7422* (US); Parc National Garamba, Terr. Dungu, *Troupin 790* (US); Dima, *Vanderyst 5237* (US); Mokaba, *Vanderyst 5600* (US).

ZIMBABWE: Chirinda Forest, *Crook 1088* (MO), *Pardy and Armitage 26* (MO); Inyanga, Pungwe, *Wild 5274* (MO).

DISCUSSION.—*Olyra latifolia* is a common, coarse, scandent species of forest margins and secondary forests throughout the Neotropics. It is naturalized and widespread in tropical Africa. There are both diploid and tetraploid populations. Recorded chromosome counts include $n = 22$ (Davidse and Pohl, 1974, 1978; Hunziker et al., 1982), $2n = \sim 30$ (Gould and Soderstrom, 1967, as *O. cordifolia*), $2n = 22$ (Reeder, 1969, Gould and Soderstrom, 1970, Kammacher et al., 1973), $n = 11$ (Pohl and Davidse, 1971, Davidse and Pohl, 1972a), and $n = 11, 22$ (Davidse and Pohl, 1972b, Olorode, 1975, Dujardin, 1978).

13. *Olyra latispicula* Soderstrom & Zuloaga, new species

FIGURES 11, 17c, 18, 19, 20

TYPE SPECIMEN—BRAZIL, BAHIA: Município Pôrto Seguro, Parque Nacional Monte Pascoal, located 14 km E of BR 101 at a point 13 km N of Itamarajú, 320 m, 13 May 1976, *Soderstrom, Russell, and Hage 2208* (holotype, CEPEC; isotype, US).

Gramen perenne, rhizomatibus breviter, culmis in fasciculis densis, erectis ~0.70 m longis; nodi incrassati, pilosi. Folia per complementum 10–15; laminae ovatae-lanceolatae, 9–11 cm longae, 2.2–3.8 cm latae, glabratae, basi asymmetricae valde, truncatae, apice symmetricae; pseudopetioli 0.3–0.4 cm longi, pilosi; ligulae membranaceae-ciliatae, ~0.3–0.4 mm longae. Paniculae laxatae, parvae, 5–9 cm longae, 1–3 cm latae. Spiculae femineae lanceolatae, aristatae, 14.8–15.8 mm longae, 3.7 mm latae, virides, glumis inter se inaequalibus; gluma inferior aristata, 5-nervis, nervis tessellatis; gluma superior acuta, 6.6 mm longa, 5-nervis, nervis tessellatis; anthoecium late ovatum, acutum, 5.5 mm longum, 3.7 mm latum, pilosum; lemma 5-nerve, nervis tessellatis. Spiculae masculae lanceolatae, acuminatae, 4.3 mm longae, 0.7 mm latae, scabrae; lemma acuminatum, 3-nerve; palea 3.5 mm longa, 2-nervis.

Short-rhizomatous perennial, 0.70 m tall. Culms borne closely together, geniculate-ascending, unbranched at the lower and median nodes; internodes compressed, hollow, short-pubescent with appressed and retrorse hairs; nodes thickened, purplish, glabrous. Leaves 10–15 per complement, drooping,

rarely ascending in the upper portion of the plant; sheaths striate, greenish to purplish, short-pubescent to glabrescent; ligules membranous-ciliate, ~0.3–0.4 mm long; pseudopetiole 0.3–0.4 cm long, brown, long- to short-pubescent with thickened, whitish hairs on both surfaces; blades ovate-lanceolate, 9–11 cm long, 2.2–3.8 cm wide, the upper leaves becoming smaller, strongly asymmetric and truncate at the base, with a symmetric, acuminate tip, glabrous on both surfaces, the margins ciliate to scabrous, with or without short hairs toward the base, the midnerve prominent. Inflorescence paniculiform, 2 or 3 borne at the upper nodes of the culms: peduncles long, ~8–10 cm long, with short, retrorse hairs; panicles few-flowered, 5–9 cm long, 1–3 cm wide, the branches divergent from the axis, the lowermost whorled, occasionally alternate, the upper ones alternate, the lower branches bearing male spikelets only, with the spikelets paired, one short- and the other long-pedicelled, the upper branches with male spikelets at the base and a terminal female spikelet or with female spikelets only; axis longitudinally ridged, hispid on the lower part, otherwise glabrous, pedicels of the male spikelets purplish, scabrous, those of the female spikelets thickened, smooth and glabrous. Axillary panicles similar to the terminal one but smaller. Female spikelets lanceolate, aristate, 14.8–15.8 mm long, 3.7 mm wide, greenish with unequal glumes; lower glume long-aristate, scaberulous, 5-nerved with transverse veinlets; upper glume acute, 6.6 mm long, glabrous, 5-nerved with transverse veinlets; a short stipe present at the base of the antherium; antherium broadly ovoid, strongly compressed, acute apically, 5.5 mm long, 3.7 mm wide, with conspicuous, caducous, long prickle hairs over the entire surface; lemma gibbous, depressed on the dorsal face along either side of the midnerve, 5-nerved with transverse veinlets. Male spikelets lanceolate, acuminate, 4.3 mm long, 0.7 mm wide, reddish, scabrous; lemma acuminate, 3-nerved with the midnerve scabrous toward the apex; palea 3.5 mm long, 2-nerved, scabrous toward the apex; anthers 2.2 mm long.

DISTRIBUTION.—Known only from the type locality, a lowland wet forest on the slopes of Monte Pascoal in southern Bahia, Brazil (Figure 11).

DISCUSSION.—*Olyra latispicula* is a very distinctive new species, unusual in its broad, slightly apiculate female antherium, with the lemma gibbous and the whole surface covered by conspicuous prickle hairs. The plants are delicate and small, with asymmetric leaves that have truncate bases. Its affinities with other species in the genus are not obvious.

14. *Olyra longifolia* Humboldt, Bonpland & Kunth

FIGURES 21, 22, 23

Olyra longifolia Humboldt, Bonpland & Kunth, 1816:198. [Type: "Crescit in humidis Guyanae ad ripam fluminis Guaviare, prope San Fernando de Atabapo, in sylvis Orinocensibus prope Santa Barbara." Holotype P, not seen, fragment of the holotype, US sheet no. 2877943.]

Olyra surinamensis Hochstetter ex Steudel, 1853:36. [Type: "Hrbr. Dr.



FIGURE 17.—Field photos of *Olyra* species. *O. filiformis*: a, detail of panicles; b, habit of plant (Bahia, Brazil, 1972). *O. latispicula*: c, habit of plant (Bahia, Brazil). *O. micrantha*: d, habit of plant (Brazil, 1968); f, detail of panicles. *O. juruana*: e, habit of plant (Brazil, 1976). Photographs by C.E. Calderón, except c by T.R. Soderstrom.

Hostmann nr. 863. Surinam." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877922; isotype, MO.]

Olyra longifolia var. *grandifolia* Doell in Martius, 1877:325. [Type: Based on *O. longifolia* Humboldt, Bonpland & Kunth, 1816:198.]

Olyra longifolia var. *parvifolia* Doell in Martius, 1877:325. [Type: "In vicinis provinciae Manaos do Alto Amazonas a cl. R. Spruce lecta (n. 880 et 1145, nomine *Olyrae acutinodae* in ejus herbario signata)." Syntype *Spruce* 880

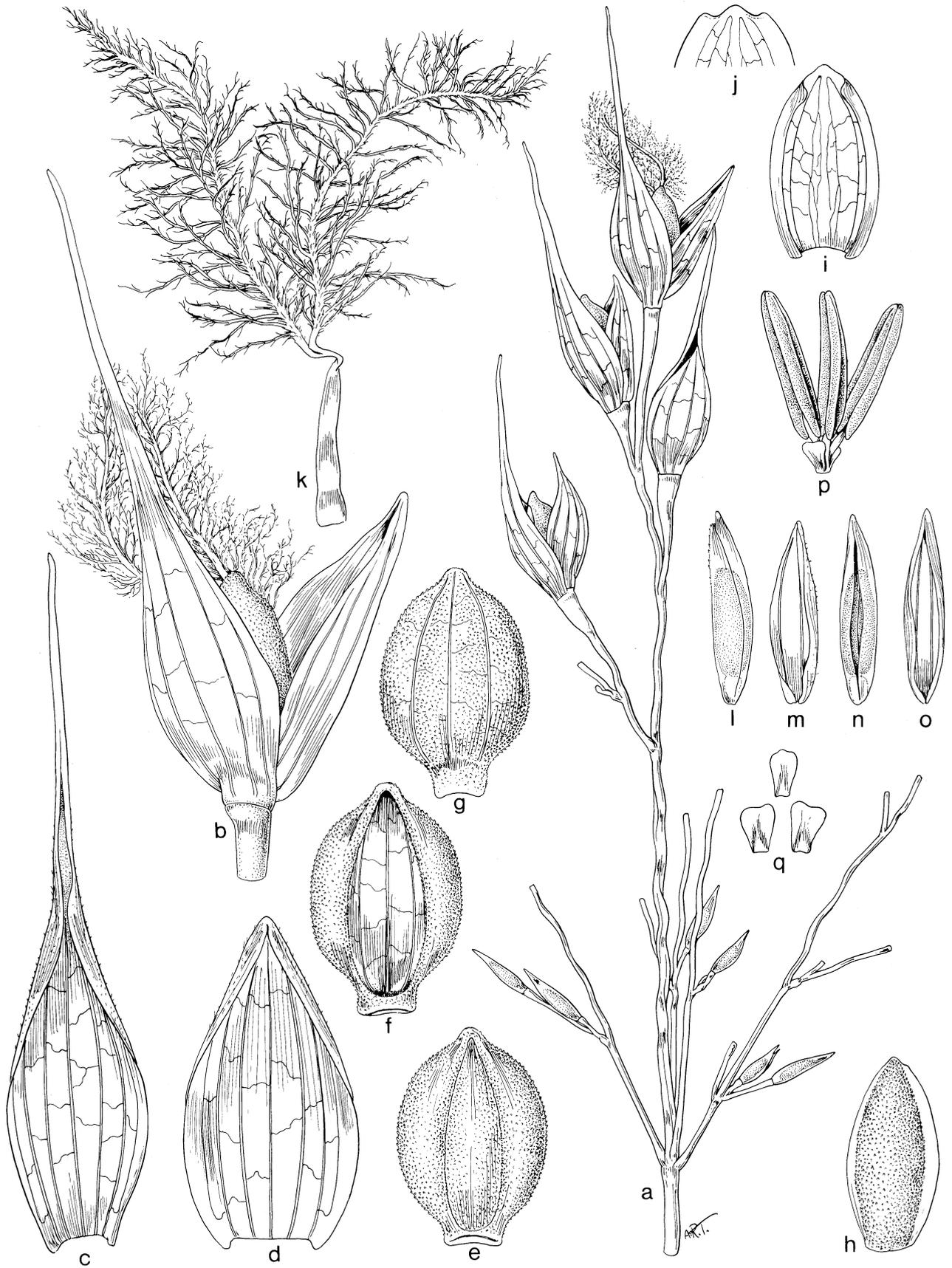
not seen; syntypes of *Spruce* 1145, NY, P, US, fragment of syntype, 1145, US sheet no. 84571.]

Olyra kegelii Mez, 1921:6. [Type: "Holl. Guyana (*Kegel* n. 251)." Holotype, B, fragment of the holotype, US.]

Perennial in cespitose clumps, short-rhizomatous. Culms 0.30–5 m tall, simple below, branching at the upper nodes,



FIGURE 18.—*Olyra latispicula*: a, habit ($\times 0.5$); b, inflorescences from upper nodes ($\times 0.5$); c, pseudopetiole and ligule ($\times 5$). Based on Soderstrom *et al.* 2208 (US). Illustration by A.R. Tangerini.



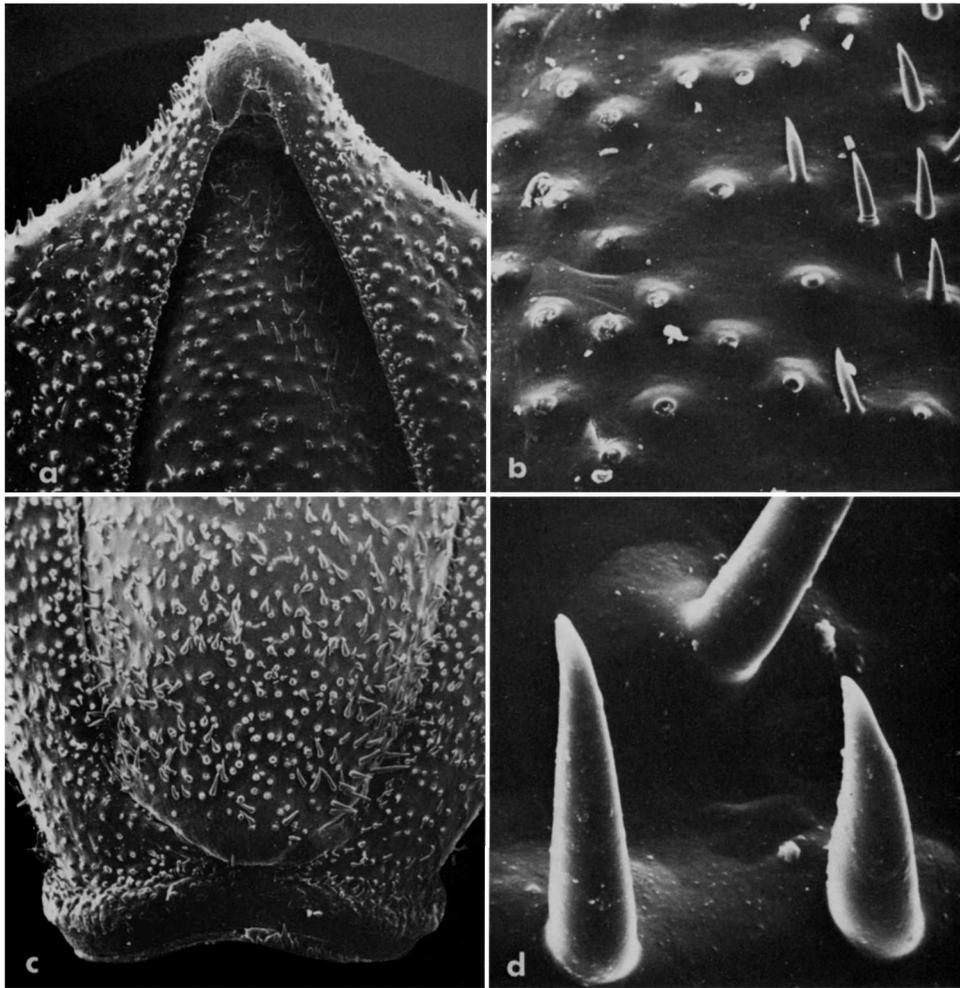


FIGURE 20.—Detail of female anthecium, *Olyra latispicula*: *a*, apex of the anthecium, ventral side ($\times 50$); *b*, detail of the surface showing caducous prickly hairs ($\times 200$); *c*, base of the anthecium, ventral side ($\times 50$); *d*, prickly hairs ($\times 1000$). All micrographs of Soderstrom *et al.* 2208 (US). (Reduced to 77% of indicated magnifications for publication.)

erect or rarely clambering; internodes cylindrical, hollow, shiny, glabrous; nodes thickened, short-pubescent with whitish hairs. *Leaves* with sheaths strongly ribbed, densely pubescent toward the summit, the rest of the surfaces short- to long-pubescent to glabrous; auricles absent; ligules membranous-

FIGURE 19.—*Olyra latispicula*: *a*, habit and inflorescence ($\times 4$); *b*, female spikelet ($\times 8$); *c*, lower glume of female spikelet ($\times 8$); *d*, upper glume of female spikelet ($\times 8$); *e*, female anthecium, palea side ($\times 8$); *f*, lemma of female spikelet, inside view ($\times 8$); *g*, lemma of female spikelet, outside view ($\times 8$); *h*, palea of female spikelet, outside view ($\times 8$); *i*, palea of female spikelet, inside view ($\times 8$); *j*, same as *i*, apex opened ($\times 8$); *k*, gynecium ($\times 8$); *l*, male spikelet ($\times 12$); *m*, lemma of male spikelet, inside view ($\times 12$); *n*, palea of male spikelet, with stamens enclosed ($\times 12$); *o*, palea of male spikelet, inside view ($\times 12$); *p*, andrecium and lodicules ($\times 16.5$); *q*, lodicules of male spikelet ($\times 24$). All components based on Soderstrom *et al.* 2208 (US). Illustration by A.R. Tangerini.

ciliate, ~ 0.6 mm long, brownish, short-pubescent on the abaxial surface; pseudopetiole 0.2–0.5 cm long, pale to purplish, pubescent with short, appressed hairs to glabrescent; blades lanceolate, 5.5–21 cm long, 1.2–5.7 cm wide, ascending, with a subcordate to narrowed and symmetric base, the apex either symmetric or asymmetric, glabrous on the adaxial surface, glaucescent and hispid on the abaxial one, the upper margins ciliate, the midnerve prominent. *Inflorescences* racemiform, usually with 2 to many panicles borne from the uppermost nodes, all the panicles almost reaching the same height, the peduncles short-pubescent; panicles 3.5–7.5 cm long, 1–2 cm wide, with male and female spikelets borne in different branches, usually with 2–5 branches with male spikelets at the base, one of these branches longer than the other ones; pedicels of the male spikelets slender, scabrous; female spikelets 4–12, disposed alternately on one branch; pedicels of the female

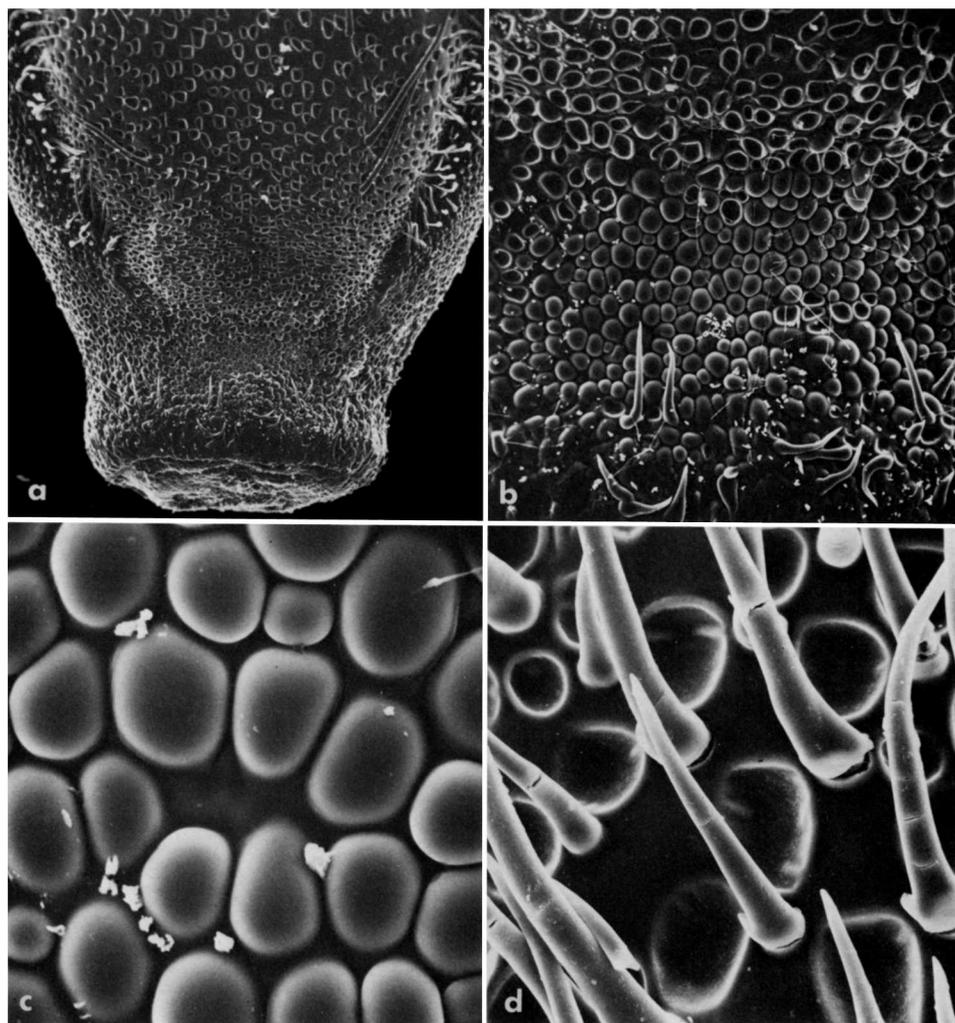


FIGURE 21.—Detail of female anthercium, *Olyra longifolia*: a, base of the anthercium, ventral side ($\times 70$); b, detail of the papillae at the base of the anthercium ($\times 200$); c, papillae ($\times 1000$); d, apex of the palea showing rounded excavations and unicellular macrohairs ($\times 500$). Micrographs a–c of *Black 48-2447* (US), d of *Schultes & Cabrera 15386* (US). (Reduced to 77% of indicated magnifications for publication.)

spikelets thickened; *axis* of the branches scabrous to sparsely pubescent. *Female spikelets* lanceolate, aristate, 17–22 mm long, 2.4–3 mm wide, greenish to purplish, the glumes subequal, scabrous, anthercium $\frac{1}{2}$ or less the length of the spikelet; *lower glume* short-aristate, 7–13-nerved with transverse veinlets, acuminate, glabrous, scabrous toward the apex of the inner surface; *upper glume* 15–18 mm long, 7–13-nerved with transverse veinlets, acuminate, glabrous; *anthercium* obovoid, 5.2–6.6 mm long, 1.9–2.4 mm wide, narrowed basally, acute apically, pale, with rounded to irregular excavations spaced throughout the surface and thickened, caducous, fragile and unicellular hairs toward the apex; *lemma* 7-nerved, *palea* 4-nerved. *Caryopsis* obovoid, brownish, 3.8–4.2 mm long, 2 mm wide; hilum as long as the caryopsis; embryo $\frac{1}{6}$ the length of the caryopsis. *Male spikelets*

lanceolate, short-aristate, 5.3–7.3 mm long, 0.6–0.8 mm wide, scabrous, pale to purplish; *lemma* 3-nerved, short-aristate; *palea* 2-nerved; anthers 3, 2–3 mm long.

DISTRIBUTION.—Northern South America from Colombia to Bolivia and Brazil, from sea level to 400 m elevation; especially common in the Guianas (Figure 23).

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, BENI: 2 km NW of Guayamerín, *Anderson et al. 12119* (MO, US).

BRAZIL, AMAPÁ: Araguari River, *Pires et al. 50581* (NY); Oiapoque, *Fróes 25743* (IAN). AMAZONAS: Cahoeira Caranguejo, River Cuabury, *Holt and Blake 422* (US); Cucuhy, Rio Negro, *Holt and Gehriger 356* (NY, RB, US), *399* (US); near Tunui, Içana River, *Fróes 28411* (IAN); Barcelos, *Maguire et al. 60041* (US); Rio Negro, ~120 km above Barcelos, *Madison et al. 6181* (US); between Moreira and Rio Quinini, *Prance et*

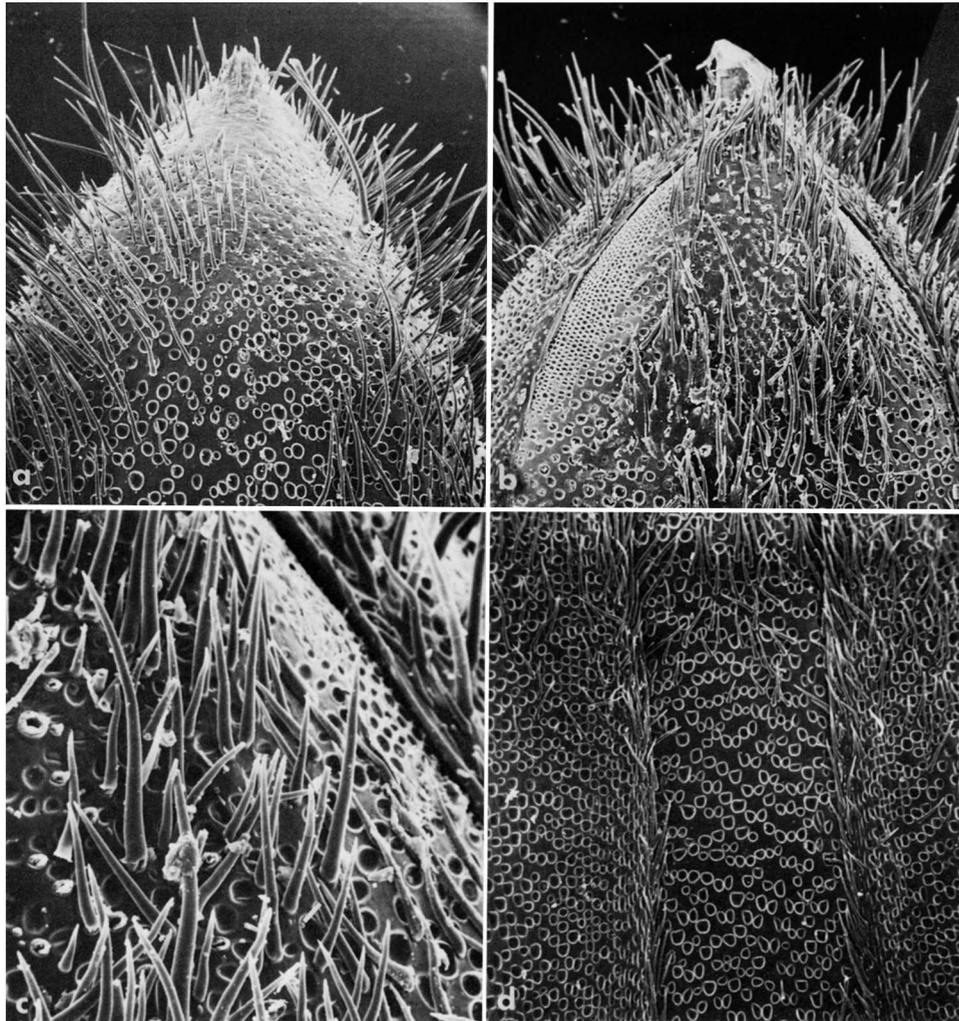


FIGURE 22.—Detail of female antherium, *Olyra longifolia*: a, apex of the antherium, dorsal side ($\times 50$); b, apex of the antherium, ventral side ($\times 50$); c, detail of the palea ($\times 200$); d, antherium, ventral side ($\times 50$). Micrographs a-c of Steyermark 512431 (US), d of Schultes & Cabrera 15386 (US). (Reduced to 77% of indicated magnifications for publication.)

al. 16253 (F); Camundé, Rio Negro, *Baldwin* 3396 (US); Negro River, Ilha do Piranade, above Barcelos, *Baldwin* 3297 (RB, US); Negro River, Ilha do Matupiri, *Fróes* 28261 (US); Paraná de São José de Ariraha, *Baldwin* 3298 (US); Parawa, below São Felipe, Rio Negro, *Baldwin* 3572 (US); Tapuruquara, Rio Negro, *Black* 48-2477 (US), *Pires* 274 (NY); Rio Negro, between Moreira and Rio Quinini, *Prance et al.* 16253 (US); Rio Negro, between Ilha Jacari and Airão, *Prance et al.* 15098 (US); basin of Rio Demeni, vicinity of Tototobi, *Prance et al.* 10217 (US); região do Rio Jari, Estrada do Munguba, *Silva* 1642 (US). MARANHÃO: Pindaré River, Monção, *Fróes* 20328 (US). PARÁ: Belém, *Soderstrom* 1193 (US); Bon Jardim-Itaituba, *Swallen* 6943 (US); Bragança railroad, *Goeldi* 79 (RB, US); Ilha do Rocado, 4 km NW de Cachoeira Porteira, *Martinelli* 7130 (MO); Mojú River, Estate Conceição, *Goeldi*

150, 151^{1/2} (US); Mojú Fabrica, *Kuhlmann* 2128 (R, RB, US), *Black* 54-16211 (US), 54-16319 (IPEAN); Gurupá, Igarapé Jacupí, *Pires and Silva* 4690 (US); River Cuminá, Cuminá-miri, *Silva* 1265 (US); 1 km N of Fazenda Urucurituba, on Tapajós River, *Archer* 8397 (US); Paragominas, River Uraim, *Silva* 404 (US); Piratininga, Almeirim, *Ducke s.n.*, April 16, 1923 (RB, US); Serubin, Itacaiuna River, *Fróes and Black* 24540 (US). RORAIMA: Baixo Rio Branco, *Fróes* 23011 (NY, US); Posto Mucajaí, Rio Mucajaí, *Prance et al.* 11074 (US).

COLOMBIA, BOYACÁ: Orocué, *Haught* 2821 (F, NY, US). CHOCÓ: Quebrada La Sierpe, *Forero et al.* 3915 (MO). EL VALLE: Veneral, Yurumanguí River, *Cuatrecasas* 15873 (F, US); Quebrada del Corosal, Cajambre River, *Cuatrecasas* 17751 (F, US). VAUPÉS: Cachivera de Jirijirimo, Apaporis River, *Schultes and Cabrera* 12424 (US); between the rivers

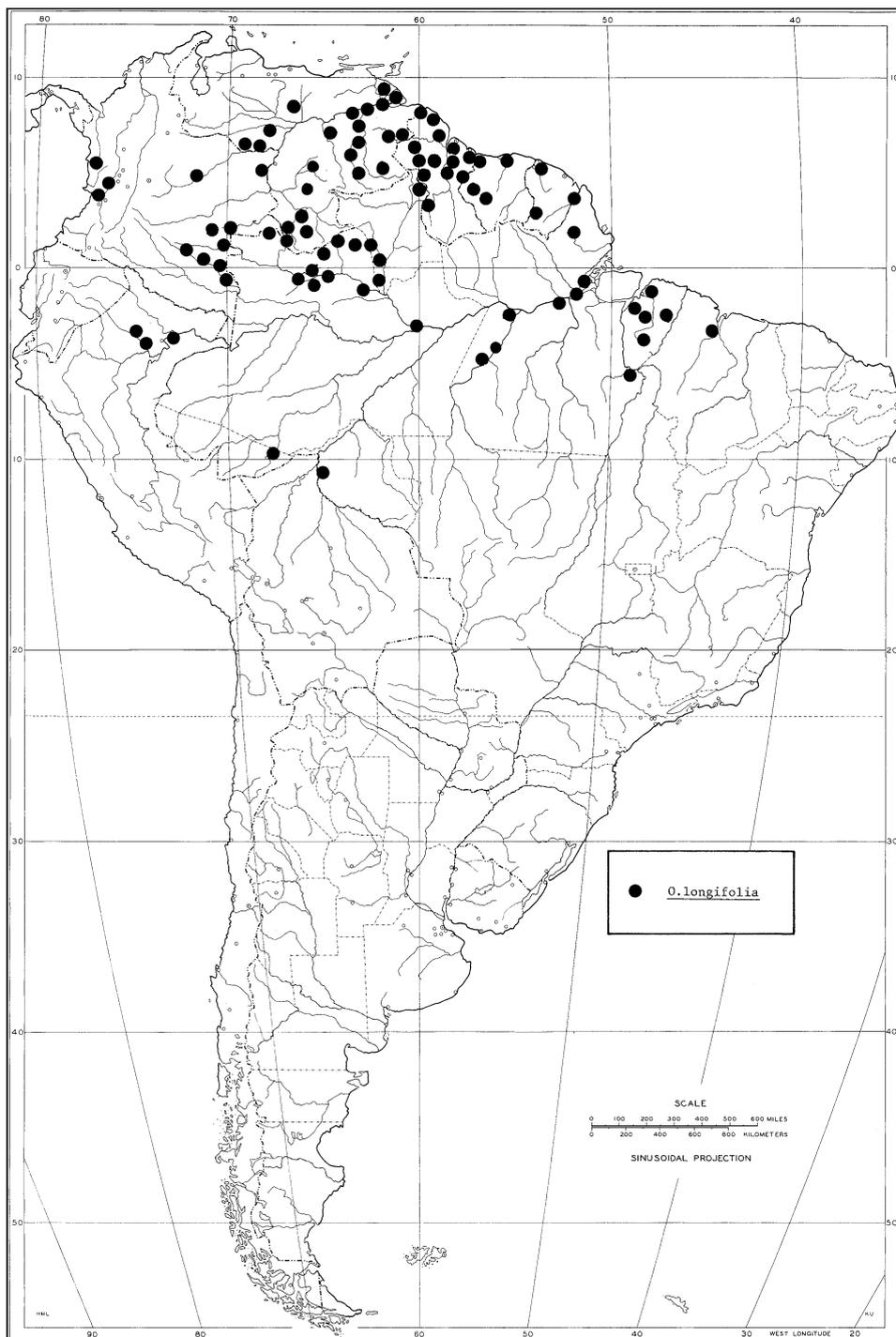


FIGURE 23.—Distribution of *Olyra longifolia*.

Pacoa and Kananari, Apaporis River, *Schultes and Cabrera* 13817 (US); Raudal Yayacopi and vicinity, *Schultes and Cabrera* 15386 (US); Inirida River, San Joaquín, *Fernandez* 1999 (F, US); Mitú, *Arbeláez and Cuatrecasas* 6784 (US); Pacoa River, tributary of Río Apaporis, *Schultes and Cabrera*

15259 (US); selvas del Tui-Igarapé, *Cuatrecasas* 6869 (US).

FRENCH GUIANA: Acarouany, *Melinon* 231 (US, WIS); Haut Itany, *Hook* s.n., 1 Jan 1956 (P); Itany, Tolinga, *Hook* s.n., 30 Dec 1955 (P).

GUYANA: Akwero, *Maas* 2409 (US); Bonisika Landing,

Arawau River, *Archer* 2336 (US); Bunsika Ck., Aruwau Ck., without collector, March 28, 1945 (NY); Cuyuni River, *Tutin* 970 (US); Essequibo River, near mouth of Mazaruni River, vicinity of Penal Settlement, *Hitchcock* 17241 (US); SE of Georgetown, East Coast Water Conservancy, *Hitchcock* 16979 (US); vicinity of Issorora, on Aruka River, *Hitchcock* 17577 (US); Kamakusa, *Leng* 16 (NY); Kaieteur Fall, left bank of Potaro River, *Cowan and Soderstrom* 2001 (F, US); 3 mi [5 km] above Kaieteur Fall, *Cowan and Soderstrom* 2108 (US); Kanuku Mountains, in drainage of Moku-moku Creek, *A.C. Smith* 3410 (F, MO, NY, US); Mazaruni Station, *Tutin* 138 (RB, US); Moruka River, Santa Rosa, *De la Cruz* 998 (NY, US); Pomeroun River, *De la Cruz* 3167 (F, MO, NY, US); Potaro River, *Jenman* 7528 (US), *Sandwith* 1395 (US); Rockstone, on the Essequibo River, *Hitchcock* 17332 (NY, US); vicinity of Tumatumari on Potaro River, *Hitchcock* 17363 (F, MO, NY, US); Wismar, on the Demerara River, *Hitchcock* 17423 (US); banks of Yawakuni River, *Abraham* 189 (US); without locality, *Jenman* 5963 (NY, US), 6737 (US).

PERU, LORETO: Río Nanay, lowland forest near River at Shiriará, *Plowman* 2554 (US); Timbuchi, on the Río Nanay, *Williams* 1043 (F, US).

SURINAM: Kayser airstrip, 25 km above confluence with Lucie Rivier, *Maguire et al.* 53952 (US); Kayser airstrip on the Zuid-Rivier, *Kramer and Hekking* 2978 (NY); Nickerie River, Kamisa falls, *Maas* 1966 (US); Wayombo River, near the mouth, *Lindeman* 6322 (US); N of Nickerie River, *Lanjouw and Lindeman* 3404 (NY); without locality, *Hostmann* 97 (US).

VENEZUELA, AMAZONAS: Along Orinoco River, at mouth of Río Sanariapo, below Sanariapo, *Steyermark* 58431 (F, US); Cunucunuma River, along river 0.5 mi [1 km] above Culebra Rapids, *Maguire et al.* 30393 (NY, US); near Santa Barbara del Orinoco, *Steyermark* 117163a (MO); vicinity of Río Coro-Coro, near airport of Yutaje, *Liesner et al.* 10980 (MO); 5 km S of San Carlos de Río Negro, *Liesner* 6205 (MO); W side of Isla Sebastián, Río Casiquiare, above Chapezon, *Liesner and Clark* 8890 (MO); Caño Jotajana, tributary of Caño Guiniquina, *Steyermark* 115125 (MO); Ibaruma, *Tamayo* 3617 (F, MO); upstream from San Victor, past Quebrada Piedradero and Río Matanaima, *Steyermark* 87188 (NY); between La Margarita and Puerta Miranda, Acure River, *Steyermark* 87721 (US); 5–14 km ESE of Los Castillos de Guayana, *Davidse and Gonzalez* 16275 (MO). APURE: 4.5 airline mi [7 km] ESE of San Carlos del Meta along the banks of the Río Meta, *Davidse and Gonzalez* 13828 (MO); E of the southern tip of the Galeras de Cinaruco, *Davidse and Gonzalez* 14616 (MO), 15640 (MO, US); near the Río Meta at Fundo El Algarrobo, Morichal de la Madera, *Davidse and Gonzalez* 14200 (MO). BOLÍVAR: Rainforest along Río Apacará, Apacará-tepuí, *Steyermark* 74642 (F, NY, US); Sierra Imataca, Río Toro, between Río La Reforma and Puerto Rico, *Steyermark* 87837 (NY); Ichún River, below the Salto Mariá Espuma, *Steyermark* 90463 (NY, US); near Campamento Las Pavas, *Steyermark* 117199 (MO); Paragua River, between La

Paragua and Salto de Auraima, *Killip* 3 7317 (US); Torono River, Indian camp above junction with Paragua River, *Killip* 37424 (US); vicinity of Los Patos, *Steyermark* 86996 (US); Guaiquinima, dense forest east of River Paragua toward Cerro Guaiquinima, *Killip* 37481 (US); SE of Canaima, *Steyermark* 106401 (MO). DELTA AMACURO: Caño Jotajana, between Epaña and Caño Araguabisi, *Steyermark et al.* 115125 (WIS). GUÁRICO: Parmana, *Tamayo* 4030 (F, MO, US).

DISCUSSION.—This is a variable species, with great variation in the size of plants and panicles.

Olyra longifolia is characterized by having the female and male spikelets in conjugate branches of the same panicle, these being contracted and borne on the uppermost nodes of the culms. In this character the species parallels the inflorescence structure of the olyroid Cuban herbaceous bamboo genera *Ekmanochloa* Hitchcock and *Mniochloa* Chase. The obovoid antheridium is greatly reduced in relation to the size of the spikelet and has rounded excavations and long, stiff, caducous hairs over the entire surface (more so toward the apex). Flowering occurs from December to June.

Clayton and Renvoize (1986) cite this species as a link between *Olyra* and *Cryptochloa* but it should be pointed out that there is no stipe at the base of the female antheridium as in the latter genus. *Cryptochloa* also differs in its usual arrangement of female racemose inflorescences from the lower nodes and female paniculate inflorescences from upper nodes of the culms.

The common name is recorded as “taboquinha” in Brazil.

15. *Olyra lorentensis* Mez

FIGURES 15, 24, 25

Olyra lorentensis Mez, 1917:47. [Type: “Peruvia, Dept. Loreto, prope Leticia in silvis (*Ule* n. 6224).” Holotype, B, fragment of the holotype, US sheet no. 2877942.]

Cespitose perennials from creeping rootstocks and forming dense clumps. Culms 30–60 cm tall, geniculate-ascending, cylindrical, hollow, short-pubescent, biform: leafy culms bearing leaves only, with the leaves of the basal nodes consisting of a sheath only or with a rudimentary blade, the sheaths shorter than the internodes; nodes thickened, formed of the thickened basal rim of the sheath above and the thickened upper rim of the internode below, brownish, short-pubescent with retrorse hairs. Leaves 5–15 per complement; sheaths sparsely papillose-pilose with short and caducous, appressed hairs, the margins ciliate, more so toward the upper part; ligule membranous-ciliate, small, 0.5 mm long; pseudopetiole stramineous, 0.2–0.3 cm long, covered by long whitish hairs; blades ovate-lanceolate to lanceolate, 11–15 cm long, 3.5–5.8 cm wide, acuminate, asymmetric and truncate basally, the midnerve conspicuous toward the base, transverse veinlets present, the adaxial surface glabrous, the abaxial one pilose toward the base, the basal margins shortly ciliate, otherwise



FIGURE 24.—*Olyra lorentensis*: a, habit ($\times 0.5$); b, portion of a branch ($\times 3.2$); c, male spikelet, side view ($\times 13.5$); d, ligule and pseudopetiole ($\times 3.2$); e, lower glume, inner side ($\times 3.2$); f, upper glume, inner side ($\times 3.2$); g, antherium, dorsal side ($\times 6.5$); h, antherium, ventral side ($\times 6.5$). Component a, a composite: base from Fróes 31193 (IAN), inflorescence from L. Williams 3001 (US); habit and inflorescence from Cowan and Maguire 38104 (US). Components b,d,e-h based on Cowan and Maguire 38104 (US); c on Pires and Black 845 (US). Illustration by G.B. Threlkeld.

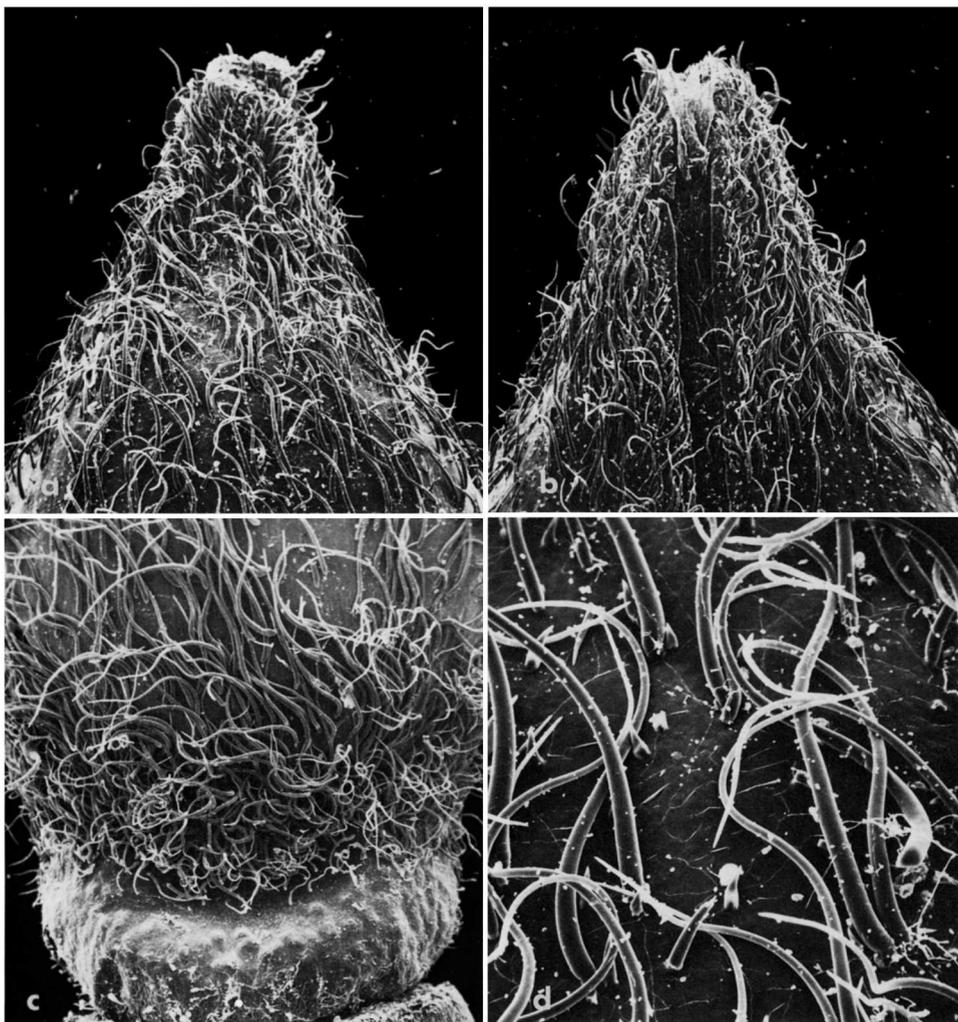


FIGURE 25.—Detail of female antherium, *Olyra lorentensis*: a, apex of the antherium, dorsal side ($\times 50$); b, apex of the antherium, ventral side ($\times 50$); c, base of the antherium, dorsal side ($\times 50$); d, detail of the surface of the lemma with cylindrical macrohairs ($\times 200$). All micrographs are of Grassl 10089 (US). (Reduced to 77% of indicated magnifications for publication.)

scabrous. *Non-leafy culms* with leaf sheaths only; *sheaths* stramineous to purplish, wide, strongly ribbed and overlapping, sparsely pilose. *Inflorescences* paniculiform, terminal, long-to short-exserted, the young panicles included in the upper sheaths, these pyramidal, lax, 6–12 cm long, 5–14 cm wide, the lower branches whorled and with male spikelets only, the upper ones alternate to opposite, with numerous and spaced male spikelets in long tertiary branchlets, the female spikelets terminal and solitary in each culm; *axis* and branches longitudinally ridged, scabrous to glabrous, the axils of the branches pilose, brownish. *Female spikelets* lanceolate, aristate, 13–18 mm long, 2.5–3 mm wide, whitish, the glumes subequal, longer than the antherium, scabrous to sparsely pilose toward the apex, otherwise completely glabrous, tipped by purple awns; *lower glume* 5–9-nerved with manifest

transverse veinlets, long-aristate, the awn of 6–8 mm long; *upper glume* 5–9-nerved with transverse veinlets, aristate, awn of 4–6 mm long; *antherium* long-ellipsoid, narrowed at the base, short-stipitate, 7.8–8.1 mm long, 2.1–2.5 mm wide, acuminate apically, whitish, pilose with long, appressed and cylindrical macrohairs over the entire surface; *lemma* 3-nerved, *palea* 2-nerved. *Caryopsis* fusiform, brownish, 4.5 mm long, 2.2 mm wide; hilum linear, as long as the caryopsis. *Male spikelets* lanceolate, 2.5–3.3 mm long, 0.5–0.7 mm wide, $\frac{1}{5}$ the length of the female spikelets, scabrous to scaberulous; *lemma* 3-nerved, aristulate; *palea* 2.2–2.6 mm long, 2-nerved.

DISTRIBUTION.—This is an Amazonian species that grows in the dense forests of equatorial Brazil, Colombia, and Peru (Figure 15), at elevations from 0 to 400 m.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, AMAPÁ: Serra

do Navio, *Emmerich and Andrade 712* (R, US), Serra do Navio, Curuca Ore Body, *Cowan and Maguire 38104* (NY, RB, US). AMAZONAS: Esperança, *Pires and Black 845* (IAN, US), *Krukoff 7502, 7512, 7517* (NY); Estrada Humaitá-Labrea, *Vieira et al. 53* (MO); São Francisco, Rio Purús, *Kuhlmann 913* (IAN, RB, US); road Humaitá to Pôrto Velho, km 10, *Prance et al. 3446* (F, MO, US); Rio Solimões, *Fróes 24058* (IAN); Solimões river, Barrio de Odorio, São Paulo de Olivença, *Lleras et al. P17389* (US); Manaus-Pôrto Velho Highway, km 380, 2 km S of Rio Jutáí, *Prance et al. 22865* (US); Rio Purús, between Lago Quati and Lago Arima near Rio Jacaré, *Prance et al. 13427* (US); km 620 on Manaus-Humaitá road, *Lowrie et al. 73* (MO); Rio Javari, non-inundated disturbed forest behind village of Paumari, *Gentry and Revilla 20559* (MO). PARÁ: Santarém, Estrada para o rio Curuá-Una, acampamento do Juarana, *Cavalcante and Jouc 1470* (US); Taperinha, parana do Ituqui, *Fróes 31193* (IAN). RONDÔNIA: 8 km NE of Pôrto Velho, *Prance et al. 8246* (MO, US).

COLOMBIA, AMAZONAS: Río Amaca-Yacu, 20 km de son embouchure sur l'Amazone, *Sastre and Echeverry 612* (US); Leticia, *Black and Schultes 46-1* (IAN, US); 18 km N of Leticia, *Gillett 16471* (MO); Loretoyacu River, 3°46'S, 70°23' N, *Grassl 10089* (US).

PERU, JUNÍN: Puerto Bermudez, *Killip and Smith 26568* (US). LORETO: San Fernando, frontier military post on Río Jauari, above Santa Rita, *Gentry and Revilla 20914* (F, MO); La Victoria, *Williams 3001* (F, US).

DISCUSSION.—Flowering occurs between August and February. *Olyra lorentensis* is unique in the genus in possessing inflorescences borne on specialized reduced-leafy culms which completely lack blades. It is a handsome species, in which the white color of the body of the female glumes contrasts strikingly with the purple color of the panicle branches, female spikelet pedicels, female glume awns, and male spikelets.

Gould and Soderstrom (1970) have recorded a chromosome number of $2n = 22$.

16. *Olyra maranonensis* Swallen

FIGURE 15

Olyra maranonensis Swallen, 1966:86. [Type: "Type in the U.S. National Herbarium No. 2382316, collected in rainforest on ridge crest of Quebrada Chuivi, valley of Río Marañón near Cascades de Mayasí, elevation 500–550 m., Amazonas, Peru, September 20, 1962, by John J. Wurdack (No. 1936)." Holotype, US sheet no. 2382316.]

Cespitose perennials. Culms erect, ~1 m tall, unbranched; internodes cylindrical, hollow, glabrous, stramineous to purplish; nodes thickened, purplish, glabrous. Leaves with sheaths pale to greenish, mottled with dark spots, the margins ciliate to glabrous, the rest of the surface shortly pubescent to glabrous; ligule membranous-ciliate, ~0.5 mm long; pseudopetiole ~0.3 cm long, dark, scaberulous on both surfaces; blades lanceolate, flat, 18–23 cm long, 3.6–4 cm long, narrowing

from an asymmetric base to an acuminate, symmetric tip, ascending, glabrous, the margins scaberulous, the midnerve conspicuous toward the base on the adaxial surface. Inflorescences paniculiform; panicles terminal, lax and pyramidal, 13 cm long, 4 cm wide, the lower branches whorled, the upper whorled to alternate, spreading, the lower branches naked at the base and with male spikelets only, the upper branches with male spikelets arranged in tertiary branchlets below and one terminal female spikelet in each branch or the female spikelets borne solitary from the axis in the upper portion; axis longitudinally ridged, scaberulous, purplish, the branches triquetrous, scabrous, the axils of the branches glabrous; pedicels of the female spikelets thickened, scaberulous to glabrous. Female spikelets fusiform, aristate, 11–25 mm long, 2.5–2.7 mm wide, glabrous, whitish; lower glume 11–25 mm long, aristate, 5-nerved with transverse veinlets, glabrous on the inner surface, short-scabrous toward the apex and margins of the outer surface, the awn of ~10 mm long; upper glume acuminate, 10–13 mm long, 7-nerved with transverse veinlets, glabrous on the inner surface, short-scabrous toward the apex of the outer surface; antheridium ellipsoid, acute, 7.5 mm long, 2.7 mm wide, smooth and shining, whitish to stramineous, with long, flattened macrohairs toward the apex and base of the lemma on the ventral surface, the margins of the lemma with prickle hairs, dorsal surface glabrous. Caryopsis not seen. Male spikelets fusiform, short-aristate, 3.5–4.7 mm long, 0.6–0.7 mm wide, hispid; lemma 3-nerved; palea 2.8–4 mm long, 2-nerved.

DISTRIBUTION.—Known only from the type locality in northern Peru (Figure 15).

DISCUSSION.—*Olyra maranonensis* resembles *O. glaberima*, differing from it by the smaller, hispid male spikelets and scaberulous pseudopetioles.

17. *Olyra micrantha* Humboldt, Bonpland & Kunth

FIGURES 17d,f, 26–28

Olyra micrantha Humboldt, Bonpland & Kunth, 1816:199. [Type: "Crescit in umbrosis, humidis ad ripam Orinoci prope cataractam Maypurensium." Holotype, P, not seen, fragment of the holotype, US sheet no. 2877940.]

Olyra hirsuta Trinius, 1826:250. [Type: "Brasil. (Langsdorff)." Holotype, LE, not seen.]

Olyra scorbiculata Schrader ex Nees von Esenbeck, 1829:303. [Nomen nudum.]

Olyra ventricosa Nees von Esenbeck, 1829:303. [Type: "Var. alpha in Mont. Corcovado, haud procul a Río de Janeiro urbe. (Mart. Langsdorff).—Var. beta in paludibus ad Paraiba. (Seren. Princ. Maximil. Neovid., nec non in ripa lacus Canomensis, in sylvaticis, et alibi in pro. Paraensi, juxta fluv. Amazonum (Mart.).—Vidi in Herb. Regio Berol. a *Sellowio* lectam).—Var. gamma in sylvis aboriginibus ad Sebastianopolin aliisque in locis pro. Rio de Janeiro. Floret Martio-Majo, et Novembr." Holotype, B, not seen.]

Olyra urvillei Steudel, 1853:36. [Type: "ex Hrbo. *Urville*." Holotype, P, not seen.]

Olyra micrantha var. *decalvata* Doell in Martius, 1877:324. [Type: "prope Manaos prov. do Alto Amazonas (*Spruce*)."] Holotype, B, not seen.]

Olyra micrantha var. *lanceolata* Doell in Martius, 1877:324. [Type: "prope Rio de Janeiro (*Gaudichaud n. 297*)."] Holotype, P, not seen, fragment of the

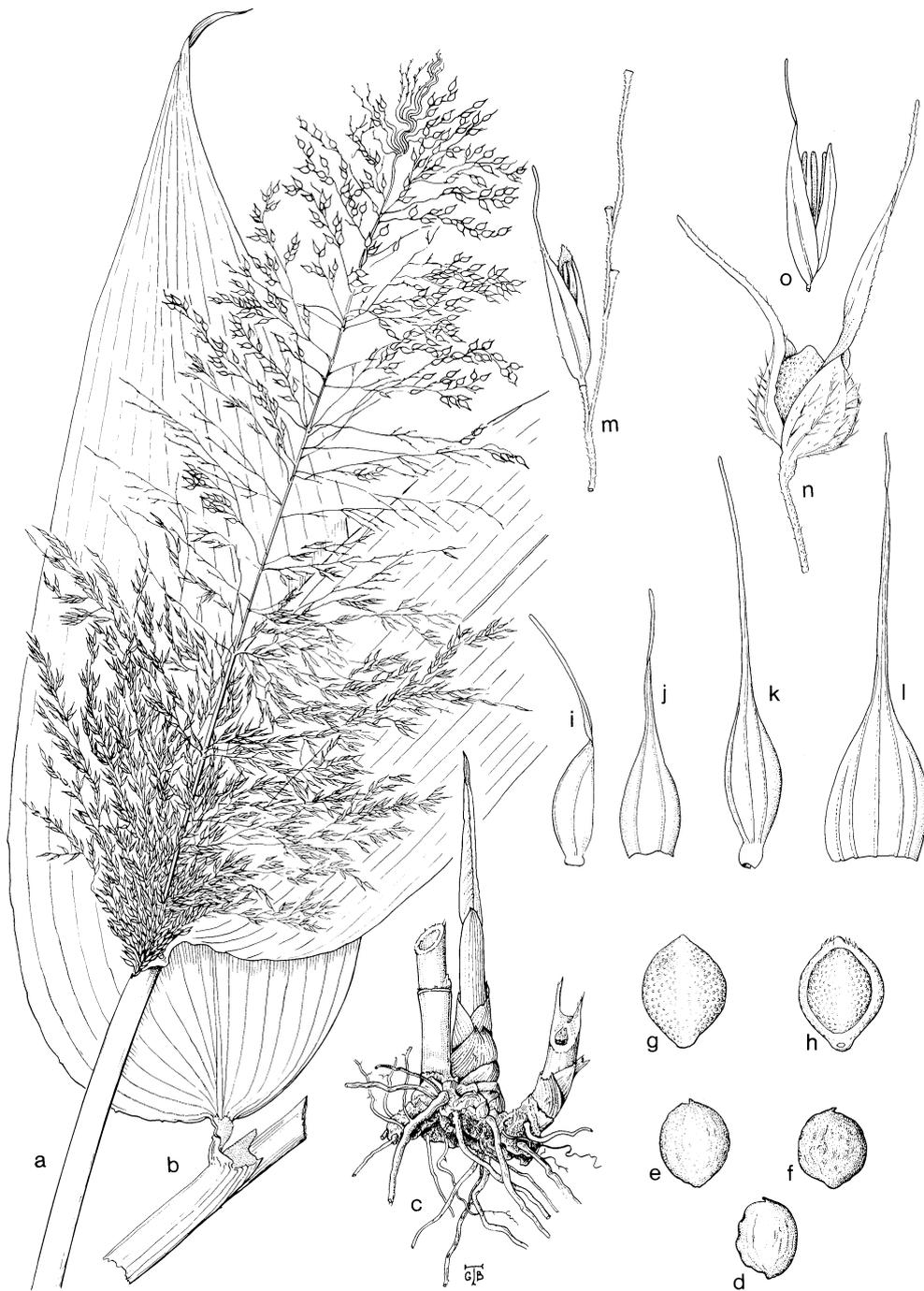


FIGURE 26.—*Olyra micrantha*: a, inflorescence ($\times 0.5$); b, leaf blade ($\times 0.5$); c, base of the plant ($\times 0.5$); d-f, caryopsis side view ($\times 6$); g, female antherium, dorsal side ($\times 6$); h, female antherium, ventral side ($\times 6$); i, lemma of the male spikelet, side view ($\times 6$); j, palea of the male spikelet, inner view ($\times 6$); k, lower glume of the female spikelet ($\times 6$); l, upper glume of the female spikelet ($\times 6$); m, portion of a branch of the inflorescence with a male spikelet ($\times 6$); n, female spikelet ($\times 6$); o, male spikelet ($\times 6$). Components a and b based on Irwin et al. 54892 (US), c on Altson 496 (US), and d-o on Belém 1814 (US). Illustration by G.B. Threlkeld.

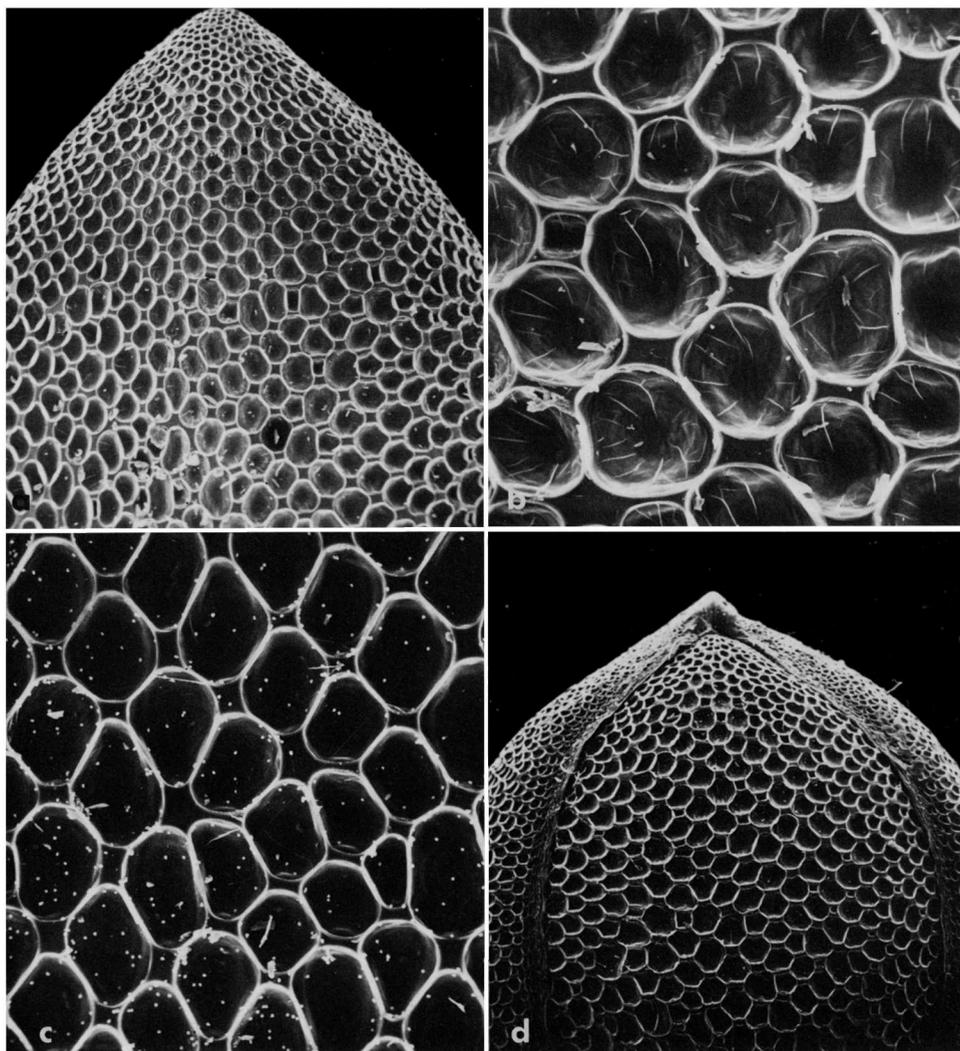


FIGURE 27.—Detail of female antherium, *Olyra micrantha*: a, apex of the antherium, dorsal side ($\times 50$); b, detail of the surface of the lemma with rounded excavations ($\times 200$); c, detail of the surface of the palea ($\times 200$); d, antherium, ventral side ($\times 50$). Micrographs a,b of Chase 10186 (US), c,d of Anderson 867 (US). (Reduced to 77% of indicated magnifications for publication.)

holotype, US sheet no. 2877940.]

Olyra micrantha var. *subvelutina* Doell in Martius, 1877:324. [Type: "prope Rio de Janeiro (Riedel, sub nomine *Olyrae pubescentis*)." Holotype not located.]

Olyra d'Urvillei Doell in Martius, 1877:323. [Nomen nudum.]

Cespitose perennials in dense clumps of as many as 20 culms borne close together from a short, creeping rhizomatous base. Culms erect, 1–4 m tall, climbing and leaning on the vegetation, densely branching at the upper nodes; internodes cylindrical, hollow, glabrous; nodes compressed, dark, shortly pubescent to glabrous. Leaves with sheaths stramineous, densely pubescent with long and appressed to erect hairs; ligule membranous-ciliate, conspicuous, 2.4–15 mm long, glabrous on the adaxial surface, sparsely pubescent on the abaxial one;

pseudopetiole 0.4–1.2 cm long, pale to purplish, shortly pilose; blades oblong-lanceolate, 13–32 (–55) cm long, 2.4–11.5 (–13) cm wide, acuminate apically, the base symmetric and subcordate, the adaxial surface greenish, glabrous to occasionally hispid to scabrous, the abaxial surface glaucous, glabrous to hispid, the midnerve prominent, the margins shortly ciliate. Inflorescences paniculiform, borne from the uppermost nodes; panicles lax and diffuse, pyramidal, 10–32 cm long, 4–14 cm wide, the branches spreading, the lower ones whorled and bearing male spikelets only, the upper ones alternate with male spikelets below and terminal female spikelets; axis longitudinally ridged, hispid, the branches angled, hispid; pedicels of the female spikelets thin, not thickened, similar to the ones of the male spikelets, scabrous to hispid. Female spikelets



FIGURE 28.—Distribution of *Olyra micrantha*.

disarticulating below the glumes, ovoid, aristate, 5.4–12.8 mm long, 1.8–2.6 mm wide, hispid to scabrous, the glumes separated by an internode, falling with the antherium, unequal, papillose-pilose with long to short hairs on the outer surface to scabrous, the inner surface of the glumes densely hispid,

lower and upper glume; lower glume aristate, 5-nerved; upper glume aristate to subulate apically, 3.7–9.2 mm long, 3–5-nerved; antherium ovoid, acute, 2.8–3.5 mm long, 1.3–2.1 mm wide, minutely scabrous toward the apex of the lemma to completely glabrous, brownish, pitted, with rounded

excavations over the entire surface; *lemma* 5-nerved. *Male spikelets* fusiform, aristate, 7.4–9.3 mm long, 0.8–1.1 mm wide; *lemma* long-aristate, scabrous, sparsely pilose; *palea* 4.6–7.1 mm long, 2-nerved, scabrous; anthers 3, 3.7 mm long.

DISTRIBUTION.—Widely distributed in South America, from Colombia and Venezuela eastward to the Atlantic Coast and westward to the Andes (Figure 28), at elevations mostly below 500 m; the southwestern boundary of its range apparently is determined by rainfall, with this species occurring in the wetter areas of Peru, Bolivia, Argentina, and Paraguay. There is also a nineteenth century collection from the Fiji Islands that must represent a casual introduction.

ADDITIONAL SPECIMENS SEEN.—ARGENTINA, MISIONES: San Pedro, S of Tobuna, *Renvoize et al.* 3232 (US).

BOLIVIA, BENI: Chácobo village of Alto Ivon, *Boom* 4091 (US). LA PAZ: San Carlos, *Buchtien* 38, 39, 65, 77, 78, 1158 (US), 76 (NY). PANDO: Río Arroyo, *Sperling and King* 6554 (US). SANTA CRUZ: Río Vibora, *Steinbach* 7572 (NY).

BRAZIL, ACRE: Vicinity Sena Madureira, *Cid and Nelson* 2541a (MO). AMAPÁ: Rio Jari, base of Serra da Arumanduba, *Egler and Irwin* 45967 (NY, US). AMAZONAS: Near Manaus, *Spruce* 1533 (NY, US); Manaus, estrada do Igarapé do Tabatinga, *Rodriguez and Chagas* 2823 (US); Manaus, estrada antiga de S. Raimundo, *Chagas and Coelho* 3773 (US). BAHIA: Fazenda Barra do Manguinho, *Mattos Silva et al.* 1067 (CEPEC); São Bento dos Lages, *Lutzelburg* 137 (NY); Castelo Novo, *Velloso* 1099 (US); Jaguaquara, *Pinto* 619 (US); Marauá, *Belém* 1814 (CEPEC, US); Rodovia BR 5, 16 km S of Eunápolis, *Belém and Pinheiro* 2675 (CEPEC, US); Rodovia Camaçan-Canavieira, 3–30 km de Camaçan, *Belém et al.* 1392 (CEPEC, US); Santa Cruz do Cabralia, *Eupunino* 280 (CEPEC, US); Dunas de Itapué, *Noblick* 1625 (CEPEC); Belmonte, *Santos* 1128 (CEPEC, US); estrada Uruçuca-Serra Grande, *Gomes* 101 (RB); Rodovia Belmonte-Itapebí, km 26, *Mattos Silva and Hage* 590 (CEPEC); Rodovia Marauá-Ubaitaba, km 3, *Calderón* 2036 (US); Riveirão de Fora, 4 km S of Itamarajú city on road Itamarajú-Teixeira de Freitas, *Calderón and Pinheiro* 2213 (CEPEC, US); Serrinha, *Capanema s.n.* (US 950601). CEARÁ: Baturité to Guarimirango, *Swallen* 4417 (US). ESPÍRITO SANTO: Est. Pedro Palacios, Boa Vista, *Vieira* 52 (RB); between Barra de Santa Angelica and Burarama, *Soderstrom and Sucre* 1971 (US); Reserva Biológica de Sooretama, Mata do Cupido, *Soderstrom and Sucre* 1899 (CEPEC, US); road from Cachoeiro de Itapemirim to Itabira, *Soderstrom and Sucre* 1966 (US); Serra do Caparão, *Chase* 10111 (US); SW of Vitória, *Soderstrom and Sucre* 1875 (CEPEC, US). MARANHÃO: Rio Pindaré, Monção, *Fróes* 20306 (US). MATTO GROSSO: Entre Cururú y Vilhena, *Kuhlmann* 1867 (RB); margem esquerda do Río Juruena, *Rosa and Santos* 213 9 (RB). MINAS GERAES: Juiz de Fora, *Schwacke s.n.*, 1895 (RB); without locality, *Lindberg* 512 (US); Caldas, *Regnell III-1377* (P, US); Lavras, *Black* 394b (US); Viçosa, *Chase* 10186 (US), *Mexia* 5089 (US, WIS), 5139a (P, US), 5113 (NY, P, US, WIS), 5153 (NY, WIS); road to Barroso, about

km 6, *Mexia* 5183a (US, WIS). PARÁ: Thomé Assú, Agua Branca, *Mexia* 5952 (NY, US); S slope of Akarai Mountains, in drainage of Rio Mapuera, *A. Smith* 2934 (NY, US); Boa Vista on the Tapajós River, *Dahlgren and Sella* 82 (US), *Swallen* 3131 (US); Breves, *Pires and Silva* 6682 (US); Castanhal, Bragança railroad, *Goeldi* 300 (NY, RB, US); Fordlândia, Tapajós River region, *Krukoff* 1047 (NY); Marabá, Serra dos Carajás, *Cavalcante* 2117 (US); Óbidos, *Swallen* 5081, 5090, 5092 (US); Sete Varas airstrip on Río Curuá, *Strudwick and Sobel* 4311 (WIS). PARANÁ: Cadeado, *Hatschbach* 14715 (US); Campo Morão, *Swallen* 9010 (US); Cerro Azul, *Hatschbach* 5037 (US); Morro do Farol, Caoiba, *Imaguire* 158 (US); Paraná River near Pôrto Byington, *Lindeman and Has s* 1717 (US); Pedra Branca de Araraquara, *Hatschbach* 12878 (US); Pôrto de Cima, *Dusen* 10257 (NY, US). PERNAMBUCO: Without locality, *Gardner* 1198 (US); Antonio, *Saito* 291b (US); Fazenda Arabari, *Tenorio* 66-198 (US). RIO DE JANEIRO: Alto Macahe, Nova Friburgo, *Glaziou* 18620 (NY, P, US); Alto da Boa Vista, *Calderón* 2028, 2030 (RB, US); Cascadura, *Holway and Holway* 1473 (US); Cosme Velho toward Corcovado, Morro Novo Mundo, *Soderstrom et al.* 1859 (CEPEC, US); Corcovado, *Flaster* 1141 (US), *Rose and Russell* 20216 (NY, US); Gávea, *Chase* 9981 (US); Mt. Itatiaia, road between Monte Serrat and Ponte Maromba, *L. Smith* 1439 (US); Itatiaia National Park, S face of Mt. Itatiaia, *Eiten and Eiten* 6499 (US); Madalena, *Feio and Castro Faria s.n.* (US 2463828); Mage, Fazenda do Cortume, *Vidal II-3997* (US); Monte Serrat, Serra de Itatiaia, *Chase* 8353 (US); Morro Novo Mundo, *Soderstrom et al.* 1856 (US); Restinga de Jacarepaguá, at east side of Pedra de Itauma, *Soderstrom and Sucre* 1915 (CEPEC, US); Rio de Janeiro, *Holway and Holway* 1077 (US), *Chase* 10004 (NY, US), *Calderón* 2026 (US), *Nee* 3400 (US); Serra do Corcovado, entre Vista Chinesa e Mesa do Imperador, *Calderón* 2014 (RB, US); Serra da Mendanha, *Soderstrom and Sucre* 1951 (US); Teresópolis, *Brade* 9677, 9690 (US), *Emygdio* 81 (US); Tijuca, *Chase* 12152 (US); Vale de Bom Sucesso, Caixa d'Água, *Soderstrom and Sucre* 1983 (CEPEC, US), *Sucre* 5844 (US), *Sucre* 5850 (US); Vista Chinesa, *Schwacke s.n.* (US 2463831); Mata do Rumo, *Sucre* 7684 (RB); Vista Chinesa, *Sucre* 7659 (US); Alto da Pedra da Gávea, *Sucre* 4335 (RB); Jacarepaguá, *Sucre* 9606 (RB); alto da Boa Vista, *Sucre* 1120, 1136 (RB); restinga da Tijuca, *Sucre* 1057 (RB); Parque Nacional da Tijuca, *Lima* 686 (RB); Mesa do Imperador, *Almeida* 1985 (RB). RORAIMA: Mt. Roraima, ridge NW of Paulo, *Tate* 162 (NY); Mt. Roraima, along Kukenan River at Roraima ford, Paulo, *Tate* 182 (NY); Serra Tepequem, in quebrada near airstrip, *Maguire* 40054 (NY); foothills of Serra Tepequem, near Igarapé Paparú, *Prance et al.* 4341 (US); Serrinha, Rio Mucajai, *Prance et al.* 4187 (US); Serra dos Sururucus, S of Mission Station, *Prance et al.* 10053 (US). SÃO PAULO: Butantan, *Kuhlmann* 557 (US); Campinas, *Novaes* 1280, 1281 (US); Campinas, Fazenda Santa Ana, *Viegas* 5036, 5102 (US), Fazenda Riqueza, *Viegas* 2876 (US); 25 km NW de Mogi Guaçu, *Gibbs and Leitao Filho* 6098

(US); São Paulo, Parque do Estado, *Calderón* 2007 (US), *Fonseca* 4 (US), *Skvortzov* 167 (US), *Gehrt* 12892 (US); Pirassumunga, *Pickel* 5820 (US); Santos, *Vaccari s.n.* (US 1625216); Santos, Guarujá, *Holway and Holway* 2014 (US); Santos, Monserrat, *Rosengurtt PE-3401* (US); S. José dos Campos, *Eiten and Mimura* 3350 (US), *Lofgren* 3831 (US); São Paulo, *Usteri* 9975 (US), *Hoehne* 29798 (NY, US); 2 km E of Sete Barras, *Clayton and Eiten* 4670 (US); Xiririca, *Hoehne* 24313 (US). SANTA CATARINA: Azambuja, *Calderón* 2004 (US), *Klein* 534 (NY, US), *Reitz* 2214 (US); Blumenau, *Reitz and Klein* 2201 (NY), *Ule* 893 (US); Bom Retiro, *Bresolin* 807 (US), *Klein and Souza* 10519 (US); Braço do Norte, Río do Medio, *Mattos* 7162 (US); Brusque, *Reitz* 5732 (US); Mato de Hoffmann, *Smith and Veloso* 5669 (US); Ibirama, *Klein* 613 (US), *Reitz and Klein* 3702 (US), *Smith and Klein* 7569 (RB, US); Ilha de Santa Catarina, Morro da Lagoa, *Rohr* 484 (US); Jordão, *Klein* 9672 (US); Morro do Cambirela, *Bresolin* 314 (US); Morro do Cavalo, *Reitz and Klein* 955 (NY, US); Morro da Cruz, *Valls et al.* 2734 (US); Morro da Fazenda, *Calderón* 2005 (US); Morro da Quebrada, *Klein and Bresolin* 8355 (US); Morro no Rio Tavares, *Klein and Bresolin* 6244 (US); Pantano do Sul, *Klein et al.* 7950 (US); Pilões, *Reitz and Klein* 3802 (US); Praia Braba, *Reitz and Klein* 1078 (US), 1082 (NY, US); Saco Grande, *Klein and Bresolin* 8399 (US).

FIJI ISLANDS: Sandalwood Bay, anno 1838-1842, *Wilkes s.n.* (US).

FRENCH GUIANA: Layon point de Trijonction-Mitaraka, km 7.5, *Sastre* 1585 (US); St. Jean, *Benoist* 1284 (US); Saint Laurent, *Hoock* 96 (NY, US); Route de St. Laurent, *Hoock s.n.*, 15 Apr 1961 (P); Tumuc Humac, *Hoock s.n.*, 23 Jan 1956 (P).

GUYANA: Maicwac River, *Altson* 496 (US); Alubia Falls, Kameron River, *Leakey* 217 (NY, US); upper Demerara River, *Jenman* 4119 (US); Kanuku Mountains, forest trail to Mt. Iramakipang, *Goodland and Maycock* 465 (US); Essequibo River, Moraballi Creek, near Bartica, *Sandwith* 282 (US); Rockstone, *Gleason* 624 (NY, US), *Hitchcock* 17283 (NY, P, US), *Jenman* 7548 (US); Mt. Roraima, *McConnell and Quelch* 708 (NY, US).

PARAGUAY: Ibitimí, *Rojas* 6110 (US); Paraguari, *Rojas* 12938 (US); Pedro Juan Caballero, *Rojas* 6398 (US); Santa Teresa, *Bertoni* 1688 (US); Sierra de Amambay, *Hassler* 11314 (NY, P, US).

PERU, CUZCO: Consuelo, Asunción, *Vargas* 7361 (US). HUÁNUCO: Río Azul, near Tingo María, *Ferreira* 12737 (US); without locality, *Anderson* 867 (US). JUNÍN: Chanchamayo Valley, *Schunke* 631 (US). LORETO: Vicinity Aguaytia, *Croat* 20968 (MO). MADRE DE DIOS: Atalaya, vicinity of Hacienda Amazonia, 2-3 km west of village, *Foster and Wachter* 7378 (MO).

SURINAM: Arrowhead Basin, *Maguire* 24456 (NY); Brownsberg, *Lindeman* 12504 (US); Coppename River near Raleighfalls, *Lanjouw* 785 (US); 2 km S of Juliana Top, *Irwin*

et al. 54645 (US); near summit of Juliana Top, *Irwin et al.* 54891, 54892 (US); area of Kabalebo Dam project, *Lindeman et al.* 317 (US); hills 9 km N of Lucie and 12 km W of Oost riviers, *Maguire et al.* 54232 (US); vicinity of Moengo, Cottica River, native trail to Adjoema Kondre village, *Cowan* 39004 (NY); Nassau, *Lanjouw and Lindeman* 2554 (NY); Saramacca River headwaters, Jacob kondre, *Maguire* 23826 (NY, US); Zanderij II, *Maguire* 23707 (NY, US).

VENEZUELA, AMAZONAS: Cerro Duida, *Steyermark* 58075 (US); Cerro Huachamacari, Río Cunucunuma, vicinity of Camp II, *Maguire et al.* 29941 (NY, US); Cerro Sipapo, vicinity of Base Camp, *Maguire and Politi* 27987 (NY, US); Serranía Parí, Río Parí, Caño Asisa, Río Ventuari, *Cowan and Wurdack* 31440 (NY, US); Yavita, *Williams* 14007 (US). ANZOÁTEGUI: Medanos de Puerto La Cruz y El Morro, *Tamayo* 20 99 (MO). APURE: Reserva Florestal San Camilo, *Steyermark et al.* 101756 (MO). BOLÍVAR: Río Chizca, region de Urimán, *Bernardi* 768 (NY); Gran Sabana, between waterfall at Rue-merú and Divina Pastora on Río Kukenán N of Santa Elena, *Steyermark* 59224 (NY, US); Hato de la Divina Pastora, Gran Sabana, *Tamayo* 2893 (US); Hacha, *Bernardi s.n.* (NY); Sierra Ichún, cercanías del Salto María Espuma del Río Ichún, base of the Sierra de Ichún, *Steyermark* 90351 (NY, US); SE of La Queina, *Wurdack and Guppy* 157 (NY, US); river banks of Raudal Maracca, about 110 river km from mouth, *Wurdack and Monachino* 41046 (NY, P, RB, US); Isla El Casabe, Río Paragua, *Killip* 37304 (NY, US). FALCÓN/LARA: Cerro Socopa, *Liesner et al.* 8336 (MO). MÉRIDA: Along Río Onia, near Bolero, N of Mesa Bolívar, *Steyermark* 56737 (NY, US). TÁCHIRA: region of La Fundación, *Liesner and González* 10188 (MO), *Liesner et al.* 9543 (MO), *van der Werff* 4940 (MO). ZULIA: Departamento Colón, Casigua El Cubo, *Bunting et al.* 6704; Departamento Bolívar, entre Las Tres Marías y el Río Chiquito, *Bunting and Stoddart* 9045 (MO); Departamento Perijá, Est. Hidrológica Aricuaísa-Pie de Monte, *Bunting and Panapera* 11024 (MO).

DISCUSSION.—*Olyra micrantha* is atypical of the genus in having thin-pedicellate female spikelets in which the glumes fall attached with the antherium, and in the conspicuous internode between the lower and upper glume. This peculiarity is also present in the genera *Raddiella* and *Parodiolyra*, but these genera have a different type of caryopsis (in which the hilum does not reach the entire length of the caryopsis), female antherium (not pitted), and inflorescence. Robust inflorescences of *O. micrantha* probably bear more spikelets than any other olyroid grass.

This is a weedy species with considerable morphological variability in the size of plants, leaf blades, panicles, and female glume size and pubescence. Many specimens from northern South America bear large leaves while in the South, as for example in São Paulo, Brazil, they are small and narrow. There is also variation in the ligule length with some populations from around Rio de Janeiro having very long ones. However, study of the specimens available showed that

intermediate types are frequent. An unpublished study made by Dr. Lynn G. Clark confirmed that large-leaved and small-leaved plants represented extremes of the same species.

Chromosome counts of $n = 20$ (Davidse and Pohl, 1974, 1978) and $2n = 40$ (Gould and Soderstrom, 1967) have been reported for the species.

18. *Olyra obliquifolia* Steudel

FIGURES 11, 29, 30a,b

Olyra obliquifolia Steudel, 1853:36. [Type: "Hochst. Hrbr. Kappler nr. 1472 (non H.B.). Surinam." Holotype, P, not seen, fragments of the type and a photograph, US sheet nos. 2877937, 2975664; isotype, MO.]

Perennial, short-rhizomatous, borne in fascicles of 10–20 culms. Culms 0.3–2 m tall, erect or slightly geniculate at the base, simple, many-noded; internodes densely pilose with retrorse hairs to glabrous, cylindrical, hollow; nodes thickened,

purplish, short-pubescent. Leaves 5–9 per complement; sheaths short and densely pilose to glabrous, strongly ribbed, the margins ciliate to glabrous, membranous; auricles present, small; ligule membranous, short-ciliate at the apex, 3–3.5 mm long, short-pubescent on the abaxial surface; pseudopetiole 0.2–0.4 cm long, densely to sparsely pilose, with whitish and stiff hairs to glabrous; blades narrowly oblong, 16–30 cm long, 4–9 cm wide, glabrous, narrowing to an asymmetric tip, narrowed and asymmetric basally, the margins ciliate to scabrous, the midnerve prominent on both surfaces, the lateral nerves anastomosing. Inflorescences umbelliform, borne from the uppermost nodes, panicles 12–16 cm long, 12–20 cm wide, each with a fascicle of 2–8 branches, the branches spreading and reaching approximately the same height, falling at maturity; peduncle hispid, the branches hispid toward the basal part, otherwise glabrous, triquetrous with one side flattened, with 1–4 terminal female spikelets and congested male

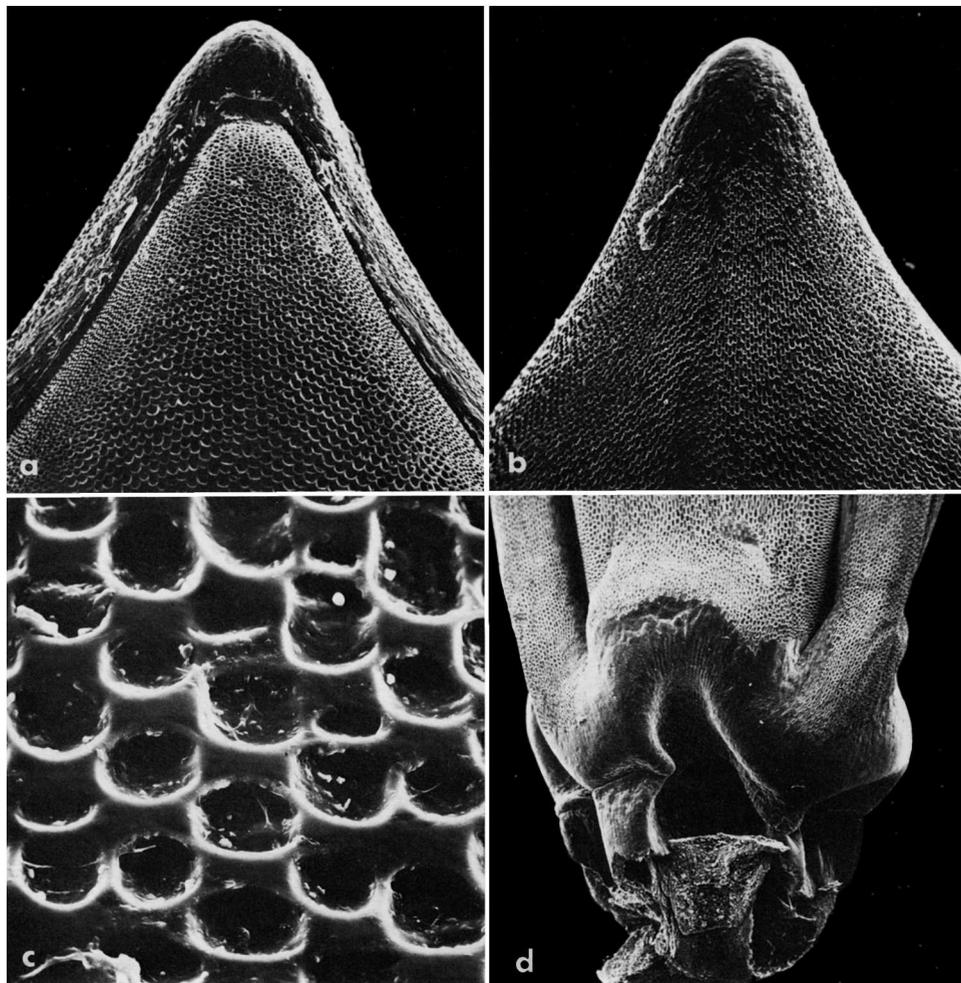


FIGURE 29.—Detail of female antherium, *Olyra obliquifolia*: a, apex of the antherium, ventral side ($\times 50$); b, apex of the antherium, dorsal side ($\times 40$); c, detail of the excavations on palea ($\times 600$); d, base of the antherium showing stipe ($\times 30$). Micrographs a-c of Maguire 40720 (US), d of Cavalcante 847 (US). (Reduced to 77% of indicated magnifications for publication.)



FIGURE 30.—Field photos of *Olyra* species. *O. obliquifolia*: a, habit of plant in forests of Brazil; b, detail of umbelliform panicle. *O. standleyi*: c, habit of plant, Panama; d, panicles; g, detail of a panicle. *O. glaberrima*: e, habit of plant, Brazil; f, detail of male and female spikelets. All photographs by C.E. Calderón, 1968.

spikelets below, the male spikelets borne alternately in pairs (or in groups of 4) along the branches; pedicels of the male spikelets short, hispid, those of the female spikelets thickened, short-pubescent; axils of the branches densely pilose. *Female spikelets* lanceolate, acuminate to short-aristate, 13–17 mm long, 3.4–4 mm wide, disarticulating above the glumes, brownish to purplish, densely papillose-pilose to sparsely pilose, occasionally glabrous; *glumes* acuminate to subulate apically, longer than the antherium, 7–9-nerved with transverse veinlets, the nerves strong, hispid on the outer surface, more so toward the margins and apex to glabrescent, the inner surface densely pilose on the upper portion; upper glume 13–15 mm long; *antherium* fusiform, acute, 9.2–11.5 mm long, 3.1–3.4 mm wide, glabrous, pale, separated from the glumes by a conspicuous stipe 0.6–1 mm long, the surface of the antherium with hexagonal to rounded excavations. *Caryopsis* broadly ovoid, 5.8 mm long, 2.6 mm wide, dark brown; hilum linear, as long as the caryopsis. *Male spikelets* lanceolate, acuminate, 5.5–8.7 mm long, 0.8–1.3 mm wide, brownish to purplish, densely hirsute to scabrous; *lemma* acuminate, 3-nerved, densely hispid, more so toward the margins to scabrous; *palea* 5–8.1 mm long, 2-nerved, sparsely hispid with margins short-ciliate to glabrous; anthers 4 mm.

DISTRIBUTION.—Northern South America from Pará, Brazil, and Surinam east to Maranhão, Brazil (Figure 11), from sea level to 700 m elevation.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, AMAPÁ: Mapati, km 116, *Black and Lobato 50-9686* (US); Rio Oiapoque, 5 km SE of Clevelândia, *Irwin et al. 47430* (NY); Rio Araguari, 1°26'N, 51°58'W, *Pires et al. 50803* (NY, US), vicinity of camp 12, 1°11'N, 52°8'W, *Pires et al. 51367* (F, NY, R, US); 40 km SW of Serra do Navio, Rio Cupuxi, *Dembros 304* (RB). MARANHÃO: Rio Pindaré, Monção, *Fróes 20302* (US); Rio Alto Turiaçú, Barraquinha, *Jangoux and Bahia 149* (MO); Turiaçú, *Rosa and Vilar 2746* (MO); S of Fazenda Guarany, km 133 of BR-316, *Daly et al. 166* (MO). PARÁ: Belém *Soderstrom 1192* (US), Belém I.P.E.A.N., *Calderón 2062* (US); 20 km S of Belém, *Irwin 5025* (US); Castanhal, Bragança railroad, *Goeldi 42, 74* (US), *301* (F, MO, NY, RB, US); Castanhal, Colônia 3 de Outubro, *Black 49-8592* (US); cabeceiras do Alumine, *Sampaio 5815* (R); road BR 22, Capanema to Maranhão, *Prance and Pennington 1870, 1895* (US), km 60, *Prance and Silva 58765* (F, MO, US), km 64, vicinity of Piritoro, *Prance and Silva 58872* (F, MO, US), *Prance and Pennington 1946* (F, US); km 167–173 da Estrada Belém-Brasília, *Oliveira 541* (IAN); Rio Capim, Caratateua, *Black 48-2368* (NY); Maguary, *Snethlage 117* (F); entre a fonte do Rio Mapuá e o Rio Piria, *Black 50-9826* (US); Marituba, Granja Imperial, *Pereira 5044* (US); Rio Parú de Oeste, *Cavalcante 847* (US); Igarapé Pixuna, *Black 48-2978* (US); Região Igarapé Pitoro, *Fróes 34731* (IAN); Santa Isabel, *Swallen 5045* (R, RB, US), *Pires and Black 1330* (RB).

FRENCH GUIANA: Itany, Village Tolinga, Machiri, *Hook 97* (NY, US); Gregoire, *Deward 125* (US); sommet des Monts

Atachi Bacca, *de Granville 785* (US); Inselberg, *Cremers 7451* (MO); Haut Maroni, *Sastre and Moretti 3849* (MO); Region de Camopi, Montagne Alikene, *de Granville B.5063* (US); Rivière Sinnamary a Petit Saut, *Cremers 5382* (US); Montagnes de la Trinite, *de Granville 5969* (US, WIS).

SURINAM: Kabelstation, *Essed 51* (MO, US); Lely mountains, 175 km SSE of Paramaribo, *Mori and Bolten 8427* (RB, US), *Lindeman et al. 50* (US); in montibus, qui dicuntur Nassau, *Lanjouw and Lindeman 2533* (NY); Nassau mountains, Marowijne River, Plateau A, 1 km E of Camp on line A, *Cowan and Lindeman 39032* (NY, US), occasional in forest on Line 12, Plateau A, *Maguire 40720* (F, NY, RB, US); Anelofoesie, Saramacca River, upstream from Nieuw Jacob Kondre, *J. and P. Florschütz 1655* (NY); Saramacca River, near Posoegronoe, *Maguire 24032* (F, MO, NY, RB, US); Tafelberg, 0.5 km S of East Ridge, *Maguire 24595* (NY, US); Zuid Rivier, 2 km above confluence with Lucie Rivier, *Maguire et al. 53971* (US), *Irwin et al. 55736* (F, MO, US); without locality, *Schwenitz s.n.* (NY).

DISCUSSION.—A remarkable feature of *Olyra obliquifolia* is the presence of umbelliform inflorescences, with all of the branches of the panicles whorled and reaching approximately the same height; every branch has male spikelets in pairs along one side of the axis. It is interesting to note that in this species, as in *O. tamaquareana*, all of the branches of the panicle fall at maturity, only the peduncles remaining at the top of the culm.

Olyra obliquifolia resembles *O. fasciculata* and *O. tamaquareana*. The three species are distinguished by the presence of a peg-like extension of the base of the antherium that extends downward into a small cavity formed by the outer wall of the rachilla internode. Davidse (1987) reported that this stipe is full of oil and serves as a functional elaiosome for the dispersal of the seeds by ants.

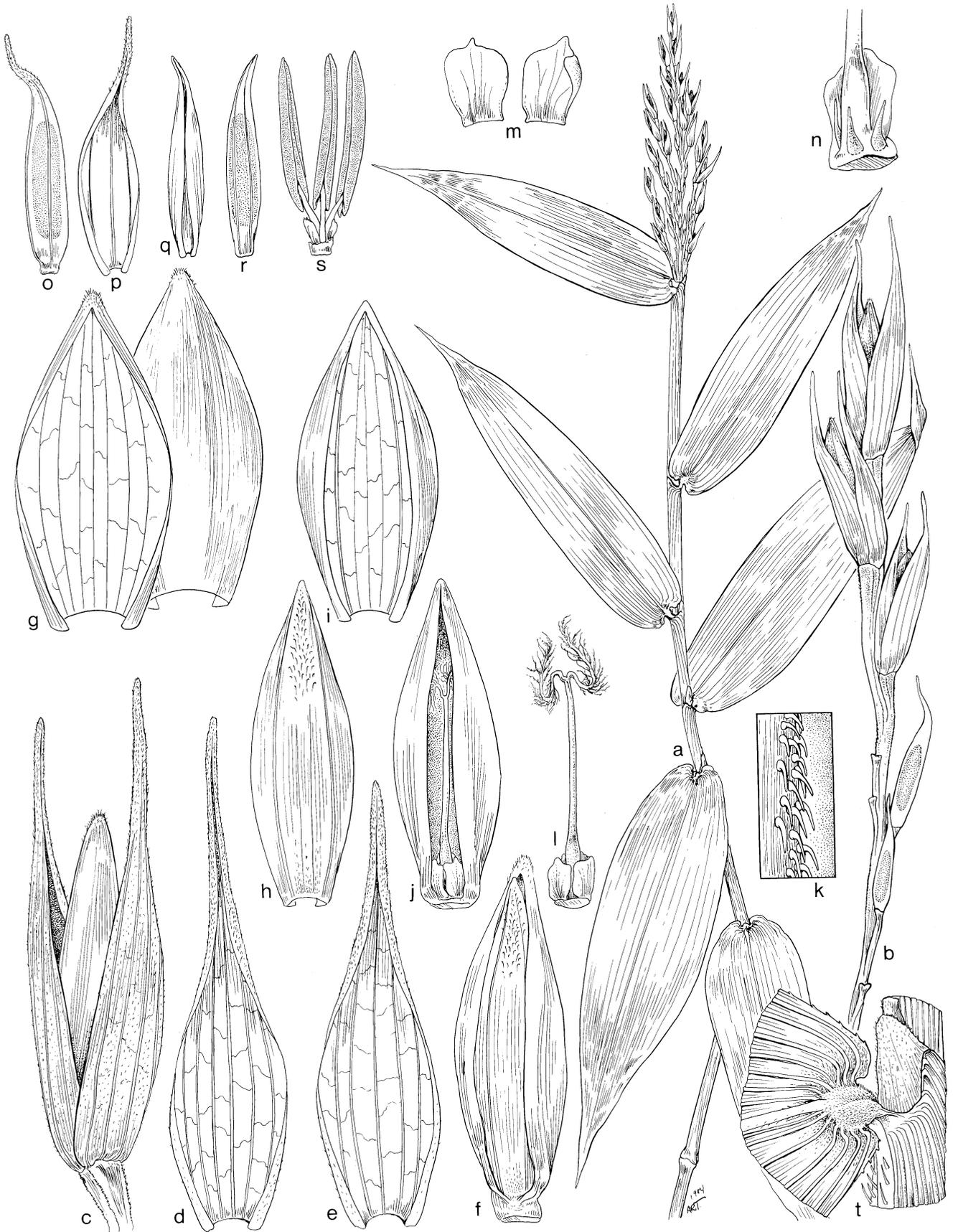
Chromosome numbers of $2n = 23, 44$ (Gould and Soderstrom, 1967) have been recorded for the species. Flowers throughout the year.

19. *Olyra retrorsa* Soderstrom & Zuloaga, new species

FIGURES 11, 31, 32

TYPE SPECIMEN.—BRAZIL, MATO GROSSO: Rio Verde, Apr 1918, *Kuhlmann 1868* (holotype, RB; isotypes, IAN, RB).

FIGURE 31.—*Olyra retrorsa*: a, inflorescence terminating culms ($\times 0.6$); b, branch of inflorescence ($\times 3.6$); c, female spikelet ($\times 7$); d, lower glume of female spikelet ($\times 7$); e, upper glume of female spikelet ($\times 7$); f, female antherium ($\times 7$); g, lemma of female antherium, inside and outside view ($\times 7$); h, palea of female spikelet, outside view ($\times 7$); i, palea of female spikelet, inside view ($\times 7$); j, palea of female spikelet with margins enclosing the flower ($\times 7$); k, enlargement of tip of palea showing retrorse hairs ($\times 30$); l, gynecium and lodicules ($\times 7$); m, lodicules of female spikelet ($\times 15$); n, base of pistil with lodicule and staminodes ($\times 15$); o, male spikelet, side view ($\times 7$); p, lemma of male spikelet ($\times 7$); q, palea of male spikelet, empty ($\times 7$); r, palea of male spikelet enclosing flower ($\times 7$); s, andrecium and lodicules ($\times 11$); t, ligule and upper surface of pseudopetiole ($\times 4.2$). All components based on *Kuhlmann 1868* (RB). Illustration by A.R. Tangerini.



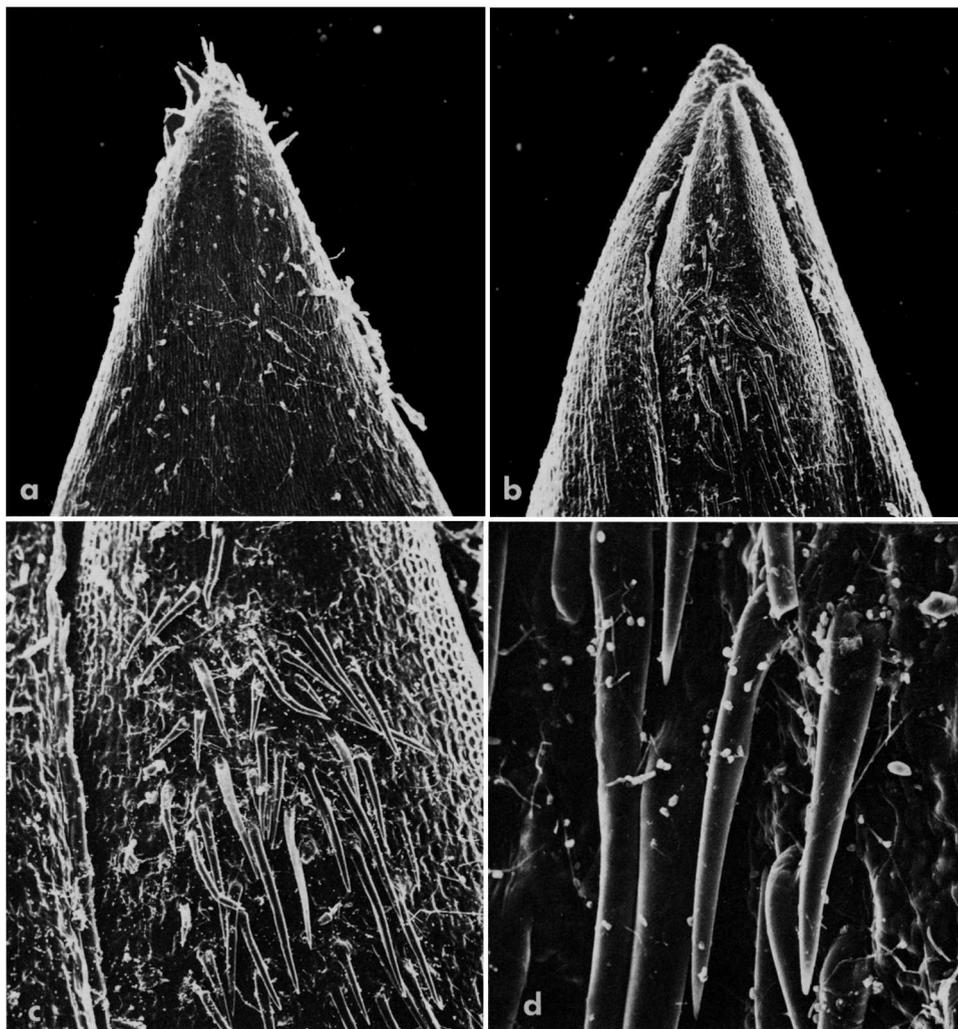


FIGURE 32.—Detail of female antherium, *Olyra retrorsa*: *a*, apex of the antherium, dorsal side showing sparse bicellular microhairs ($\times 50$); *b*, apex of the antherium, ventral side ($\times 40$); *c*, detail of retrorse unicellular hairs and bicellular microhairs on the surface of the palea ($\times 100$); *d*, detail of retrorse, unicellular macrohairs ($\times 500$). All micrographs of Kuhlmann 1868 (RB). (Reduced to 77% of indicated magnifications for publication.)

Gramen perenne. *Culmis* erectibus, non ramosus ad basis; nodi incrassati, glabri. *Laminae* lanceolatae, 10.5–13.2 cm longae, 2.7–3.4 cm latae, basi symmetricae, subcordatae, apice symmetricae, subulatae; pseudopetoli 0.2–0.3 cm longi, pilosi breviter; ligulae membranaceae, apice ciliatae breviter, 2.5–4 mm longae. *Paniculae* oblongae, contractatae, 6–10 cm longae, 1–2 cm latae. *Spiculae femineae* lanceolatae, subulatae, 13.8 mm longae, 3.1 mm latae, glumis inter se subaequalibus, glabris; gluma inferior subulata, 5–7-nervis, nervis tessellatis; gluma superior subulata, 11.6–12.8 mm longa, 5–7-nervis, nervis tessellatis; anthoecium lanceolatum, acuminatum, 8.5–8.7 mm longum, brunneum, excavatum minute; lemma 5-nerve, apice pilosum breviter; palea 2-nervis, apice pilosa. *Spiculae masculae* lanceolatae, 9–9.7 mm longae, 0.8–1 mm latae, aristatae, glabratae; lemma 3-nerve, aristatum; palea

acuminata, 5.3–7.5 mm longa, 2-nervis.

Perennial. *Culms* erect, unbranched; internodes cylindrical, hollow, pubescent; nodes thickened, brownish, glabrous. *Leaves* with sheaths stramineous, papillose-pilose with appressed, caducous hairs; auricles membranous; ligules membranous, conspicuous, 2.5–4 mm long, short-ciliate at the apex, glabrous and shiny on the adaxial surface, short-pubescent on the abaxial; pseudopetiole 0.2–0.3 cm long, short-pilose; blades lanceolate, 10.5–13.2 cm long, 2.7–3.4 cm wide, subcordate and symmetric basally, subulate and symmetric apically, drooping, the midnerve not prominent, papillose-pilose toward the base of the blade on the abaxial surface, the rest of the surface glabrous, the margins scabrous to glabrous. *Inflorescences* oblong, contracted; panicles borne from the

uppermost nodes, 6–10 cm long, 1–2 cm wide, the branches alternate; *axis* longitudinally ridged, hispid, the branches triquetrous, scabrous to short-hispid, the lower branch bearing only male spikelets, the upper ones with pairs of male spikelets on either side of the triquetrous axis, one sessile, the other short-pedicelled, 1–4 terminal female spikelets on each branch, pedicels of the female spikelets thickened, short-hispid. *Female spikelets* lanceolate, subulate apically, 13.8 mm long, 3.1 mm wide, the glumes subequal, glabrous; *lower glume* subulate, 5–7-nerved with transverse veinlets, scabrous toward the apex on the outer surface, pilose toward the apex on the inner surface; *upper glume* subulate, 11.6–12.8 mm long, 5–7-nerved with transverse veinlets, the pubescence similar to that of the lower glume; *anthercium* lanceolate, acuminate apically, 8.5–8.7 mm long, 2.9 mm wide, brownish, slightly pitted with oblong excavations; *lemma* 5-nerved, with bicellular microhairs and long, unicellular macrohairs toward its apex; *palea* 2-nerved, with long, retrorse unicellular hairs toward the middle portion and the apex. *Male spikelets* lanceolate, 9–9.7 mm long, 0.8–1 mm wide, aristate, glabrous; *lemma* 3-nerved, glabrous, brownish, aristate, the awn scabrous; *palea* acuminate, 5.3–7.5 mm long, 2-nerved, sparsely pilose toward the middle, otherwise glabrous, brownish; anthers 3.1 mm long.

DISTRIBUTION.—Endemic to Mato Grosso, Brazil (Figure 11), and known only from the type locality.

DISCUSSION.—While *O. retrorsa* shares with *O. taquara* the same type of blade morphology and ornamentation of the female anthercium, the retrorse hairs on the female palea and bicellular microhairs at the tip of the female lemma of the former species have no counterpart in the genus. Due to the lack of material it is not known whether the species flowers irregularly, as does *O. taquara*.

20. *Olyra standleyi* Hitchcock

FIGURES 30c,d,g, 33, 34

Olyra standleyi Hitchcock, 1927:86. [Type: "In the U.S. National Herbarium, no. 1307238, collected in moist forest, at El Muñeco on the Río Navarro, Province of Cartago, Costa Rica, alt. 1400 to 1500 m, March 6 to 7, 1926, by Paul C. Standley and Ruben Torres (no. 50932)." Holotype, US sheet no. 1307238.]

Robust arching or clambering perennials from thick creeping short-rhizomatous rootstocks. *Culms* up to 3 m tall, decumbent and geniculate at the lower nodes, branching sparingly from the middle and upper nodes; internodes glabrous, hollow, up to 35 cm long and 1 cm diameter; nodes dark brown and with short, retrorse whitish hairs to glabrous, flared, formed by the thickened basal rim of the sheath above and the thickened upper rim of the internode below. *Leaves* with sheaths strongly ribbed, glabrous to sparsely papillose-pilose, with caducous, glassy hairs; auricles membranous, glabrous; ligules membranous, ~1 mm long; pseudopetiole broad, brownish, flat, 0.3–0.5 cm long, ~0.5 cm wide, glabrous to sparsely pilose on both surfaces; blades ovate to oblong-lanceolate, 14–30

cm long, 4–7 cm wide, greenish to purplish at the base, the base symmetric, cordate, narrowed abruptly to an acute to subulate and symmetric to slightly asymmetric apex, the abaxial surface glaucous, the midnerve prominent, the margins short to long-ciliate toward the base to completely glabrous. *Inflorescences* paniculiform, borne on the 8 or 9 upper nodes; panicles 9–17 cm long, 5–25 cm wide, with simple branches stiffly ascending or spreading from the axis, with 1–3 female spikelets borne terminally on each branch and numerous, paired (or in groups of 4) male spikelets below, one sessile, the other short- to long-pedicelled, the panicles exerted on long, glabrous to short-pilose peduncles ~40 cm long, the lower branches whorled, the upper ones whorled to alternate or opposite; *axis* longitudinally ridged and sparsely to densely pubescent, flattened on one side with the spikelets all borne on the other side; axils of the branches pilose. *Female spikelets* 18–25 mm long, 2.2–3 mm wide, pale green to brownish or purplish, the glumes attenuate, unequal and longer than the anthercium, glabrous to occasionally hispid; *lower glume* 5–7-nerved with transverse veinlets, glabrous to sparsely hispid toward the base and more so toward the apex to hispid, the inner surface pilose toward the apex; *upper glume* shorter than the lower, 12.5–19 mm long, 5–7-nerved with transverse veinlets, with a pubescence similar to that of the lower glume; *anthercium* fusiform, 8–9.5 mm long, 1.9–2.5 mm wide, whitish to stramineous, pitted with oblong to ovate excavations, the apex of the palea covered with bicellular microhairs and short prickly hairs; *lemma* 5–7-nerved; *palea* 4-nerved; lodicules ~1 mm long. *Caryopsis* fusiform, brownish, 6.3 mm long, 2 mm wide; hilum as long as the caryopsis. *Male spikelets* lanceolate, aristate, 10–14 mm long, 0.9–1.5 mm wide, purplish, glabrous to hispid; *lemma* aristate, 3–5-nerved with transverse veinlets, glabrous to scabrous or hispid; *palea* 5–10 mm long, 2-nerved; anthers orange-yellow, 5–7 mm long.

DISTRIBUTION.—Cloud forests of Costa Rica, Panama, and Venezuela (Figure 34), at elevations from 900 to 2700 m (occurs at lower elevations in Venezuela).

ADDITIONAL SPECIMENS SEEN.—COSTA RICA, CARTAGO: Along primitive road, 1 km S of El Muñeco, *Pohl and Davidse 11698* (US); 8 km S of Cartago by air, Finca El Chaparral, 4.5 km S of bridge on Agua Caliente at Lourdes, *Liesner and Judziwicz 14606* (MO, US, WIS); El Muñeco, S of Navarro, *Standley 33878* (Paratype, US).

PANAMA, PANAMÁ: Cerro Jefe, *Calderón 2081* (US), *Calderón and Dressler 2123* (US), *Folsom et al. 2009* (US), *Soderstrom 2008* (US), *J.T. and F. Witherspoon 8482* (US); vicinity of Cerro Jefe, *Lewis and Dressler 7558* (US).

VENEZUELA, AMAZONAS: Caño San Miguel, Río Guianía, *Williams 3391* (MO). DISTRITO FEDERAL: Along ridge of the Ávila, *McClure 21246* (US); cordillera del Ávila, between Los Venados and Pico Oriental, *Steyermark 55597* (US); near summit of El Junquito, *Chase 12447* (US), *McClure 21239* (US); en selvas nubladas de Galipán, *Tamayo 1381* (F). GUÁRICO: En las orillas de la Laguna del Salvaje, *Tamayo*

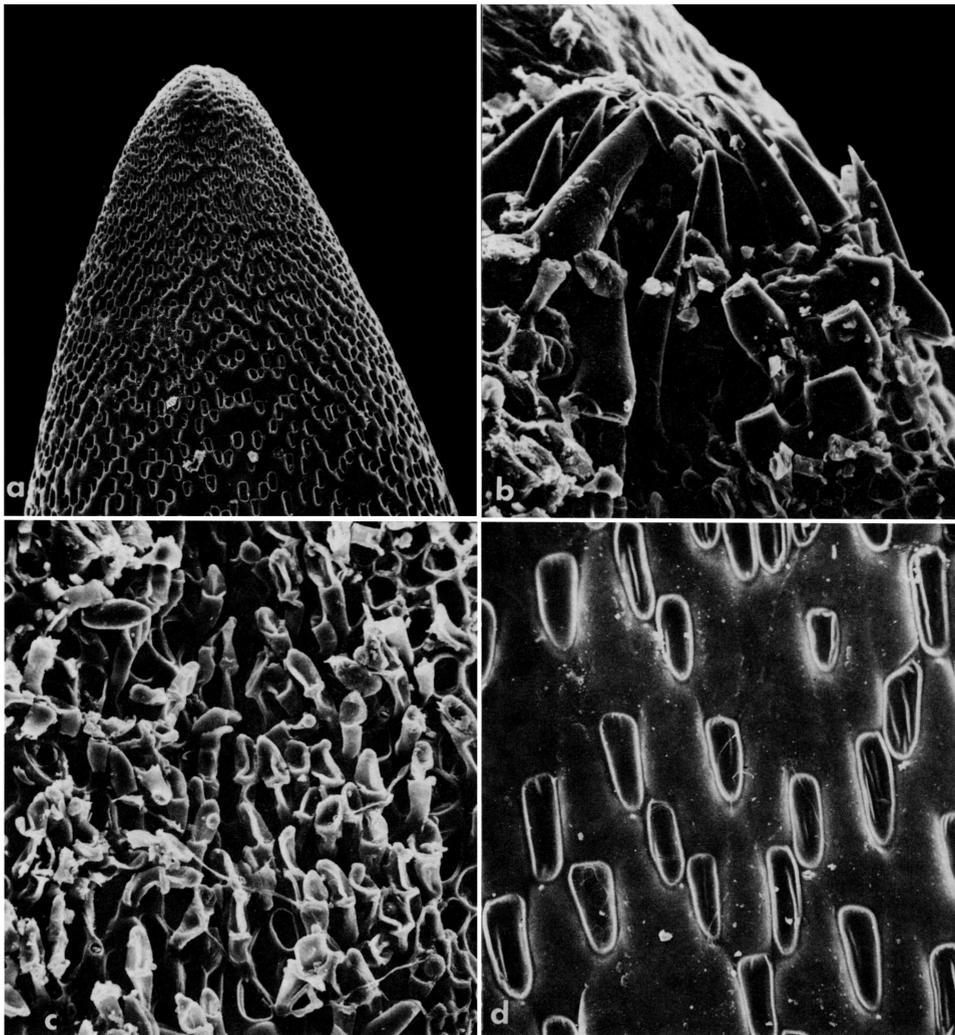


FIGURE 33.—Detail of female antheridium, *Olyra standleyi*: a, apex of the antheridium, dorsal side ($\times 50$); b, detail of the apex of the palea showing numerous prickly hairs ($\times 250$); c, detail of the apex of the palea showing numerous bicellular microhairs ($\times 400$); d, detail of the surface of the lemma with oblong excavations ($\times 200$). All micrographs of McClure 21246 (US). (Reduced to 77% of indicated magnifications for publication.)

3391 (F). ZULIA: Sierra de Perijá, loma arriba de la quebrada del Río Omira-Kuna (Tumuriasa), SE de Pishikao e Iria hacia la mision Sucurpo, *Steyermark and Dunsterville 105686* (MO).

DISCUSSION.—When collecting *Olyra standleyi* in Venezuela, McClure (herbarium label) stated that the plants showed signs of dying after flowering, at least the aerial parts. A similar observation was made by Soderstrom on Cerro Jefe, Panama, where the whole population of the species flowered and died in 1973, with seedlings produced. The plants often grow in huge, sterile clones.

The elevations (1400 m in Costa Rica, 1000 m in Panama, and 2700 m in Venezuela) at which this species occurs are the highest for any olyroid grass, and, indeed, for any herbaceous bambusoid. The Amazonas and Zulia, Venezuela plants are from lower elevations. Flowering has been recorded from

October through April.

The spikelets of *Calderón 2081* are densely hispid, while in the rest of the specimens examined they are nearly glabrous.

21. *Olyra tamanquareana* Soderstrom & Zuloaga, new species

FIGURES 11, 35

TYPE SPECIMEN.—BRAZIL, AMAZONAS: Rio Negro, Ilha Tamanquare, downstream near Santa Isabel do Rio Negro (Tapuruquara), Sep 12, 1979, *K. Kubitzki, C.E. Calderón and H.H. Poppendieck 79-252* (holotype, INPA; isotypes, K, MO, LE, NY, SI, US).

Gramen perenne, caespitosum. *Culmis* 10–20 in fasciculis



FIGURE 34.—Distribution of *Olyra ecaudata*, *O. standleyi*, and *O. taquara*.

densis, non ramosus ad basim, 60–120 cm longis; nodi compressi, glabri. *Folia* per complementum 3–7; laminae lanceolatae, 13–25 cm longae, 3–5.5 latae, basi asymmetricae, angustatae, glabrae; pseudopetioli ~0.4 cm longi, pilosi; ligulae membranaceae, apice ciliatae breviter, ~3 mm longae. *Paniculae* contractatae. *Spiculae femineae* lanceolatae, longe aristatae, 35 mm longae, 4.2 mm latae, glumis inter se subaequalibus, anthoecio longioribus; gluma inferior 9–13-nervis, nervis tessellatis; gluma superior 9–11-nervis, nervis tessellatis, stipite prominentis, 1–1.2 mm longis; anthoecium lanceolatum, 13–13.2 mm longum, 3.5–3.8 mm latum, glabrum, excavatum valde; lemma 5-nerve. *Spiculae masculae* lanceola-

tae, acutae, 5 mm longae, 1 mm latae, pilosae; lemma 3-nerve; palea 2-nervis.

Cespitose, robust perennials from creeping rootstocks, forming dense clumps with 10–20 culms in a fascicle. *Culms* erect, geniculate at the base, 60–120 cm tall, unbranched at the lower and median nodes, branching toward the upper nodes; internodes hollow, glabrous, the lower ones with a sheath only or with a rudimentary blade; nodes dark, compressed, glabrous. *Leaves* 3–7 per complement; sheaths strongly ribbed, with the margins shortly ciliate, otherwise puberulous; auricles membranous; ligule membranous, ~3 mm long, shortly ciliate at the tip; pseudopetiole dark brown, ~0.4 cm long, short-to

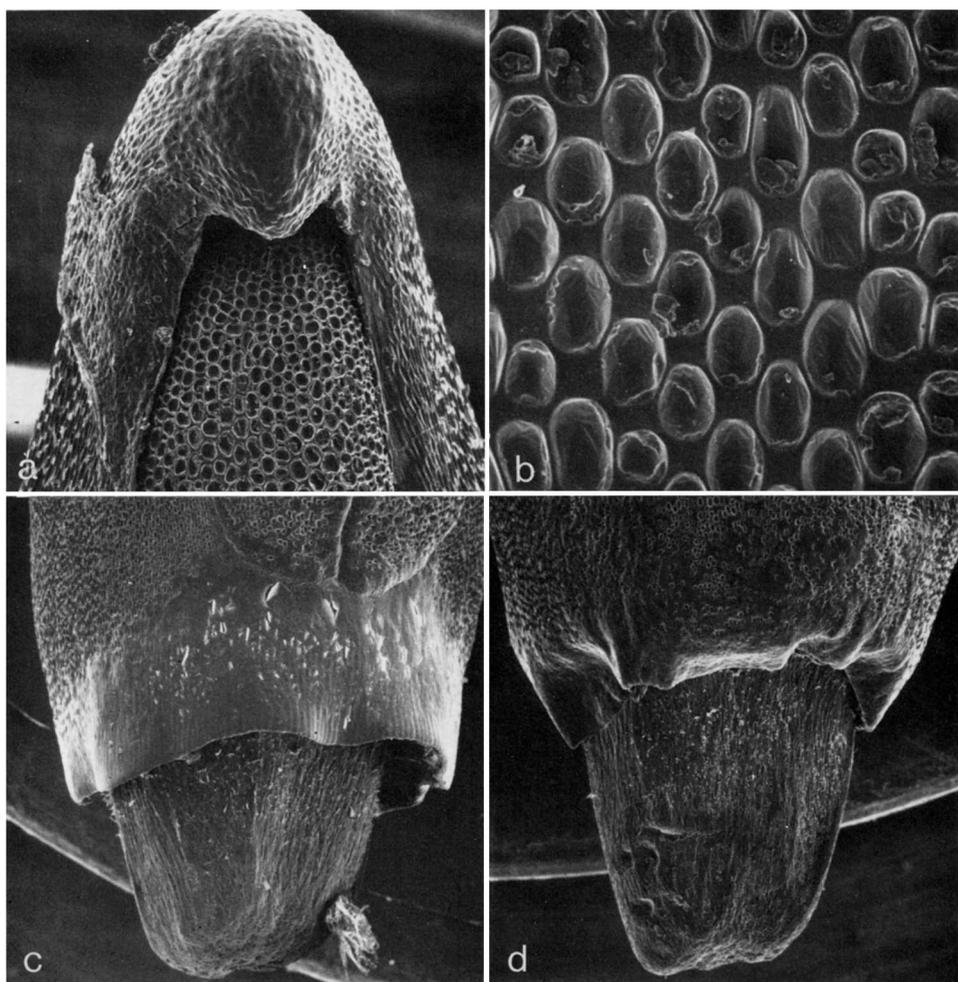


FIGURE 35.—Detail of female antherium, *Olyra tamanquareana*: a, apex of the antherium, ventral side ($\times 100$); b, detail of excavations ($\times 200$); c, base of the antherium showing stipe, dorsal side ($\times 40$); d, base of the antherium showing stipe, ventral side ($\times 40$). All micrographs of Kubitzki et al. 79-252 (US). (Reduced to 77% of indicated magnifications for publication.)

long-hispid on both surfaces; blades lanceolate, flat, 13–25 cm long, 3–5.5 cm wide, narrowing to an asymmetric base, the apex acuminate and asymmetric, glabrous, the margins smooth, scabrous toward the apex, the midnerve conspicuous, the lateral nerves anastomosing. *Inflorescences* paniculiform and numerous (5–7), borne at the uppermost nodes, long-exserted, peduncles longitudinally ridged, shortly hispid, panicles falling completely at maturity, only the peduncles remaining, contracted, formed by a single branch (occasionally two conjugate branches present), each branch with the axis flattened or triquetrous, with male spikelets shortly pedicelled, spaced and alternate in groups of 4 below, and one terminal female spikelet per branch; *axis* shortly hispid, pedicels of the male spikelets short, hispid, those of the female spikelets thickened, shortly hispid. *Female spikelets* lanceolate, long-aristate, 35 mm long, 4.2 mm wide, the glumes subequal,

scaberulous to shortly hispid on the outer surface, densely hispid toward the apex on the inner surface, the antherium less than $\frac{1}{2}$ the length of the spikelet; *lower glume* 9–13-nerved with transverse veinlets; *upper glume* 9–11-nerved with transverse veinlets; *stipe* conspicuous at the base of the antherium, ~1–1.2 mm long; *antherium* lanceolate, 13–13.2 mm long, 3.5–3.8 mm long, glabrous, pitted, with rounded excavations over the entire surface, mottled at maturity; *lemma* 5-nerved. *Caryopsis* fusiform, brownish, 9 mm long, 2.5 mm wide; hilum linear, as long as the caryopsis. *Male spikelets* lanceolate, acute, 5 mm long, 1 mm wide, shortly hispid on the outer surface, smooth and shining on the inner surface; *lemma* 3-nerved, *palea* 2-nerved; anthers 1.8 mm long.

DISTRIBUTION.—Known only from the type locality, a dense forest along the Rio Negro in Amazonas, Brazil (Figure 11); *Prance et al.* 15797 (NY, US), from the same locality, is an

immature plant that may also be referable to this species.

DISCUSSION.—*Olyra tamanquareana* resembles *O. obliquifolia*, from which it differs in having panicles with but a single (occasionally two) branch present with only one terminal female spikelet per branch, and in the larger female spikelets.

22. *Olyra taquara* Swallen

FIGURES 34, 36, 37

Olyra taquara Swallen, 1966:86. [Type: "In the U.S. National Herbarium, No. 2434254, collected in swamp forest at Ribeirão Grande, Município Jataí, Goiás, Brazil, July 25, 1956, by A. Macedo (No. 4586)." Holotype, US sheet no. 2434254; isotype, US sheet no. 2434255.]

Robust erect perennials in dense clumps of as many as 30 culms from a thick creeping short-rhizomatous base. Culms up to 3.5 m tall, unbranched at the base, and branching toward the upper nodes; internodes cylindrical, glabrous, hollow and

smooth, up to 1 cm in diameter, the basal internodes with a sheath only or with a rudimentary or reduced blade; nodes conspicuous, flared, dark brown and glabrous to short-pubescent, formed by the thickened basal rim of the sheath above and the thickened upper rim of the internode below. Leaves with sheaths strongly ribbed, glabrous to pubescent with glassy, caducous and brownish hairs all over the surface, pale green and strongly mottled with dark purple spots; ligule membranous, brownish, 0.7–1.4 mm long; pseudopetiole brownish, broad, flat, 0.3–0.4 cm long, shortly pubescent, usually recurved and positioning the blade downward; blades ovate to oblong-lanceolate, 21–32 cm long, 5.6–8 cm wide, narrowed abruptly to an acuminate and symmetric apex, cordate and symmetric basally, pale to purplish around the midnerve at the juncture with the pseudopetiole, glabrous on the adaxial surface, the abaxial surface glabrous to sparsely pubescent with short, appressed hairs and covered with

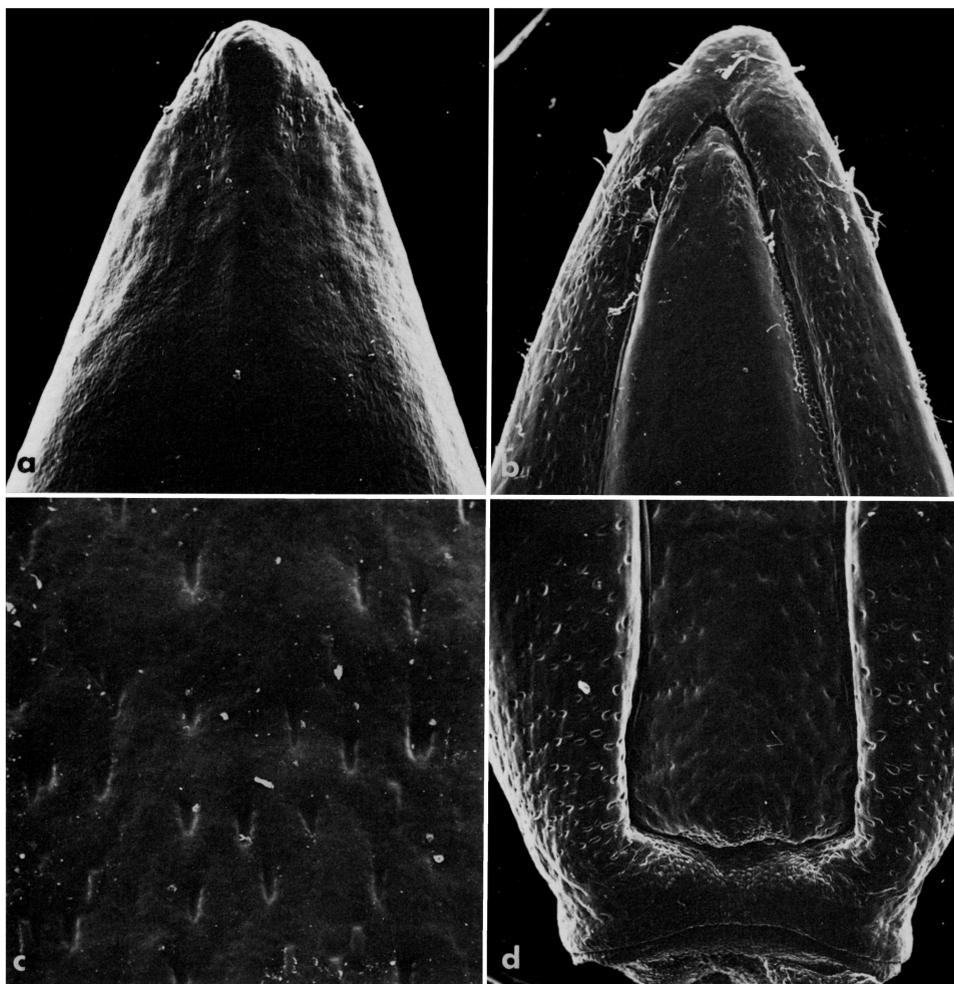


FIGURE 36.—Detail of female antherium, *Olyra taquara*: a, apex of the antherium, dorsal side ($\times 50$); b, apex of the antherium, ventral side ($\times 50$); c, detail of the surface of the lemma showing excavations ($\times 100$); d, detail of the base of the antherium ($\times 50$). Micrographs a, d of Irwin and Soderstrom 5873 (US), b, c of Richards 6804 (US). (Reduced to 77% of indicated magnifications for publication.)



FIGURE 37.—Field photo of *Olyra taquara* (photograph by T.R. Soderstrom, Brazil, 1964), with Brazilian botanist Romeu Belém.

brownish, caducous hairs toward the base, about the same color as the upper one (purplish in young leaves), the margins scabrous. *Inflorescences* paniculiform, borne from the uppermost nodes, 10–23 cm long, 10–30 cm wide, the lower branches whorled, ~13–20 cm long, the upper ones alternate, ascending or spreading from the axis, the panicles exerted on long glabrous peduncles, these becoming sparingly pubescent toward the panicle; *axis* strongly angled and sparingly pilose,

the branches sparingly pilose and flattened on one side, the axils of the branches pilose, each branch with male spikelets in pairs, one short- and the other long-pedicellate and to several on fine tertiary branchlets all along the branches; the terminal female spikelets 2 to 4 on each branch. *Female spikelets* fusiform, 16–20.5 mm long, 2.2–3 mm wide, pale green to stramineous, mottled with purple spots, shining, the glumes subequal and subulate to aristate, longer than the antherium;

lower glume aristate, 5-nerved with transverse veinlets, the inner surface shortly and densely pilose, the outer surface scabrous toward the apex, otherwise glabrous; upper glume 12.6–17.7 mm long, subulate to aristate, 5-nerved with some transverse veinlets, with a pubescence similar to that of the lower glume; anthercium fusiform, 8.4–9.2 mm long, 2–2.7 mm wide, whitish, indurate, irregularly pitted with small excavations; lemma 5-nerved. Caryopsis fusiform, brownish, 6.2 mm long, 2.6 mm wide; hilum 5.6 mm long, almost reaching the entire length of the caryopsis. Male spikelets lanceolate, purplish, 10.4–14.1 mm long, 0.9–1.3 mm wide, aristate, glabrous; lemma awned, 3-nerved; palea 7.8–10.3 mm long, 2-nerved, glabrous.

DISTRIBUTION.—Found in the shade of gallery forests in central Brazil (Figure 34), from 300 to 1000 m elevation.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, DISTRITO FEDERAL: Colegio Agrícola de Brasília, Pires and Mattos 9865 (US), Mattos and Heringer 351 (RB, US); 35 km E of Brasília, Irwin and Soderstrom 5420 (US); Brasília, terrenos do Country Club, Sucre 446 (RB, US); Parque Municipal de Gama, ~20 km S of Brasília, Irwin and Soderstrom 5873 (F, MO, US); slopes of Chapada da Contagem, ~20 km E of Brasília, Irwin and Soderstrom 5203 (US). GOIÁS: Ribeirão Grande, Macedo 4580 (US); Rio da Prata, vicinity of Posse, Irwin et al. 14569 (F, MO, RB, US). MATO GROSSO: Serra do Roncador, vicinity of Chavantina, margin of Rio Mortes, Prance et al. 59092, 59108 (F, MO, US, WIS); Ponte de Pedra, Kuhlmann 1869 (IAN, RB); ~270 km N of Xavantina, 12°54'S, 51°52'W, Ratter et al. 1505 (US); 5 km W of the Rio Suia-Missu Ferry, ~290 km N of Xavantina, Ratter et al. 1425 (US); 260 km along new road NNE of village of Xavantina, Eiten and Eiten 8615 (US). MATO GROSSO DO SUL: ~5 km N of Xavantina, Irwin and Soderstrom 6327 (US); Base Camp Square, 12°49'S, 51°46'W, Richards 6804 (RB, US). MINAS GERAIS: Horto Florestal de Paraopeba, Heringer 9171 (UB, US). PARÁ: Serra do Cachimbo, Pires et al. 6261 (IAN).

DISCUSSION.—This species resembles *Olyra ecaudata* of the tropical forests of northern South America and *O. standleyi* of Venezuela, Panama, and Costa Rica. In all three, the leaf blades are conspicuously symmetric at base (and often subcordate with a small purple spot), while the female anthercium is completely pitted with small excavations over its entire surface.

Also, the whole plant when in flower, between May and September, produces numerous inflorescences but few leaves. Soderstrom examined large clumps near Brasília in 1983 and found no signs of flowering on the culms; as these were old, mature culms it seemed apparent that flowering is not annual and may be a one-time event ending with death of plant. This phenomenon should be studied in *O. ecaudata*, *O. standleyi*, and *O. taquara*.

The common name is recorded in Brazil as “taboquinha.” The chromosome number is $2n = 20$ (Gould and Soderstrom, 1967).

23. *Olyra wurdackii* Swallen

FIGURES 11, 38

Olyra wurdackii Swallen, 1966:85. [Type: “Type in the U.S. National Herbarium, No. 2307269 and 2307270, collected at edge of open rock on crystalline dome on right bank of Río Siapa just below Raudal Gallineta, Territory Amazonas, Venezuela, altitude 300–500 m, July 21, 1959, by John J. Wurdack and L. S. Adderley (No. 43540).” Holotype, US sheet nos. 2307269, 2307270.]

Perennial in caespitose clumps. Culms 1–4 m tall, branching at the upper nodes, erect; internodes hollow, short-pubescent; nodes thickened, conspicuous, densely pilose with short, whitish, appressed hairs. Leaves with sheaths greenish, short-pubescent, the borders ciliate toward the upper portion, otherwise glabrous; ligule membranous, short-ciliate or not at the tip, 4–8 mm long, brownish; pseudopetiole short, dark brown, glabrous; blades lanceolate, 26 cm long, 5.2 cm wide, the apex symmetric, subulate, with a symmetric, subcordate base, glabrous on both surfaces, glaucous (to purplish near the base), the midnerve inconspicuous, the basal borders ciliate. Inflorescences paniculiform; panicles axillary and terminal at the upper nodes, ~30 cm long and 20–25 cm wide, many-flowered, the branches divergent to ascendent, the lower ones whorled, the upper alternate to opposite, each branch with many male spikelets below and 2–5 terminal female spikelets above; pedicels of the male spikelets short, disposed in short tertiary branchlets; axis of the panicles longitudinally ridged, densely hirsute, the axis of the branches triquetrous, hispid, purplish, pedicels of the female spikelets thickened, hispid. Female spikelets lanceolate, acuminate, 7–7.5 mm long, 2.2–2.5 mm wide, the glumes subequal, densely to sparsely hispid on the dorsal surface to glabrescent, densely pilose toward the apex on the ventral surface; lower glume acuminate, 9-nerved, with transverse veinlets; upper glume acuminate, 7–7.5 mm long, 7–9-nerved, with transverse veinlets; anthercium ovoid, acute, 5.5 mm long, shortly stipitate, smooth and shining, whitish; lemma with long prickly hairs toward the basal margins; palea with short prickly hairs and numerous bicellular, bottle-like microhairs on the upper portion. Male spikelets 8.9–11.5 mm long, 0.8–1 mm wide, greenish to purplish; lemma 3-nerved, scabrous on the dorsal surface, glabrous on the ventral one, long-aristate, the awn 2.5–4 mm long; palea 7.5–8.8 mm long, 2-nerved, glabrous, short-aristate; anthers 3, 4–4.3 mm long.

DISTRIBUTION.—Known only from two collections from the Amazonian region of Venezuela and Brazil (Figure 11).

ADDITIONAL SPECIMENS SEEN.—BRAZIL, AMAZONAS: Manaus-Pôrto Velho Highway, km 246, 4 km S of Igapo Açú, Prance et al. 20531 (US).

DISCUSSION.—The affinities of *O. wurdackii* are not clear. The species is unusual in that the male spikelets are larger than the female, and the female anthercium is completely smooth and shining with conspicuous bicellular microhairs and prickly hairs at the apex of the palea.

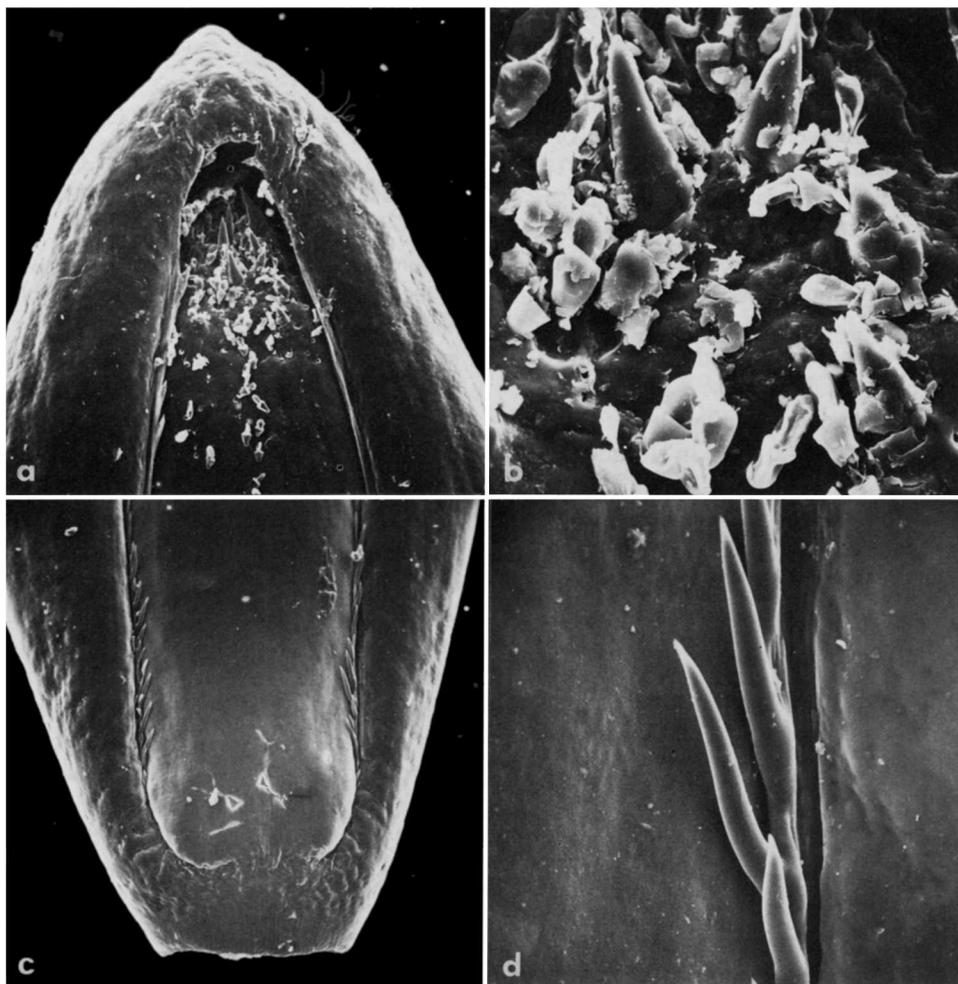


FIGURE 38.—Detail of female antherium, *Olyra wurdackii*: a, apex of the antherium, ventral side ($\times 100$); b, detail of the apex of the palea showing prickly hairs and short bicellular microhairs ($\times 500$); c, base of the antherium, ventral side ($\times 50$); d, detail of hairs on margin of the lemma ($\times 400$). All micrographs of *Prance et al. 20531* (US). (Reduced to 77% of indicated magnifications for publication.)

Parodiolyra Soderstrom & Zuloaga, new genus

Gramen herbaceum scandens, perenne. *Culmi* supra nodi medium profuse ramificantes profuse. *Lamina* ovato-lanceolata vel lanceolata, ad basim asymmetrica truncata, ad apicem asymmetrica, acuminata; pseudopetiolus brevis, pilosus; ligulae breves, membranaceo-ciliatae. *Inflorescentiae* paniculatae, laxae, diffusae, e nodis superioribus productae, ramis inferioribus masculis, ramis superioribus cum spiculis femineis infra et spiculis masculis supra (vel ramis superioribus cum spicula feminea 1); pedicelli feminei filiformes. *Spiculae* 1-florae, unisexuales. *Spicula feminea* decidua; glumae 2 subequales, brevopilosae, quam anthoecium longiores, inflatae vel induratae; rachilla inter glumas incrassata, pulviniformis; gluma inferna 5–9-nervata amplectens; gluma superna 3–6-nervata; anthoecium ellipsoideum, induratum laeve, nitidum, apice

acuto vel obtuso; lemma 5-nervatum tessellatum; palea 2-nervata; lodiculae 3; stylus singularis; stigmata 2. *Caryopsis*: hilum lineare quam caryopsis $1/2$ – $3/4$ longius. *Spiculae masculae* fusiformes, acuminatae, hispidae vel laeves; lemma 3–4-nervatum; palea 2-nervata; stamina 3.

Perennial monoecious herbs. *Culms* vine-like, arching and clambering, profusely branching from the median and upper nodes; internodes hollow, cylindrical; nodes thickened, pilose with retrorse hairs. *Leaves* with sheaths glabrous to pilose; ligule membranous-ciliate, small; pseudopetiole short, pilose; blades ovate-lanceolate to lanceolate, flat, stiff, asymmetric and truncate at the base, tapering to an acuminate, asymmetric apex. *Inflorescences* borne from the uppermost nodes, paniculiform, the panicles lax and diffuse, the lower branches with male spikelets only, the upper ones with male spikelets below and

terminal female spikelets above or with female spikelets only; pedicels of the female spikelets not thickened, the female spikelets disarticulating below the glumes. *Female spikelets* ellipsoid, shortly pilose on the outer surface of the glumes; glumes subequal, inflated to indurate at maturity; rachilla prominent between the lower and upper glume and thickened, giving the spikelet a pulviniform shape at its base; *lower glume* 5-9-nerved with transverse veinlets, completely embracing the upper glume; *upper glume* 3-6-nerved with transverse veinlets; small stipe present at the base of the antherium; *antherium*, indurate, shorter than the glumes, smooth and shining, acute to obtuse apically, with or without conspicuous bicellular, bottle-like microhairs at the tip of the lemma and palea; *lemma* 5-nerved; *palea* 2-nerved; lodicules 3; style 1, stigmas 2. *Caryopsis* ellipsoid, brownish, the hilum linear, $\frac{1}{2}$ - $\frac{3}{4}$ the length of the caryopsis. *Male spikelets* lanceolate, acuminate, hispid to glabrous; *lemma* 3-4-nerved; *palea* 2-nerved; anthers 3.

TYPE SPECIES.—*Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga.

DISTRIBUTION.—Three species; low- and mid-elevation forests and savannas from Costa Rica south to Bolivia and Bahia, Brazil.

DISCUSSION.—Species of *Olyra* are erect plants that generally occur in shaded forest. They are generally unbranched at the lower nodes and have female spikelets on clavate pedicels in which the glumes are persistent (except for *O. micrantha*). The glumes are not inflated and there is no swollen internode between them. The hilum is linear and extends for the full length of the caryopsis.

Three species previously included in *Olyra* (as *O. lateralis*, *O. luetzelburgii*, and *O. ramosissima*) do not possess the above features but rather share a suite of unusual characters that clearly set them apart. We are establishing *Parodiolyra* to accommodate them. *Parodiolyra* includes decumbent, vine-like, clambering, or declining plants that branch and often root from the lower or from the median and upper nodes. They may grow in shaded forest but also often in full sunlight when enough moisture is available. The female spikelets fall entire, disarticulating below the glumes, and a conspicuous, thickened internode is present between the lower and upper glume in all

species. There is also a prolongation of the rachilla between the upper glume and the antherium, in the form of a slender, thin stipe. Perhaps the most striking feature of this new genus is the presence of a shortened hilum that extends for only $\frac{1}{2}$ to $\frac{3}{4}$ the length of the caryopsis, never reaching its entire length (as in *Olyra* and most other genera of the tribe Olyreae).

In *Parodiolyra*, the shortened hilum, female spikelet disarticulating entire from a filiform pedicel, and the conspicuous, thickened internode between the glumes are reminiscent of *Raddiella* Swallen and *Diandrolyra* Stapf, rather than *Olyra*. However, plants of *Diandrolyra* differ from *Parodiolyra* in being erect with spike-like inflorescences borne on specialized culms and with the male spikelets bearing only two stamens. *Raddiella*, a genus that inhabits moist areas such as savannas, wet cliff faces, and bases of waterfalls, also has decumbent culms, but it differs from *Parodiolyra* by the disposition of the inflorescences and male and female spikelets within the plants. In *Parodiolyra* the inflorescences are paniculiform, borne only from the uppermost nodes, lax, diffuse, and many-flowered, with the lower branches bearing male spikelets and the upper branches bearing male spikelets below and female spikelets above. In contrast, in *Raddiella* there are numerous axillary inflorescences borne at the median and upper nodes of the plants, and these panicles are small, few-flowered, and usually bear female spikelets only, with the male spikelets confined to terminal panicles.

The species of *Parodiolyra* are also characterized by their inflated, membranous glumes (indurate at maturity in *P. lateralis*), with the lower member amplexant. The female antherium is smooth and shining, with the tip of the palea with rounded excavations and the upper portion of lemma and palea covered by conspicuous bottle-like, bicellular, secretory microhairs in *P. luetzelburgii* and *P. ramosissima* (completely glabrous in *P. lateralis*). These hairs contain a resin that is secreted when the antherium is mature and become dark, making the antherium viscous. In *P. lateralis* the glumes are indurate and purplish and shining at maturity, and Davidse (1987) has suggested that their dark coloration might attract birds, while the induration of the glumes might serve as mechanical protection for the antherium and its enclosed caryopsis.

Key to the Species of *Parodiolyra*

1. Female spikelets at maturity black, indurate, 2-2.6 mm long, the antherium glabrous, obtuse apically; leaf blades 2.5-5 cm long 1. *P. lateralis*, new combination (widespread, Costa Rica to Bolivia and Brazil)
1. Female spikelets at maturity light-colored, chartaceous, 3-4.6 mm long, the antherium with conspicuous bicellular microhairs at the acute apex; leaf blades 4-13 cm long 2

2. Female spikelets 3–3.6 mm long, 1.5–1.7 mm wide; male spikelets 4.1–5 mm long; panicles with the lower branches whorled; ovary glabrous; lower margins of the blades long-ciliate 2. *P. luetzelburgii*, new combination (northern South America from Venezuela to Maranhão and Mato Grosso, Brazil)
2. Female spikelets 5–5.8 mm long, 1.9–2.8 mm wide; male spikelets 3.5–4.3 mm long; panicles with the lower branches alternate or opposite; ovary pilose towards the summit; lower margins of the blades glabrous or scabrous, not ciliate 3. *P. ramosissima*, new combination (Bahia, Brazil)

1. *Parodiolyra lateralis* (Presl ex Nees von Esenbeck)
Soderstrom & Zuloaga, new combination

FIGURES 39, 40, 44

Panicum laterale var. α Presl ex Nees von Esenbeck, 1829:213–214. [Type: "In montibus Orinocensibus lectam." Holotype, PR, not seen, fragment of holotype and photograph, US sheet no. 2877929. Nees saw this specimen in the Haenke Herbarium in PR where one of the labels gives as the locality "Peruanae montanae huanocenses [Department of Huanuco, Peru]," the latter word of which Nees misread as "Orinocenses."]

Panicum laterale J.S. Presl, 1830:305. [Type: "Hab. in Peruviae montanis huanocensibus." By the habitat that Presl cites, he clearly indicates that his *P. laterale* is the Haenke specimen from Peru, var. α of Nees von Esenbeck].

Olyra sarmentosa Doell in Martius, 1877:319. [Type: "A cl. Poeppig (n. 3055) in Brasilia Amazonica, et in republica Peruviana a cl. Dombey (n. 146) lecta." Syntypes, B, not seen, fragments of the syntypes Poeppig 3055, US sheet no. 2877929, Dombey 146, US sheet no. 2877929.]

Olyra lateralis (Presl ex Nees von Esenbeck) Chase, 1908:179. [Type: Based on *Panicum laterale* var. α Presl ex Nees von Esenbeck, 1829:213–214.]

Raddiella truncata Swallen, 1948:89. [Type: "Guyana, Waratuk Falls, Potaro River Gorge," Maguire and Fanshawe 23035. Holotype, US sheet no. 171359; isotypes, NY, US sheet no. 1914990.]

Sprawling perennial. *Culms* up to 8 m or more long, trailing and clambering on vegetation, branching profusely at the median and upper nodes; internodes sulcate, hollow, glabrous, the basal ones elongated, 11–20 cm long and with sheaths only or sheaths with rudimentary blades; nodes thickened, formed by the thickened basal rim of the sheath above and the thickened upper rim of the internode below, pilose with whitish retrorse hairs. *Leaves* with sheaths overlapping, ribbed, sparsely pilose with retrorse hairs, more densely so along the margins, long-ciliate or not at the summit; auricles present, long-ciliate or not; ligule membranous-ciliate, ~0.2 mm long; pseudopetiole, indurate, 1–2 mm long, pale to dark brown, densely pubescent on both surfaces; blades ovate-lanceolate, 2.5–5 cm long, 0.5–1.3 cm wide, rather stiff, asymmetric and truncate basally, the apex asymmetric and apiculate, sparsely ciliate on the margins towards the apex and base, the rest of the surface scabrous or shortly pubescent to glabrous, the abaxial surface glaucous. *Inflorescences* paniculiform, borne profusely from the uppermost nodes, occasionally with panicles produced at the lower nodes, long-exserted, the peduncles 5–9 cm long, glabrous; *panicles* lax, pyramidal, the branches spreading, 1.2–3 cm long, 1.5–3.5 cm wide, the lower branches opposite or alternate and bearing male spikelets

only or paired male spikelets (one long and the other short-pedicelled), the upper branches alternate and with female spikelets only, or some specimens with panicles bearing only female spikelets; *axis* and branches cylindrical, flexuous, scabrous to sparsely pilose, the axils of the branches pubescent; pedicels smooth, sparsely pubescent to glabrous. *Female spikelets* elliptical, acute, 2–2.6 mm long, ~1.2 mm wide, greenish to purplish or black at maturity; glumes subequal and longer than the antherium, indurate at maturity and shining, the lower glume embracing completely the upper one; *lower glume* 5–7-nerved, scabrous to shortly and densely pilose, more densely so towards the base; *upper glume* 3–5-nerved, hispid to glabrous; *antherium* obovoid, obtuse apically, indurate, whitish, smooth and shining, glabrous, shortly stipitate at the base; *lemma* 7-nerved; *palea* 2-nerved. *Caryopsis* ovoid, brownish, 1 mm long, 0.6 mm wide, the hilum linear, $\frac{1}{2}$ the length of the caryopsis. *Male spikelets* lanceolate, acute, 3–4 mm long, 0.6–0.8 mm wide, shortly pilose to glabrous, brownish to purplish, the glumes occasionally present; *lemma* 3-nerved; *palea* 2-nerved; anthers ~2 mm long, purple.

DISTRIBUTION.—This is the most common and widespread species of *Parodiolyra*. It is distributed from the mountains of Mesoamerica (Costa Rica) into South America, south along the eastern foothills of the Andes to Bolivia and east at the edge of the Guyana highlands to Surinam (Figure 44). The plants inhabit wet savannas, riverbanks, bluffs, and cliffs in full shade or sun, at elevations from 400 to 1800 m above sea level.

ADDITIONAL SPECIMENS SEEN.—BOLIVIA, LA PAZ: Hacienda Simaco, sobre el camino a Tipuani, *Buchtien* 5333 (F, MO, NY, US); San Carlos, *Buchtien* 25 (US); Ticunhaya, *Tate* 1079 (NY, US).

BRAZIL, AMAZONAS: Rio Negro, Serra Curicuriari, *Madison* and *Kennedy* 6565 (US), *Prance et al.* 16125 (MO, US). RORAIMA: NE of Mission station, Serra dos Surucucus, *Prance et al.* 10011 (MO, US).

COLOMBIA, CHOCÓ: Cerca al Río Atrato, en los alrededores de Quibdó, *Molina and Barkley* 19C142 (NY, US). CUNDINAMARCA: "Pipiral," SE of Quetame, *Pennell* 1685 (NY, US). MAGDALENA: Santa Marta, *H.H. Smith* 2149 (F, MO, US, WIS). META: Las Lagartijas, plateau between Río Papaneme and Río Duda, 11 km SW of Uribe, *Fosberg* 19512

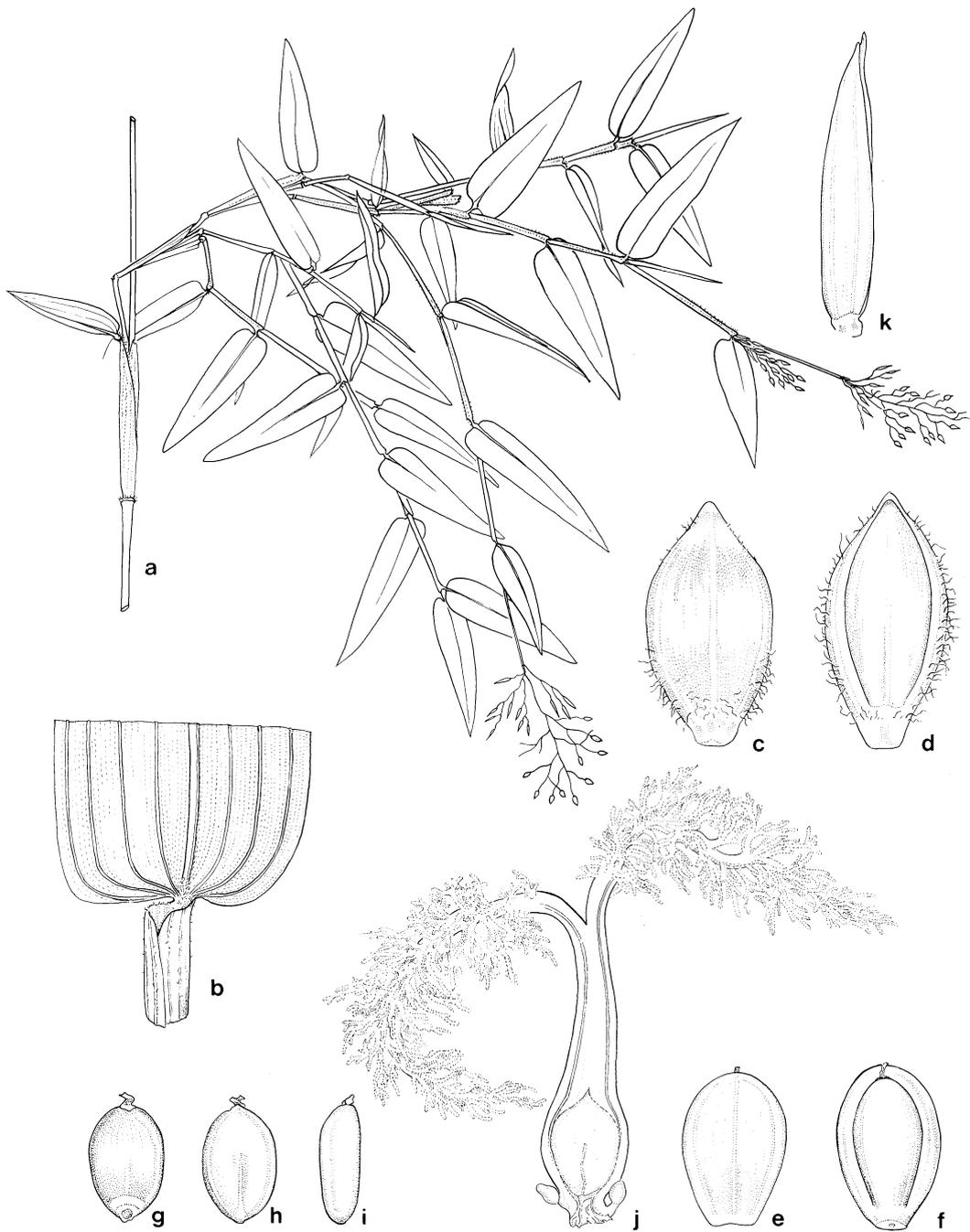


FIGURE 39.—*Parodiolyra lateralis*: a, flowering branches with inflorescences ($\times 0.6$); b, base of leaf blade ($\times 3.7$); c, female spikelet, view of lower glume side ($\times 15$); d, female spikelet, view of upper glume side ($\times 15$); e, female antherium, dorsal view ($\times 15$); f, female antherium, ventral view ($\times 15$); g-i, caryopsis ($\times 15$); g, dorsal view; h, ventral view; i, side view; j, gynecium ($\times 15$); k, male spikelet ($\times 15$). Component a based on *Skutsch 2254* (US); b based on *Smith 2149* (US); c-f,k based on *MacBride 4990* (US); g-i based on *Buchtien 25* (US); j based on *Steyermark 89552* (US). All illustrations by G.B. Threlkeld.

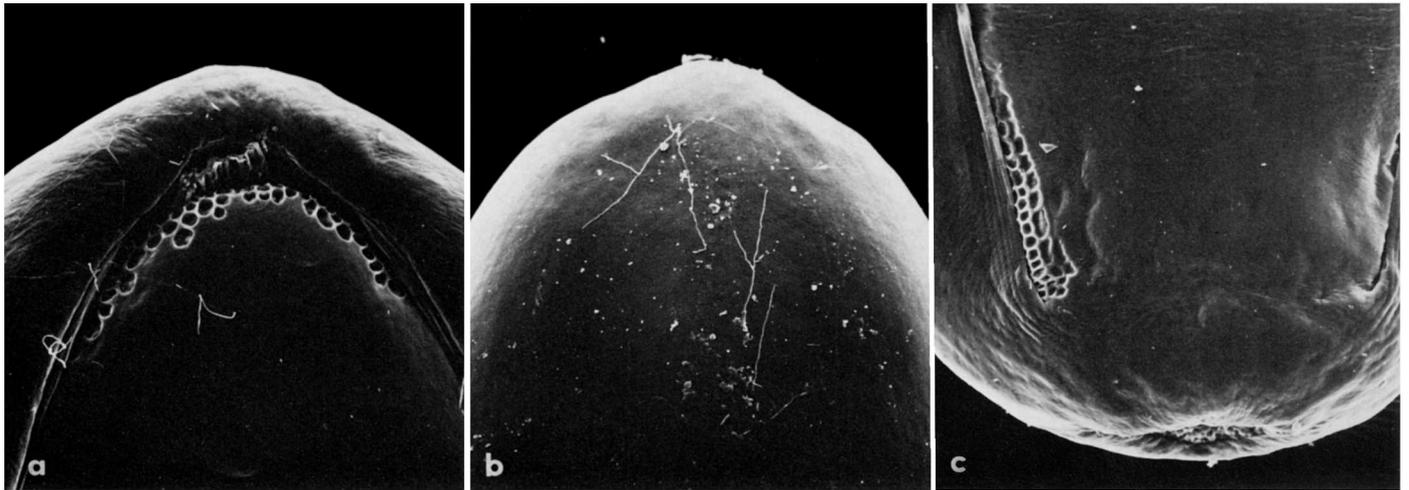


FIGURE 40.—Detail of female antherium, *Parodiolyra lateralis*: a, apex, ventral side ($\times 200$); b, apex, dorsal side ($\times 100$); base, c, base, ventral side ($\times 200$). All micrographs of Steyermark et al. 92399 (US). (Reduced to 77% of indicated magnifications for publication.)

(US); Sierra de La Macarena, Central Mountains, Approach Ridge, *Philipson and Idrobo 1877* (US).

COSTA RICA, HEREDIA: Cordoncillal, *Pittier 3641* (US); Cienaga de Agua Buena, Cañas Gordas, *Pittier 11008* (US). SAN JOSÉ: Helechales du General, Vallée du Diquis, *Pittier 12058* (US); vicinity of El General, *Skutch 2254* (MO, US). PROVINCE UNKNOWN: Cienaga de Agua Buena, *Pittier 11008* (US).

GUYANA: Mure-Mure Savanna, Kaieteur Plateau, *Cowan and Soderstrom 2141* (US), *2165* (US).

PANAMA, COCLÉ: El Valle, *Soderstrom 2015* (US). HERRERA: 18 km W of Las Minas, trail to top of Alto Higo, N slope of Cerro Alto Higo, *Hammel 4213* (MO, US). PANAMÁ: Cerro Azul, *Dwyer 1504* (MO, US), *Calderón 2088* (US); Cerro Jefe, *Calderón and Dressler 2139* (US), *Witherspoon 8498* (MO, US); Cerro Campana, *Calderón and Dressler 2129* (US), *Calderón 2092* (US); 7 mi [11 km] N of Cerro Azul on road to Cerro Jefe, *Blum et al. 1789, 1809* (US).

PERU, HUÁNUCO: Andes, *Poeppig 976* (F, US). PASCO: Vilcabamba, hacienda on Río Chinchao, *Macbride 4990* (F, US). SAN MARTÍN: San Roque, *Williams 7111* (F, US). STATE UNKNOWN: Andes, *Poeppig 976* (US).

SURINAM: Tafelberg, West Grace Falls, Arrowhead Basin, *Maguire 24501* (F, NY).

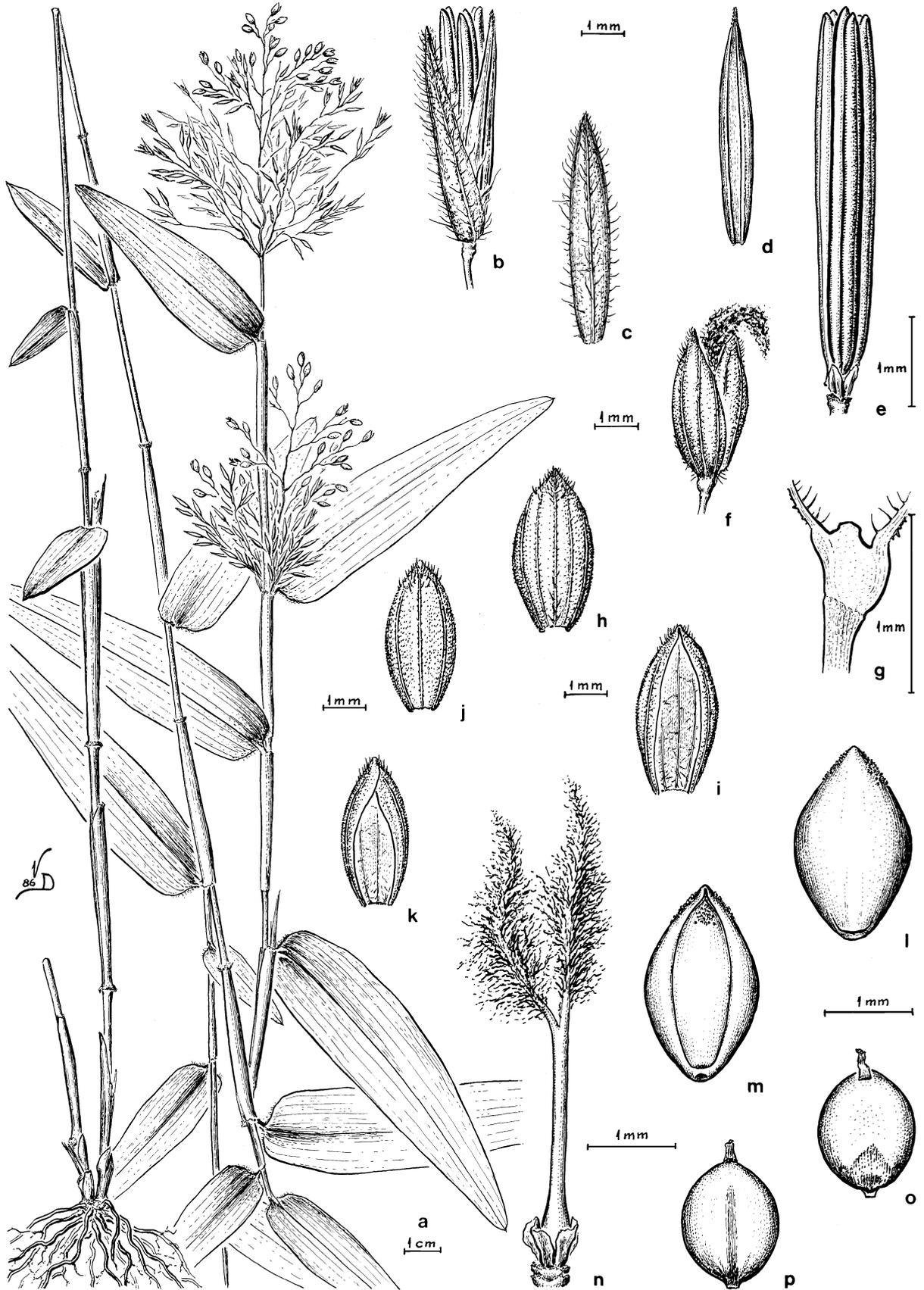
VENEZUELA, AMAZONAS: entre Shimada-Wochi y el alto Río Matacuni, Sierra Parima, *Huber and Colchester 8390* (MO, US). BOLÍVAR: 3 km S of El Puajl, *Liesner and Holst 18818* (MO, US); Gran Sabana, between Mision of Santa Teresita de Kavanayen, NW of Río Karuai, *Steyermark 59380* (F, NY, US); between Río Karuai and Salto de Iraba-raima along Río Karuai, at SW base of Ptari-tepuí, *Steyermark 60705* (F, NY, US); Chimantá Massif, along base of southeast-facing sandstone bluffs of Chimantá-tepuí (Toronó-tepuí), *Steyermark*

75506 (F, NY, US); Steyermark Falls, on upper reaches of Río Tirica, *Steyermark 76004* (F, NY, US); Sierra de Lema, cabeceras de Río Chinacán 80 km SW of El Dorado, *Steyermark 89552* (F, NY, US); Cerro La Danta, NW of Cerro Venamo, *Steyermark and Nilsson 32* (F, NY); Chimantá Massif, Amuri-tepuí, *Steyermark and Wurdack 1348* (MO, NY, US); Cerro Venamo, subiendo el Río Venamo, *Steyermark et al. 92399* (US); Río Venamo, *Steyermark 92778* (US). DISTRITO FEDERAL: Cerro Naiguatá, arriba del pueblo de Naiguatá, Lomas de Las Delicias, 9–12 km SW de Hacienda Cocuizal, *Steyermark 91998* (US). ZULIA: Perijá, *Gines 1517* (US).

DISCUSSION.—In flower all year. One group of specimens is peculiar in that all panicles of the plant contain only female spikelets. These compare favorably with the type specimen of *Raddiella truncata* Swallen, however close examination of the spikelets reveals that they are like those of *Parodiolyra lateralis* and that the flowering system is that of *Parodiolyra*. In *Raddiella*, the flowering system of the lower nodes produces peduncles, each of which bears only 2–3 female spikelets, while the flowering system of the terminal node produces only panicles bearing male spikelets.

The chromosome number has been recorded as $n = 18$ (Davidse and Pohl, 1978).

FIGURE 41.—*Parodiolyra luetzelburgii*: a, habit; b, male spikelet; c, male lemma; d, male palea; e, male flower; f, female spikelet; g, longitudinal section through pulvinus at base of female spikelet; h, lower female glume, dorsal view; i, lower female glume, ventral view; j, upper female glume, dorsal view; k, upper female glume, ventral view; l, female antherium, dorsal view; m, female antherium, ventral view; n, female flower; o, caryopsis, dorsal view; p, caryopsis, ventral view. All based on *Irwin et al. 55516* (US). All illustrations by Vladimiro Dudás.



2. *Parodiolyra luetzelburgii* (Pilger)
Soderstrom & Zuloaga, new combination

FIGURES 41, 42, 43a-c, 44c

Olyra luetzelburgii Pilger, 1930:1049. [Type: "Nord-Brasilien: Igarapé, Caicán; auf Sand (Oktober 1927), von Luetzelburg, Brasilianische Grenzexpeditionen General Rondon, n. 21354." Holotype, B, not seen, fragment of the holotype, US sheet no. 2877941; isotypes, IAN, R.]

Cespitose, short-rhizomatous perennial. *Culms* 70–160 cm tall, erect and geniculate, climbing and leaning on the vegetation, unbranched towards the base, densely branching at the median and upper nodes; internodes cylindrical, hollow, glabrous, the basal internodes with a sheath only or sheaths with a rudimentary or reduced blade; nodes dark, thickened, pubescent with retrorse whitish hairs. *Leaves* with sheaths shorter than the internodes, densely pilose all over the surface to pilose towards the margins and apex, the rest of the surface

glabrous, usually mottled with green spots; ligule membranous, short-ciliate at the apex, ~0.4 mm long; pseudopetiole stramineous, densely villous, ~2 mm long; blades ovate-lanceolate, 8–11 cm long, 1.6–3.1 cm wide, stiff, glaucous, flat, basally truncate and slightly asymmetric, the apex asymmetric; both surfaces densely hispid to scabrous or the adaxial surface scabrous and the abaxial one densely pubescent; abaxial surface silvery blue green, the margins long-ciliate towards the base, otherwise scaberulous, cartilaginuous at the tip; midnerve inconspicuous. *Inflorescences* paniculiform, borne from the uppermost nodes, the peduncles ribbed, elongate, glabrous; *panicles* pyramidal, lax, 5–8 cm long, 4.5–8 cm wide, the lower branches whorled, with male spikelets only (these arranged in pairs or in groups of 3 on long pedicels), the upper branches alternate to opposite, with male spikelets below and terminal female spikelets above or only with female spikelets; *axis* scabrous to hispid, longitudi-

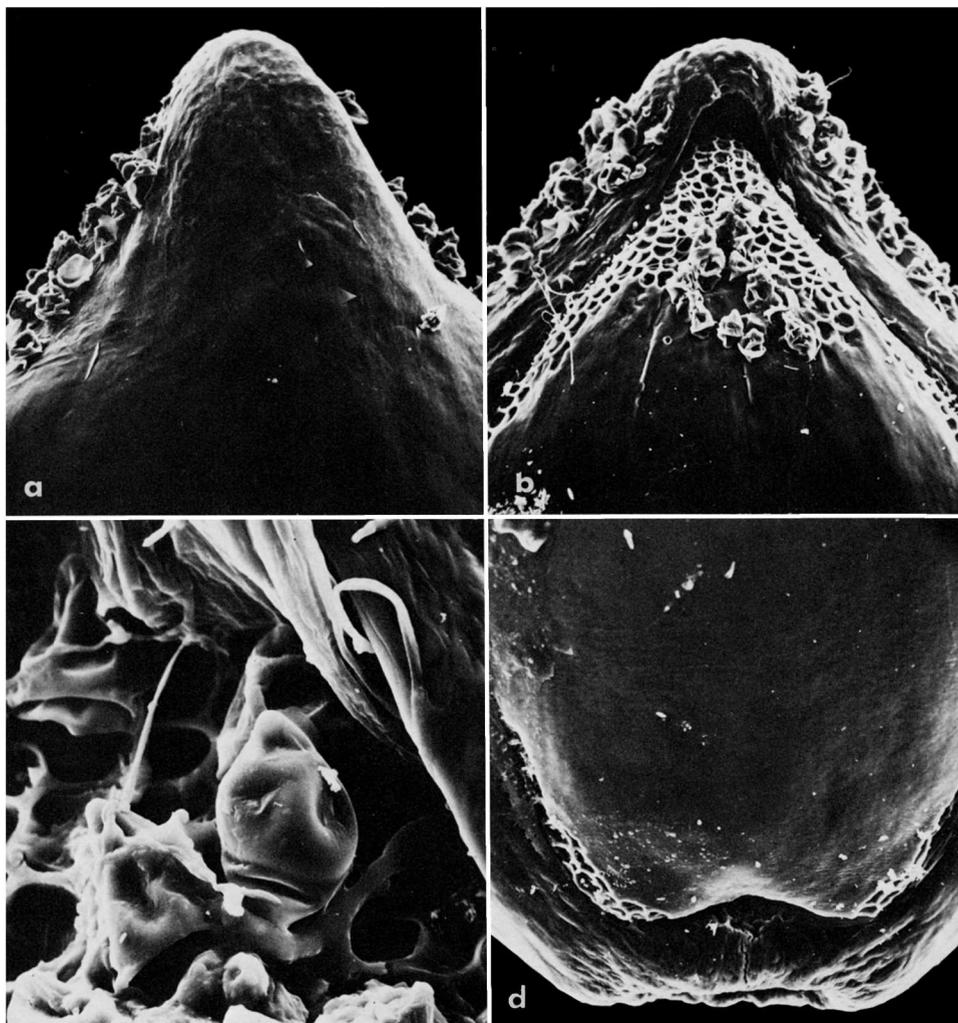


FIGURE 42.—Detail of female antherium, *Parodiolyra luetzelburgii*: a, apex, dorsal side ($\times 200$); b, apex, ventral side ($\times 200$); c, detail of bicellular microhair on apex of the palea ($\times 1000$); d, base, ventral side ($\times 200$). All micrographs of Black 54-16672 (IAN). (Reduced to 77% of indicated magnifications for publication.)

nally ridged, the branches cylindrical, purplish, the axils of the branches pilose; pedicels smooth, hispid; axillary panicles similar to the terminal one. *Female spikelets* ellipsoid, whitish to purplish, inflated, 3–3.6 mm long, 1.5–1.7 mm wide; glumes subequal, acute, scabrous with short, retrorse hairs, hirsute or not with stiff hairs towards the apex and with short hairs towards the base, separated by a conspicuous, thickened internode, a stipe present at the base of the antherium; *lower glume* chartaceous, strongly 7–9-nerved, completely embracing the upper glume; *upper glume* chartaceous, strongly 5–7-nerved; *antherium* lanceolate, shorter than the glumes, 1.9–2.5 mm long, 1–1.2 mm wide, whitish to stramineous, smooth and shining, with numerous bicellular bottle-like microhairs at the acute apex; *lemma* 5-nerved, with rounded excavations towards the apex; *palea* 2-nerved, with rounded

excavations towards the apex and on the inner margins; ovary glabrous. *Caryopsis* 1.4 mm long, 0.9 mm wide, the hilum $\sim 3/4$ as long as the caryopsis. *Male spikelets* lanceolate, 4.2–5.1 mm long, 0.8 mm wide, purplish, acuminate, hispid; *lemma* 3–4-nerved, acute; *palea* 4.1–5 mm long, 2-nerved, sparsely hispid on the middle portion; anthers 3–3.2 mm long.

DISTRIBUTION.—Northern South America from western Venezuela east and south to Maranhão and Mato Grosso, Brazil (Figure 44), growing in open areas, on sandy slopes, ridges, and quebradas, from 100 to 600 m above sea level.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, AMAPÁ: Colônia do Torrão, *Pires and Cavalcante* 52636 (MO, US). AMAZONAS: Maués, across from Guaraná factory, *Campbell et al.* P21984 (US). MARANHÃO: Itapicurú, *Black et al.* 54-16672 (IAN). MATO GROSSO: Município de Colider, 30 km de Guarantan,

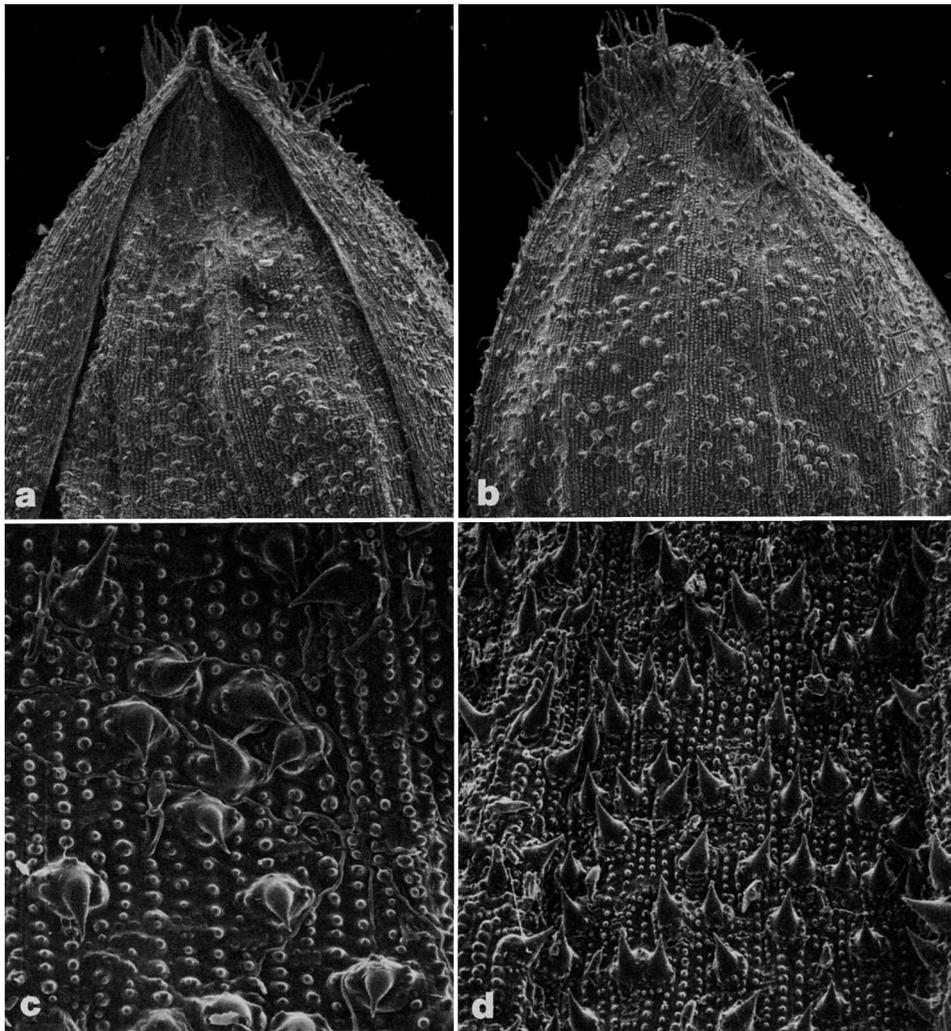


FIGURE 43.—Detail of female spikelets of *Parodiolyra* species. *P. luetzelburgii*: a, apex of the spikelet, ventral side, showing cucullate apex ($\times 70$); b, apex of the lower glume ($\times 70$); c, detail of the surface of the lower glume ($\times 400$). *P. ramosissima*: d, detail of the surface of the lower glume showing simple papillae, prickle hairs, and bicellular microhairs ($\times 400$). Micrographs a–c of *Wurdack and Adderley* 43514 (US); d of *Calderón and Pinheiro* 2198 (US). (Reduced to 77% of indicated magnifications for publication.)



FIGURE 44.—Distribution map of *Parodiolyra* species.

(IAN); Rio Capim, Aproaga, *Black 48-2385* (IAN, NY, US). RORAIMA: Igarapé Arapapo, *Luetzelburg 21481* (R); Valle do Croe-Cry, *Luetzelburg 21359* (R).

FRENCH GUIANA: Montagnes de la Trinité, *de Granville et al. 6075* (MO).

SURINAM: Wilhelmina Gebergte, 5 km E of confluence of Oost and Lucie riviervs, 3°36'–3°41'N, 56°30'–56°34'W, *Irwin et al. 55516* (MO, NY, US); trail line Lucie Rivier-Wilhelmina Mts., slope of unknown peak near km 14, *Schulz 10462* (US).

VENEZUELA, AMAZONAS: ~33 km al NE de Puerto Ayacucho, *Huber 2732* (MO); on right bank of Río Siapa, 8 km below Raudal Gallineta, *Wurdack and Adderley 43514*

(MO, NY, US). BOLÍVAR: Morichal El Caballo, ~225 km S of Caicara del Orinoco by road, *Holst and van der Werff 2610* (MO, SI); rapids of Río Apácará, 1/4 mile down stream from the mouth of Río Abácará to the mouth of Río Abácará, western side of Apácará-tepuí, *Steyermark 74702* (F, NY, US); Sierra Auraima, en la margen terminal norte sobre el margen oeste del Río Paragua, en la zona del raudal de El Perro, *Steyermark 90817* (F, NY, US). TÁCHIRA: Montaña de Guafitas, just W and N of El Pinal, *Steyermark et al. 119502* (MO, US).

DISCUSSION.—Flowers throughout the year. This species shows a closer resemblance to *P. ramosissima* than to *P. lateralis*.

3. *Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga, new combination

FIGURES 43d, 44, 45, 46

Olyra ramosissima Trinius, 1834:28 [page 116 in published form, 1835]. [Type: "Bahiens," Riedel s.n. Holotype, LE, not seen, fragment of the holotype, US; isotype, GH.]

Olyra blanchetii Mez, 1917:46. [Type: "Brasilia, Bahia, loco accuratior non indicato (Blanchet n. 2730)." Holotype B, not seen, fragment of the holotype, US.]

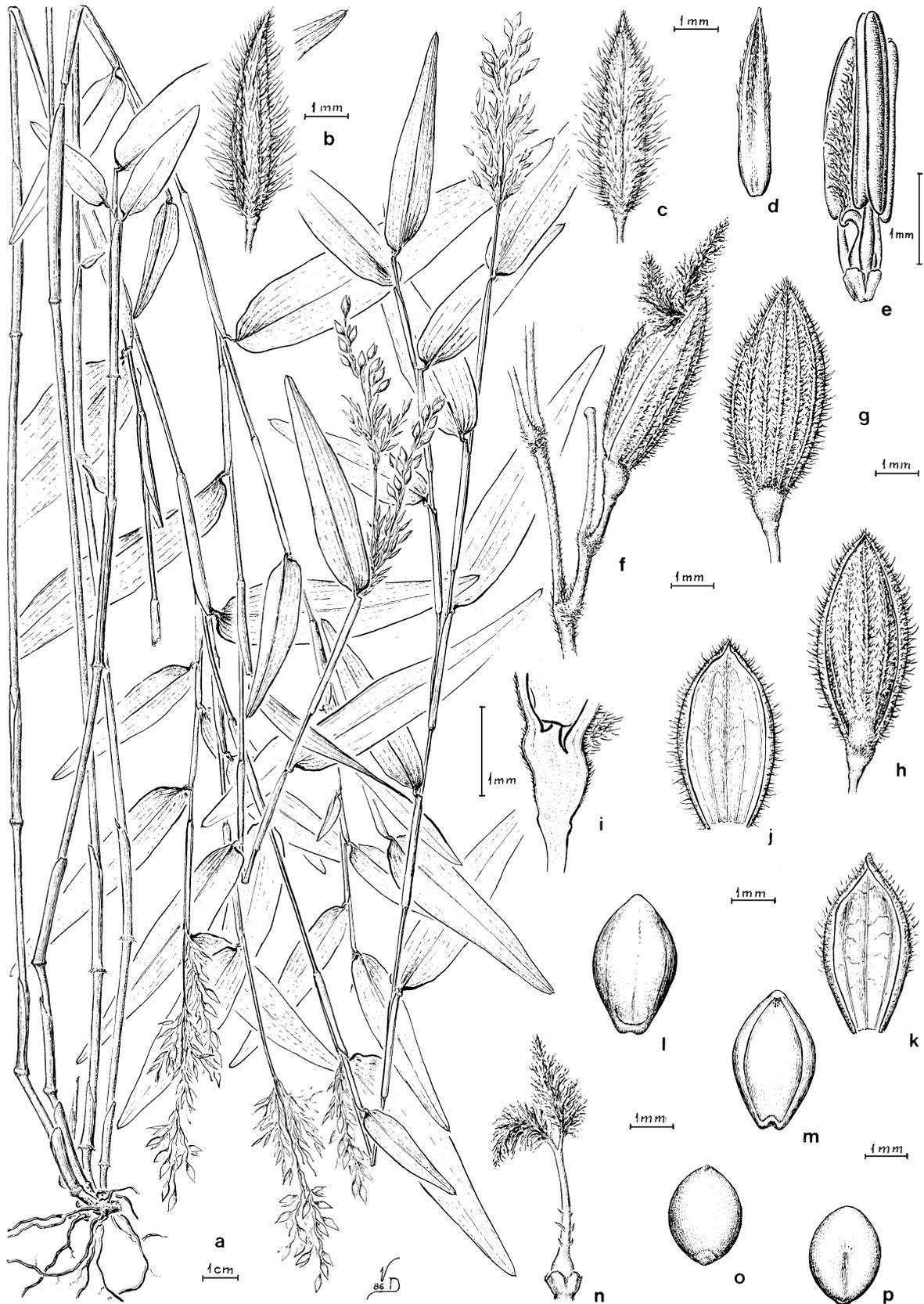
Cespitose perennial. Culms 5–30 per clump, 30–150 cm tall, geniculate at the lower nodes, the young culms erect, unbranched at the lower nodes, profusely branching at the median and upper nodes, climbing and leaning on the vegetation; internodes cylindrical, hollow, maroon to purplish, glabrous, the basal ones with sheaths only or sheaths with rudimentary blades; nodes thickened, densely pilose with long retrorse whitish hairs. Leaves with sheaths strongly ribbed, greenish to purplish, glabrous to pubescent with retrorse hairs, the margins ciliate; ligules membranous at the base and short-ciliate at the tip, ~0.3 mm long; pseudopetioles stramineous to purplish, scabrous to densely pubescent with long, whitish hairs, ~2–3 mm long; blades lanceolate, 3.6–13 cm long, 0.9–1.7 cm wide, ascending, stiff, narrowed and asymmetric basally, tapering abruptly to an apiculate tip, glabrous to strongly scabrous, the margins scabrous, the midnerve prominent towards the base, the abaxial surface greenish to somewhat purplish or dark maroon. Inflorescences numerous, long-exserted, borne from the uppermost nodes, 3–8 cm long, 1–4 cm wide, the lower branches alternate to opposite and with paired male spikelets (one short and the other long-pedicelled), the upper branches alternate and with male spikelets below and one terminal female spikelet above or with female spikelets only; axis longitudinally ridged, scaberulous to short-pubescent, the branches cylindrical, puberulent to scabrous, the axils of the branches pubescent; pedicels of the female spikelets similar to those of the male spikelets, scabrous; axillary panicles similar to the terminal one. Female spikelets broadly ellipsoid, inflated, 5–5.8 mm long, 1.9–2.8 mm wide, whitish, obtuse to acute; glumes exceeding the anthercium in length, shortly hispid to scabrous with short, retrorse hairs, glabrous and shining on the inner surface, the internode conspicuous and thickened between the lower glume and the anthercium; lower glume 4.1–5.1 mm long, 7–9-nerved with transverse veinlets; upper glume 3.9–4.6 mm long, 5–6-nerved with transverse veinlets, acute; anthercium ellipsoid, 3–3.3 mm long, 1.5–2 mm wide, acute, whitish to

olivaceous at maturity, smooth and shining, with numerous bicellular, bottle-like microhairs at the apex, shortly stipitate at its base, the stipe ~0.3 mm long.; lemma 5-nerved, with rounded excavations towards the tip; palea 2-nerved, with rounded excavations towards the tip; ovary pilose towards summit. Caryopsis ellipsoid, brownish, 2–2.5 mm long, 1.4–1.8 mm wide; hilum linear, 1.7–1.9 mm long, $\frac{3}{4}$ the length of the caryopsis. Male spikelets lanceolate, 3.5–4.3 mm long, 0.7–1 mm wide, purplish, densely hispid with long, whitish hairs; lemma 3-nerved, acute; palea 2-nerved, pilose in the middle portion to glabrous; pistilode usually present.

DISTRIBUTION.—Endemic to Bahia, Brazil (Figure 44), where it grows on sandy soils within or at the edges of open forests, frequently in disturbed areas, at elevations below 150 m.

ADDITIONAL SPECIMENS SEEN.—BRAZIL, BAHIA: 3 km W of Itacaré, Soderstrom et al. 2216 (CEPEC, US); rodovia Camamú-Ibirapitanga, 11 km SW of Camamú City, Calderón and Pinheiro 2237 (CEPEC, US); Reserva Biológica Pau Brasil, 16 km W of Pôrto Seguro, Calderón and Pinheiro 2198 (CEPEC, US), Soderstrom et al. 2189 (CEPEC, US), Eupunino 19 (US), Hage 67 (CEPEC, US); ramal para Mogiquiçaba, com entrada no km 23 da rodovia Belmonte-Itapebí, Mattos Silva and Brito 974 (RB, US); ~18 km W of Valença on road to Zona Orobó, Soderstrom et al. 2162 (CEPEC, US); between Itapebí and Belmonte, 10–12 km E of the Estação Experimental of CEPLAC, Soderstrom et al. 2136 (CEPEC, US); rodovia Camamú a Ibirapitanga, Pinheiro 1847 (MO, US); km 10, rodovia Pôrto Seguro para Eunápolis, Calderón 2050 (US); Marau, Belém 1810, 1821 (CEPEC, US); entre os kms 45–46 da rodovia Eunápolis-Pôrto Seguro (BR-367), Mori et al. 10960 (CEPEC, MO, US); 17 km W of Pôrto Seguro, Mori et al. 10797 (CEPEC); 4 km N of Olivença, on the road from Olivença to Ilhéus, Mori et al. 13678 (CEPEC, MO); Nova Viçosa, Guimarães 1022 (RB); estrada Olivença-Marumim, km 4–5, Mantone 1006 (RB); antiga rodovia que liga Estação Ecológica de Pau Brasil a Santa Cruz da Cabralia, kms 2 a 9, Mattos Silva and Brito 898 (RB); rodovia Canavieiras/Camaçã (BA 270), a 20 km W de Canavieiras, dos Santos and Mattos Silva 3279 (MO); without locality, Calderón 2448 (US).

DISCUSSION.—In flower between January and October. Until 1966, when Romeu Belém recollected it in Bahia, *P. ramosissima* had been known only from Blanchet and Riedel type collections made there in the 19th century.



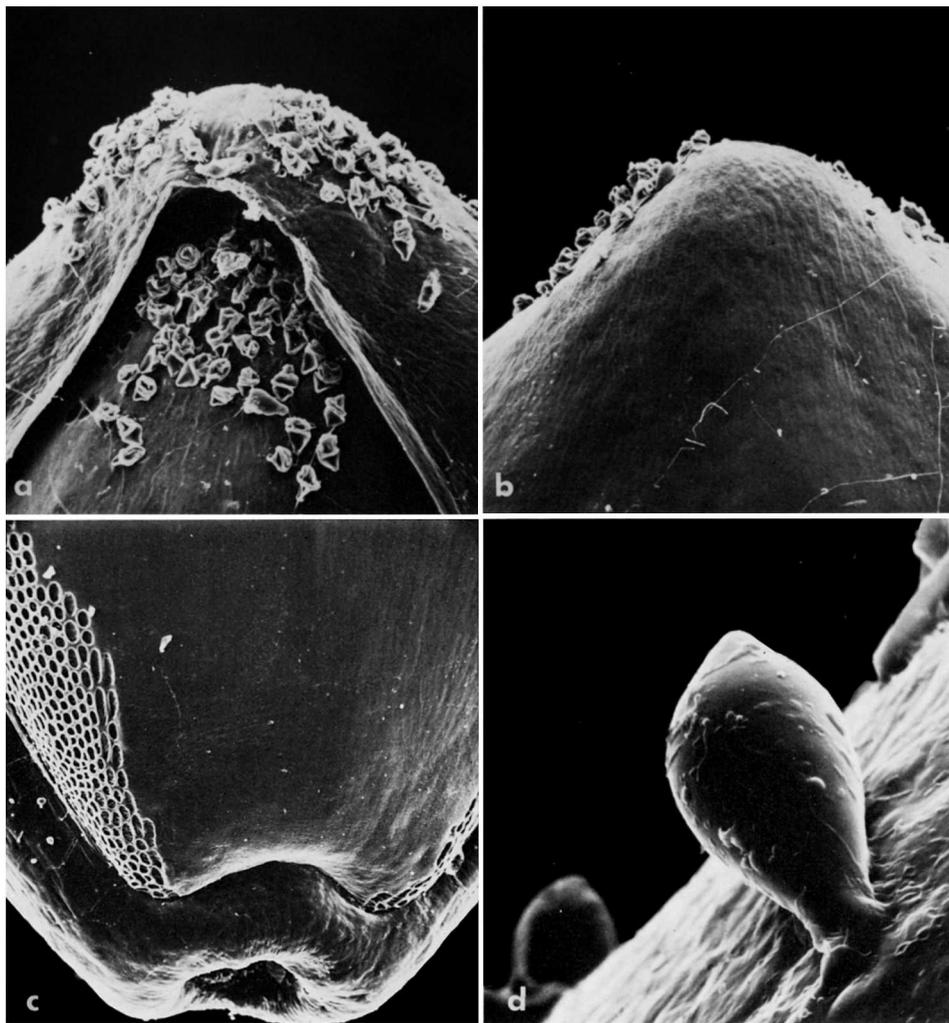


FIGURE 46.—Female anthecium of *Parodiolyra ramosissima*: a, apex, ventral side ($\times 150$); b, apex, dorsal side ($\times 100$); c, base, ventral side ($\times 100$); d, detail of microhair on top of the palea ($\times 1500$). Micrograph a of Mori et al. 10960 (US), b-d of Calderón and Pinheiro 2198 (US). (Reduced to 77% of indicated magnifications for publication.)

FIGURE 45.—*Parodiolyra ramosissima*: a, habit; b,c, male spikelet; d, male palea; e, male flower; f, branchlets bearing female spikelet and male spikelet (fallen); g, female spikelet, view of back of lower glume; h, female spikelet, view of back of upper glume; i, longitudinal section through pulvinus at base of female spikelet; j, lower female glume, ventral view; k, upper female glume, ventral view; l, female anthecium, dorsal view; m, female anthecium, ventral view; n, female flower; o, caryopsis, dorsal view; p, caryopsis, ventral view. Component a based on Calderón 2050 (US), b-p based on Calderón 2448 (US), both from Bahia, Brazil. All illustrations by Vladimiro Dudás.

Appendix 1

Names Included in *Olyra* Linnaeus

(Names accepted here are in italics.)

- O. amapana* Soderstrom & Zuloaga
O. arundinacea Humboldt, Bonpland & Kunth = *O. latifolia*
O. brasiliensis Desvoux = *O. latifolia*
O. brevifolia Schumacher = *O. latifolia*
O. buchtienii Hackel
O. caudata Trinius
O. ciliatifolia Raddi
O. corcovadensis Wawra = *O. glaberrima*
O. cordifolia Humboldt, Bonpland & Kunth = *O. latifolia*
O. cordifolia var. *scabriuscula* Doell in Martius = *O. latifolia*
O. cuneatifolia Desvoux = *O. ciliatifolia*
O. dimidiata Hochstetter ex Steudel = *O. caudata*
O. d'Urvillei Doell in Martius = *O. micrantha*
O. ecaudata Doell in Martius
O. fasciculata Trinius
O. filiformis Trinius
O. glaberrima Raddi
O. glaberrima var. *humilis* (Nees von Esenbeck) Mez = *O. humilis*
O. heliconia Lindman = *O. fasciculata*
O. hirsuta Trinius = *O. micrantha*
O. holttumiana Soderstrom & Zuloaga
O. humilis Nees von Esenbeck
O. humilis var. *angustifolia* Doell in Martius = *O. humilis*
O. humilis var. *latifolia* Doell in Martius = *O. humilis*
O. juruana Mez
O. kegelii Mez = *O. longifolia*
O. latifolia Linnaeus
O. latifolia var. *arundinacea* Grisebach = *O. latifolia*
O. latifolia var. *glabriuscula* Doell in Martius = *O. latifolia*
O. latifolia var. *pubescens* Doell in Martius = *O. latifolia*
O. latifolia var. *vestita* Henrard in Amshoff & Henrard = *O. latifolia*
O. latispicula Soderstrom & Zuloaga
O. longifolia Humboldt, Bonpland & Kunth
O. longifolia var. *grandifolia* Doell in Martius = *O. longifolia*
O. longifolia var. *parvifolia* Doell in Martius = *O. longifolia*
O. lorentensis Mez
O. maranonensis Swallen
O. media Desvoux = *O. latifolia*
O. micrantha Humboldt, Bonpland & Kunth
O. micrantha var. *decalvata* Doell in Martius = *O. micrantha*
O. micrantha var. *lanceolata* Doell in Martius = *O. micrantha*
O. micrantha var. *subvelutina* Doell in Martius = *O. micrantha*
O. obliqua Desvoux = *O. glaberrima*
O. obliquifolia Steudel
O. paniculata Swartz = *O. latifolia*
O. pittieri Hackel = *O. caudata*
O. pubescens Raddi = *O. latifolia*
O. retrorsa Soderstrom & Zuloaga
O. scabra Nees von Esenbeck = *O. latifolia*
O. scorbiculata Schrader ex Nees von Esenbeck = *O. micrantha*
O. semiovata Trinius = *O. glaberrima*
O. semiovata var. *pubescens* Hackel = *O. glaberrima*
O. semiovata var. *pubiflora* Hackel = *O. glaberrima*
O. standleyi Hitchcock
O. surinamensis Hochstetter ex Steudel = *O. longifolia*
O. tamanquareana Soderstrom & Zuloaga
O. taquara Swallen
O. urvillei Steudel = *O. micrantha*
O. ventricosa Nees von Esenbeck = *O. micrantha*
O. wurdackii Swallen

Appendix 2

Names Excluded from *Olyra* Linnaeus

(Current names are in italics.)

- Olyra axillaris* Lamarck = *Lithachne pauciflora* (Swartz) Palisot de Beauvois
- Olyra blanchetii* Mez = *Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga, new combination
- Olyra brasiliensis* (Bertoloni) Sprengel = *Raddia brasiliensis* Bertoloni
- Olyra capillata* Trinius = *Cryptochloa capillata* (Trinius) Soderstrom
- Olyra capillata* var. *segregata* Doell in Martius = *Cryptochloa capillata* (Trinius) Soderstrom
- Olyra concinna* Hooker f. = *Cryptochloa concinna* (Hooker f.) Swallen
- Olyra flaccida* Doell in Martius = *Arberella flaccida* (Doell in Martius) Soderstrom & Calderón
- Olyra floribunda* Raddi = *Raddia brasiliensis* Bertoloni
- Olyra floribunda* var. *microphylla* Doell in Martius = *Raddia brasiliensis* Bertoloni
- Olyra hoehnei* Pilger = *Raddia brasiliensis* Bertoloni
- Olyra lancifolia* Mez [This species appears to belong to a different genus from *Olyra*. The poor material available does not allow a decision on its generic disposition to be made at this point.]
- Olyra lateralis* (Presl ex Nees von Esenbeck) Chase = *Parodiolyra lateralis* (Presl ex Nees von Esenbeck) Soderstrom & Zuloaga, new combination
- Olyra luetzelburgii* Pilger = *Parodiolyra luetzelburgii* (Pilger) Soderstrom & Zuloaga, new combination
- Olyra malaccensis* Wallich = *Scleria caricina* (Cyperaceae), teste Chase and Niles (1962)
- Olyra malmeana* Ekman = *Raddiella malmeana* (Ekman) Swallen
- Olyra nana* Doell in Martius = *Raddiella esenbeckii* (Steudel) Calderón & Soderstrom
- Olyra orientalis* Loureiro = not a member of the Poaceae, teste Chase and Niles (1962)
- Olyra ovata* Hamilton = *Ichnanthus panicoides* Palisot de Beauvois
- Olyra pauciflora* Swartz = *Lithachne pauciflora* (Swartz) Palisot de Beauvois
- Olyra pineti* Wright ex Grisebach = *Lithachne pineti* (Wright ex Grisebach) Chase
- Olyra podachne* Mez = *Cryptochloa capillata* (Trinius) Soderstrom
- Olyra polyodioides* Trinius = *Raddia distichophylla* (Schrader) Chase
- Olyra ramosissima* Trinius = *Parodiolyra ramosissima* (Trinius) Soderstrom & Zuloaga
- Olyra sampaiana* Hitchcock = *Sucrea sampaiana* (Hitchcock) Soderstrom
- Olyra sarmentosa* Doell in Martius = *Parodiolyra lateralis* (Presl ex Nees von Esenbeck) Soderstrom & Zuloaga
- Olyra strephioides* Grisebach = *Mniochloa strephioides* (Grisebach) Chase
- Olyra strictiflora* Fournier = *Cryptochloa strictiflora* (Fournier) Swallen
- Olyra sympodica* Doell in Martius = *Piresia sympodica* (Doell in Martius) Swallen
- Olyra urbaniana* Mez = *Raddia guianensis* (Brongniart) Hitchcock

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