THE WILD SPECIES OF ORYZA IN THE MALAY ARCHIPELAGO

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According to general opinion the spikelets of *Oryza* consist, reckoned from their base upwards, of 2 sterile glumes, called hereafter I and II, one fertile glume (*valvula inferior*; *lemma*), called hereafter III, and the palea (*valvula superior*) to this glume, called hereafter p_s. The spikelets are placed singly on the very short ultimate branchlets, called hereafter *pedicels*, of a more or less strongly ramose panicle; the tips of the pedicels are broadened into a shallow *infra-spicular cup*, either distinctly 2-lobed or not; from the bottom of the cup arises a minute knob, on which the very distinct basal callus of the spikelet is jointed. When ripe, the spikelets of the wild species fall off as a whole, disarticulating at the joint (in dried specimens often long before maturity; hence in herbarium-specimens they are frequently lacking). In many cultivated forms they remain firmly attached to their pedicels, a property of very high economic value.

The spikelets are strongly laterally compressed. I and II are either 1-nerved or nerveless; as a rule they are many times shorter than the spikelet, sometimes even very minute. Only in *O. Ridleyi* they are comparatively well-developed, reaching about half the length of the spikelet, but very narrow. III is very rigid, usually conspicuously granulate, boat-shaped, keeled, either awned or not, 5-nerved, with a strong midrib; it has the ultimate lateral nerves along the margins. P_s is likewise boat-shaped, shortly cuspidate or not, with a narrow, rather rounded, less often faintly keeled back, 3-nerved; it is about as long as III, awn disregarded, and has the same rigid granulate structure, excepted the narrowly incurved thinly membranaceous smooth marginal parts (hidden by III). It might be taken for a fertile glume, but this view is inadmissible because of the averted position of the lodicules. It has a rather thin mid-nerve and strong lateral nerves, separating the rigid central part from the membranaceous borders. The well-developed lodicules are glabrous; the six stamens are free; there are 2 free shortish styles with large plumose white or violet stigmas which, during anthesis, stick out from the sides of the spikelet in or below its middle. The ripe fruit is oblong or lanceolate, usually angular; it is free from glume and palea but remains firmly incarcerated between them.

This is the conception most authors, i. a. Hooker (**5**, 92; **6**, 113), Hitchcock (**18**, 535), Backer (**11**, 144; **12**, 103), have of the structure of the spikelet. Stapf (**6**, 182), on the contrary, enunciates the revolutionary

theory, that the apical cup of the spikelet originates from the coalescence of 2 rudimentary glumes. He says: "The spikelet of *Oryza* consists theoretically or normally of 5 glumes of which the two lowest are very minute, are confluent with the tip of the pedicel and rarily discernible. The spikelet is hence only apparently articulate with the pedicel, the real articulation being above these two suppressed glumes". If this should be the correct explanation, our sterile glume I would have to be called III, II should become IV, III would have to be renamed V, and p_3 would become p_5. The axis of the spikelet disintegrating above II would give the genus a different place in the system.

Mere theoretical discussion of this point cannot lead to any unassailable conclusion, hence is of little avail. In order to come to an acceptable decision, I have looked for a grass in which just such is a cup is present and where the taxonomic value of that cup cannot possibly be misinterpreted. Such a grass is the Andropogonaceous genus *Asthenochloa*, a native of the dryer regions of Java, where, as a true kremnophyte (**8**, 14; **14**, 298, 307), it inhabits steep walls and terrace-sides. This grass has small, much branched panicles with very slender branches. Each ultimate branchlet is terminated by a very distinct cup, pilose on the outside, glabrous within, from the centre of which arises just such a knob as in *Oryza*. But in *Asthenochloa* this knob not only bears a normal spikelet, but very frequently, though not always, also one, or sometimes two, very minute stalks (**2**, 367; **11**, 105; **15**, 580), representing rudimentary spikelets, such as are frequently met with in other Andropogonaceous genera, f. i. *Arthraxon* (**11**, 72) and *Thelepogon* (**11**, 62). Hence the pedicellar cup of *Asthenochloa* cannot possibly form part of the spikelet itself but indubitably belongs to the pedicel. And there is no reason to suppose that in *Oryza* a quite identical structure should have an entirely different origin. Therefore I adhere, as regards the structure of the spikelets of *Oryza*, to the common conception given above; the theory of Stapf has to be rejected.

There are some more grasses with cup-shaped pedicel-tips, f. i. *Rhynchelytrum (Tricholaena) roseum* (**11**, 170), *Garnotia stricta* (**11**, 207) and *Cyathopus* (**5**, 240). *Leersia hexandra* has a very minute, lobed pedicellar cup which is likewise considered by Stapf (**16**, 221; **17**, 659) to have arisen from the coalescence of reduced glumes. On the origin of the cups of *Garnotia*, *Rhynchelytrum* and *Cyathopus*, the last genus being created by Stapf, this author does not pronounce any opinion.

For a comparison with the above-given description of the apical cavity in the pedicels of *Oryza* and in order to facilitate a valuation of the taxonomic value of that character, I wish to call attention to the curious elaiosome-containing hollows in the inflorescence of the grass *Sclerachne* (**11**, 30). The apex of the peduncle of the spike exhibits there a cavity not possibly due to any concretion of glumes; the rachis of the spike is jointed on the peduncle and has a hollow base. The two corresponding cavities, incompletely separated by a transverse, narrow circular rim, form together a double chamber, which contains a curved thick white corneous elaiosome, contricted in the middle and united by a firm strand to the base of the lowest female flower, usually the only one. When the ripe

fruiting spike detaches itself and drops, the partly protruding elaiosome remains attached to it by the strand. In Java I frequently saw ants laboriously dragging the elaisomes with the adhering spikelets to their nests. Elaiosome-containing cavities, in the main similar to those of *Sclerachne,* are also found in the joints of the spikes of the grasses *Coelorhachis (Rottboellia) glandulosa* (**11**, 64), *Hackelochloa (Manisuris)* (**11**, 67), *Mnesithea* (**11**, 70), *Ophiurus* (**11**, 68), *Rottboellia exaltata* (**11**, 64) and *Polytoca* (**11**, 27). They were already mentioned by me in **11** and **12** and should be studied in the living plant, where the elaiosomes are rather large. In dried materials they are usually shrivelled up to an inconspicuous shapeless clump.

As far as known at present the genus *Oryza* is represented in the Malay Archipelago by 5 wild species, viz. *O. fatua* Koen., *O. granulata* Nees et Arn., *O. Meyeriana* (Z. M.) Baill., *O. minuta* Presl and *O. Ridleyi* Hook.f. Of these we give herebeneath a detailed description, preceded by a few historical and geographical notes, a description of the genus and a key to the described species.

For more than a century already *O. fatua* has been known to be indigenous to Java. It is an aquatic long-awned grass, with long, at last spreading or drooping panicle-branches and violet stigmas, a robust floating inhabitant of rather deep fresh-water pools and ditches, which may be entirely filled up with it, only the tips of the culms and the entire panicles — if at least the grass has been left time to produce these — emerging; over large stretches it frequently crowds out all other vegetation. Of this very conspicuous species the Leyden Herbarium possesses a couple of very old well-preserved and well recognizable specimens the age of which can to some extent be deduced from the antique handwriting on the accompanying labels (made of very old paper). The inscription on the labels, which gives neither date nor collector's name, reads: "In de Graslanden om Batavia" (in the grass-lands around Batavia). Evidently the pools around Batavia are meant, where this plant still locally plentifully occurs and where it is regularly cut (on an average once a month; this frequent cutting often preventing it from flowering freely) by the natives, who highly value it as a fodder for horses, though they are very well acquainted with the fact, that it may cause lethal poisoning (possibly brought about by adhering noxious impurities) if not carefully washed out in living or at least clean water. It is the only wild *Oryza*-species in the Archipelago that has any economic value. It comes extremely near some forms of the highly variable cultivated rice (*Oryza sativa* L.), from which it differs only in points of minor systematic (though highly economic) importance (f. i. its being perennial and the ripe spikelets readily falling off), and of which it might perhaps be considered an ancestral wild form (forma *spontanea*) (**11**, 194; **12**, 103; **13**, plate 96 [1]). Thellung (**9**, 748) has already pointed out that in some other cultivated

[1]) In the legend to plate 96 of the atlas the word *vergroot* (magnified) should be cancelled. In the original drawing the spikelet was magnified, and the printer's corrector did not think of striking out the word in the legend to the much reduced reproduction.

species analogous phenomena present themselves. With rice *O. fatua* has in common the very long ligule, deeply cleft into 2 acute segments, and also the marginal nerves of the fertile glume being produced beyond the tip of this glume on either side of the base of the awn into a short but very distinct mucro. By these two characters the two species may be at once distinguished from all other Indo-Malayan *Oryza*-species (*O. fatua* moreover by the long awns). In June 1843 Zollinger gathered *O. fatua* in West-Java; Mars (**4**, 241) described and figured it in 1889 as a sometimes (near big towns, for horse-fodder) cultivated variety of *O. sativa*. Up to now it has been collected in Java, Borneo, Kangean and New-Guinea; in Java it seems to be restricted to the western part, where it has been gathered in several localities between 1 and 1000 m above sea-level. In some of these it may originally have been planted. At the present time this cannot be ascertained any more; the grass, which is known to reach a considerable age, may from times immemorial have been growing in those pools, which are used for no other purpose; its origin may have been forgotten by — or, more probably, never have been known to — the present grass-cutters, ignorant people who often talk rubbish. Information these persons furnish on such problems is always most unreliable.

In contradistinction to *Oryza fatua*, the second of the above-listed species, *O. granulata* Nees et Arn., has been known from the Malay Archipelago only for a comparatively short time. Hooker (**5**, 93; **6**, 183) recorded it in 1897 and 1900 for Java, but this statement rested, as I was recently informed by the Director of the Kew Herbarium, on a misnamed specimen of *O. Meyeriana*, there being no Javanese specimen of *Oryza granulata* in the Kew Herbarium collected earlier than in 1913. According to Koorders (**7**, 142) he collected it (in 1895) in the Minahassa (N.-Celebes) (Kds 19781 β, named by Stapf, not seen by me). In January 1913 it was for the first time with certainty gathered in Java, where, in later years, it proved to be rather common in the central part between 1 and 700 m above sea-level, rather scarce in the West of the island and of very local occurrence in the eastern part. It may be recognized by the small (3—12½ cm) panicles, with a small number of very erect short branches, appressed against the main axis, hence easily escaping observation, awnless, small, pale green or greyish spikelets, 5—6½ mm long (the only other Indo-Malayan species with spikelets of that diminutive size, *O. minuta*, has the spikelets distinctly awned), irregularly and densely granulate flowering glume and palea, white stigmas, small fruits (3—4 mm long), short (5—30 cm) and rather narrow (6—20 mm) leaves, widest in or slightly below the middle, very short ligules, slender culms, close-set on a horizontal rhizome and small height (0.30—0.75 m). It grows in calcareous or volcanic soils; it never occurs in moist, much less in inundated localities; it prefers moderately shadowy spots and is almost restricted to teak-forests, where, though never growing gregariously, it may be rather common. Outside Java it occurs in British India, Ceylon, Madura (island), Celebes, Kangean and the Philippines.

The third species of the Archipelago, *O. Meyeriana* (Z. et M.) Baill. can boast of something like a history. In 1841 the then still obscure, in later years justly renowned Swiss botanist and plant-collector, Heinrich

Zollinger, took at Rotterdam ship to Batavia, where he was eagerly awaited and most heartily welcomed by his compatriot A. J. Meyer, owner and manager of a small rice-estate at Tjikoya (village in the West of Java, quite near the boundary between the residencies of Batavia and Bantam, ± 50 m above sea-level). Meyer, himself an ardent lover of nature, had taken the initiative for Zollinger's coming over, had met part of his expenses, and took him into his house, which Zollinger continued to use as a starting-point for collecting-trips until Meyer, aged 73, died in 1843.

It was near Tjikoya that Zollinger in 1842 made one of his many remarkable discoveries. In a humid thicket he found a grass (Z. M. 718), which proved new to science and in 1845 even was described, though on unsound grounds, as a new genus *Padia*, by his friend A. Moritzi (**1**, 103), professor at Solothurn, who called it *Padia Meyeriana* Z. M.: *Padia* because of its resemblance to padi, rice; *Meyeriana* in honour of Zollinger's host.

Moritzi did not expressly state by which characters he wished to distinguish his new genus *Padia* from the most closely related *Oryza* with which it is now rightly united. The only plausible reason for the separation seems that he supposed the two lowest glumes of *Padia* to be connate into a short 2-pointed cup, a character which he ascribes to his new genus. This, however, is an error; these glumes are, as in all species of *Oryza*, quite free. The so-called cup, which apparently was not closely examined by Moritzi, is, as a matter of fact, the solid hard callus. Though the genus cannot stand, the species is a good one. From the key to the species and the description at the end of this paper it will appear, that Hooker (**5**, 93), Koorders (**7**, 142) and Merrill (**10**, 77) were wrong in uniting it with *O. granulata* Nees et Arn. Like this it possesses a sparingly branched panicle, composed of comparatively few (5—30) spikelets but these are much larger than in *O. granulata*, 8—10 mm long; the midnerve of the flowering glume mostly bears near its base a short dense longitudinal row of short white hairs; the much larger fruit is 5½—6½ mm long; the lanceolate leaves, which usually are widest well below the middle, reach a width of 1—3½ cm.

Due to the fact that most subsequent collectors paid no or hardly any attention to grasses, the new plant, after Zollinger in 1848 had left Java, remained unnoticed for a long stretch of years. Not before 1910 it was rediscovered, this time in a forest in the East of the Preanger Regencies. Afterwards it was repeatedly gathered in West-, Central- and East-Java between 50 and 900 m above sea-level, in not too dry regions, in evergreen forest and thickets, never in swampy localities. Outside Java it occurs in Borneo.

The fourth species of our list, *O. minuta* Presl (= *O. manilensis* Merr.) was formerly often, also by myself (**11**, 194) confounded with the West-Indian *O. latifolia* DC, which differs by its much wider leaves (4—5 cm) and greater height (2 m and more). It rather resembles *O. fatua*; like this it has large panicles with long, at last spreading or drooping branches, but it markedly differs by the much smaller spikelets (4—5 mm long), the much shorter awn (3½—18 mm) and the short ligules

(1—5 mm). The marginal nerves of III are not produced into a mucro. The erect or ascending (never floating) culms are tufted on a short horizontal rhizome; they possess (in vivo) much thickened nodes. The leaves are ¾—3 cm wide. This species is known from British India, the Philippines, Sumatra, Borneo, Java and Buru (Moluccas). In Java it occurs, in disjunct regions, from the West to the East of the island, from the plains up to 400 m above sea-level, on watersides and in shallow pools and marshes, whether or not drying up in the dry season; it never grows gregariously.

Disregarding a rather old specimen in the Leyden Herbarium, according to the perhaps unreliable note on the label originating from Java, but bearing neither collector's name, nor date, nor mention of the exact locality where it was gathered (in the beginning of this century it was wrongly named *O. sativa* by the late Lotsy), the oldest specimen in the herbarium, with certainty collected in the Archipelago, was gathered in 1900 by Boerlage in the island of Buru. In Java it was found (again) in 1904 (Batavia) and repeatedly afterwards.

The last and, as it seems, rarest of the 5 Indo-Malayan species, *O. Ridleyi* Hook.f., was discovered in the Archipelago about thirty years ago. It may at once be recognized by the very narrow spikelets, the long, slender callus, the 2 lowest glumes which are, for the genus, very long, reaching up to about the middle of the spikelet or somewhat higher, attaining a length of 5½—7 mm, and the very faintly granulate III and p_3. Up to now it has been collected, besides in the Malay Peninsula, in Sumatra, Borneo and New-Guinea, where it inhabits moist localities.

Herebeneath we give, restricting ourselves to the forms wild in the Malay Archipelago, a description of the genus, a key to the 5 species and a detailed description of these.

ORYZA L.

Spikelets united into a terminal, more of less strongly branched, contracted or effuse panicle, solitary, shortly pedicelled, erect and appressed against the thin flexuous panicle-branches, strongly laterally compressed, consisting of 3 glumes, 1-flowered, ♀; pedicel erect, at the apex widened into a shallow, usually faintly 2-lobed smooth, glabrous cup, bearing in its centre a minute knob or column on which the spikelet is jointed; callus distinct, solid, hard, glabrous; I and II usually very small, rarely half as long as the spikelet or slightly longer, erect or erecto-patent, free, subulate or ovate-lanceolate, acute or acuminate, nerveless or 1-nerved, membranaceous or subcoriaceous; III much larger, erect, boatshaped, with narrowly incurved margins, keeled, awned or not, very rigid, usually distinctly granulate, 5-nerved; ultimate lateral nerves close to the margin, produced beyond the tip of the glume or not; p_3 as long as III or slightly longer or shorter (awn disregarded), with a narrowly rounded or fainty keeled, rigid and mostly distinctly granulate back and narrowly incurved, membranaceous smooth margins (hid by III), obtuse, acute, acuminate or with a short cusp, 3-nerved; lateral nerves close to the margins. Lodicules 2 (on the side of III) oblong-lanceolate, glabrous;

stamens 6, free, anthers linear; ovary glabrous; styles 2, free, shortish; stigmas large, plumose, during anthesis exserted from the sides of the spikelet in or somewhat below the middle; caryopsis free, but firmly enclosed between III and p_3, oblong or lanceolate, usually angular-furrowed, glabrous; hilum linear. Culms slightly compressed, hollow in the older parts, smooth, glabrous; leaf-sheaths long, keeled, split to the base on the anterior side, hairy at the mouth, for the rest glabrous, smooth; blade lanceolate or linear, very acute, with (above the smooth base) retrorsely scabrid margins, glabrous, rough or smooth, herbaceous, involute in bud, afterwards flat (those of terrestrial species often involute in very dry weather), at the very base on either side of the ligule when young often with a very fugacious, marginal, narrowly linear-falcate appendage. Perennial, terrestrial or aquatic grasses, either with a short rhizome or not, erect, ascending or floating.

Key to the species.

1. I and II both much less than half the length of the spikelet, shorter than 4 mm, sometimes very minute. Callus of the spikelet not more high than wide. III and back of p_3 to the naked eye distinctly granulate 2
   I and II about half the length of the spikelet or somewhat longer, 5½—7 mm, very narrow. Callus of the spikelet much more long than wide; spikelets comparatively narrow, 8—10 mm long, 2—2½ mm wide; awn 4—5 mm. III and back of p_3 to the naked eye not or hardly perceptibly granulate. Ligule of the leaves 2½—6 mm. Culms ascending, sometimes rooting at the base. Terrestrial. . . . . **5. O. Ridleyi**
2. Panicles 3—15 cm long, composed of 4—30 unawned spikelets, with comparatively few (1—6), short (at best 7 cm), simple or very sparingly ramose branches; these erect, subappressed against the main-axis. Callus of the spikelet less high than wide. I ¼—1 mm; II ½—1½ mm; III glabrous or hairy only on the base of the mid-nerve; p_3 glabrous. Granules on III and p_3 not in distinct horizontal or vertical rows. Ligules of leaves 1—2 mm long. Terrestrial species, growing in dry localities; culms erect. 3
   Panicles 15—40 cm long, composed of upwards of 50 distinctly awned spikelets, with 5 or more, often numerous, rather long (up to 25 cm), at last spreading or drooping branches. I and II 1½—3½ mm; III and p_3 clothed with rather many, scattered longish hairs. Granules on III and p_3 in rather distinct vertical and horizontal rows. Ligules of the leaves 1—35 mm. Plants of watersides or moist or inundated localities 4
3. Spikelets 5—6½ mm long, oval-oblong. III entirely glabrous; caryopsis 3—4 mm long. Leaves linear-lanceolate, widest in or slightly below the middle, 6—20 mm wide; their upper surface smooth or scabrid, sometimes very scabrid **1. O. granulata**
   Spikelets 8—10 mm long, lanceolate III usually on the mid-nerve above its base with a short, dense row of short white hairs; caryopsis 5½—6½ mm long. Leaves lanceolate, widest well below the middle, 14—35 mm wide; their upper surface smooth. . . . . **2. O. Meyeriana**
4. Spikelets (awn disregarded) 4—5 mm long; awn 3½—18 mm; III not with a mucro on either side of the base of the awn. Ligules of the leaves 1—5 mm long, entire or lacerate, not deeply bifid. Not-floating . . . **3. O. minuta**
   Spikelets (awn disregarded) 7—9½ mm long; awn 4—10 cm; III on either side of the base of the awn with a short but distinct mucro. Ligules of the leaves deeply cleft into two acute segments, 10—35 mm long. Usually floating . . . . . **4. O. fatua**

1. **Oryza granulata** Nees et Arn. (*Padia Meyeriana* Auct. nonn., haud Z. et M.).

Panicle erect, 3—12½ cm long, bearing 5—20 spikelets, glabrous or

with scattered short white hairs; lateral branches 1—6, erect and often appressed against the main axis, hence not conspicuous, simple or very sparingly branched, smooth or hardly scabrid; lower branches 1½—7 cm long. Spikelets oval-oblong, with an obliquely rounded base, in the upper part shortly narrowed towards the tip, awnless, glabrous, pale green or greyish, 5—6½ mm long, ± 2½ mm wide; pedicels of lateral spikelets smooth, ¾—2 mm; infra-spicular cup membranaceous or subcoriaceous, more or less deeply split into two broad rounded lobes, ¼—½ mm high, 1 mm wide. I and II membranaceous; I inserted ± halfway up the callus, ¼—½ mm long; II at the apex of the callus, ± 1 mm long. III with a rounded base, obtuse or obscurely acuminate, irregularly densely and finely granulate, quite glabrous; p_3 with a rounded hard, irregularly densely and finely granulate back; apex entire but sometimes spuriously shortly 3-dentate by the prominency of the 3 central nerves; lodicules acute or subobtuse, 1¼—1¾ mm long; anthers white, 3½—5½ mm long; styles (white stigmas included) 3—4 mm; caryopsis oblong, dull brown, 3—4 mm long.

Culms tufted on a not deep-lying, horizontal, firm short rhizome, erect, slender; leaves rather distant; sheath narrow; ligule truncate, glabrous, 1—1½ mm; blade linear-lanceolate, broadest in or slightly below the middle, tapering to both ends, at the rounded base suddenly contracted into a very short petiole, above and beneath smooth or more or less retrorsely rough, sometimes even very rough, glabrous, 5—30 cm long, 6—20 mm wide. Plant 0.30—0.75 m high.

2. **Oryza Meyeriana** (Z. et M.) Baill. (*Padia Meyeriana* Z. et M.).

Panicle erect, 4—15 cm long, bearing 5—30 spikelets, glabrous or the main axis at the base of the lateral branches with a few long white hairs; lateral branches 1—6, erect and often appressed against the main axis, hence not conspicuous, simple or very sparingly branched, short, finely granulate. Spikelets lanceolate, with a shortly narrowed base, in the upper part narrowed towards the tip, awnless, 8—10 mm long, 2½—2¾ mm wide; pedicels of lateral spikelets 1¼—2 mm, roughish; infra-spicular cup membranaceous or subcoriaceous, smooth, glabrous, faintly 2-lobed, ⅓—½ mm high, 1—1¼ mm wide; callus in sicco rugose, ½—1 mm high, 1—1¼ mm wide; I and II membranaceous; I inserted ± halfway up the callus, ¼—1 mm long; II at the apex of the callus, usually longer than I, ½—1½ mm; III irregularly densely and finely granulate, on the base of the keel usually with a short row of erecto-patent short white hairs; p_3 with a densely and finely granulate back; lodicules acute, 1½—2 mm long; anthers white, 2½—4½ mm long; styles (white stigmas included) 4—5 mm long; caryopsis oblong-lanceolate, angular-furrowed, dull brown, 5½—6½ mm long.

Culms tufted on a not deep-lying horizontal, firm, short rhizome, erect; leaves rather distant; sheaths narrow; ligule truncate, glabrous, 1—2 mm; blade lanceolate, broadest well below the middle, from there tapering upwards, at the obtuse or ± rounded base suddenly constricted into a short petiole; leaves beneath more or less retrorsely roughish, glabrous, firmly herbaceous, rather strongly veined, in vivo darkgreen, 7—22 cm long, 1—3½ cm wide. Plant 0.50—1.00 m high.

3. **Oryza minuta** Presl (*O. latifolia* Auct. non Desv.).

Panicle erect or nodding, very scabrid, finely pubescent at the insertion of the branches, 15—40 cm long, bearing more than 50 spikelets; lateral branches 5 or more, often numerous, in lower part of panicle geminate or (semi)verticillate, in upper part solitary, at last spreading or drooping; lower ones 6—22 cm long, often branched; secondary branchlets erect short. Spikelets oval with an obtuse or rounded base, in their upper part shortly narrowed towards the tip, awned, 4—5 mm long (awn disregarded), 2½—3 mm wide, dark brown or black when ripe; pedicels of lateral spikelets finely granulate and set with many erecto-patent bristles, sometimes slightly nodding at the apex but, on the whole, less distinctly so than in *O. fatua*, 1½—5 mm long; infra-spicular cup thinly coriaceous, faintly 2-lobed, ± 1/5 mm high, ± ½ mm wide; callus cylindrical, smooth, 1/3—½ mm high, ± ½ mm wide; I and II subulate, set with minute erecto-patent bristles; I at the very base of the callus, 1¼—1½ mm long; II placed very little higher, 1¼—2 mm; III obtuse or cuneate at the base, at the apex rapidly narrowed into a thin, flexuous or straight, scabrid, green, 3½—18 mm long awn, not mucronate at the base of the awn, densely and minutely granulate (granules arranged in close-set vertical and horizontal, rather regular rows), on the keel rather densely clothed with erecto-patent or upcurved, rather long, white bristles, on the 4 other nerves with similar but fewer bristles; p_3 crowned by a rather robust, ¾—1¾ mm long cusp, with a rounded, densely and minutely granulate, thinly bristly (like III) back; lodicules ½—¾ mm; anthers yellowish; stigmas violet; caryopsis oblong.

Culms few, tufted on a not deep-lying, horizontal, firm rhizome; nodes in vivo much thickened; leaves rather distant, ligule entire or lacerate, not bifid, glabrous or ciliate, 1—5 mm long; blade linear, narrowed only at the very base, suddenly contracted into a very short petiole, on both surfaces roughish or smooth, not strongly veined, 12—80 cm long, 7—30 mm wide. Plant 0.60—1.50 m high.

4. **Oryza fatua** Koen. (*O. sativa* L., forma *spontanea* Auct.).

Panicle nodding or suberect, very scabrid, 15—40 cm long, bearing upwards of 50 spikelets; lateral branches rather numerous, in lower part of panicle geminate or semiverticillate, in upper part solitary, at last spreading or drooping; lower ones 10—25 cm long, simple or branched; secondary branchlets erect, short. Spikelets oblong, unequalsided (especially so at the apex), with a cuneate or rounded base, in their upper part shortly narrowed towards the tip, awned, 7½—9 mm long (awn disregarded), 2—2½ mm wide, yellow when ripe; pedicels of lateral spikelets 1½—2½ mm long, finely granulate, glabrous or sparingly clothed with minute bristles, slightly nodding at the apex; infra-spicular cup thinly coriaceous, faintly 2-lobed, ± 1/3 mm high, ± 2/3 mm wide; callus thick, smooth, ± ½ mm high, 2/3—1 mm wide; I and II ovate-lanceolate, membranaceous, along the margins minutely bristly, 1½—2¾ mm long; I at the base of the callus, tapering towards the tip; II inserted slightly higher, not rarely abruptly acumimate, acute; III obtuse or rounded at the base, at the apex abruptly narrowed into a rather thin, flexuous, very scabrid, green, yellowish or partly or entirely purple,

4—10 cm long awn, on either side of the awn with a minute obtuse mucro (produced tips of the lateral nerves), densely and minutely granulate (granules distinctly arranged in close-set vertical and horizontal, rather regular rows), on the nerves rather thinly clothed with suberect or upcurved, longish white bristles; p_3 crowned by a rather strong obtuse, ¾—1 mm long cusp, with a rounded densely and minutely granulate thinly bristly back (like III); lodicules ± ¾ mm; anthers pale yellow, 3—5 mm; stigmas violet; caryopsis brown, 6—7 mm long.

Culms in vivo with thickened nodes; leaves rather distant; ligule deeply cleft into 2 acute segments, glabrous or at the base sparingly hairy, 10—35 mm long; blade sessile, linear, narrowed near the rather obtuse base, ± glaucous, on both surfaces smooth or roughish, not strongly veined, 15—80 cm long, 10—25 mm wide. Aquatic; culms floating, at the top ascending, rooting from the submerged nodes. Plant 1.50—4.00 m long.

This species should be compared with *O. perennis* Moench, which I have not seen.

5. **Oryza Ridleyi** Hook. f.

Panicle erect or nodding, 15—30 cm long, bearing upwards of 50 spikelets; lateral branches 5—10, erect, sparingly branched, slightly scabrid; lower branches 5—10 cm long. Spikelets oblong-lanceolate, often slightly broadened upwards, with an unequally rounded base, in the upper part shortly narrowed towards the tip, awned, 8—10 mm long (awn disregarded), 2—2½ mm wide; pedicels of lateral spikelets thinly clothed with erecto-patent short bristles, 1½—2½ mm; infra-spicular cup membranaceous, faintly 2-lobed, ± ¼ mm high, ½ mm wide; callus cylindrical, in sicco longitudinally ribbed, ± 1¼ mm high, ± ⅔ mm wide; I and II narrowly subulate, finely acuminate, thickish, set with erecto-patent short bristles; I inserted just below the middle of the callus, 5½—6½ mm long; II inserted slightly higher, about the middle of the callus, 6—7 mm long; III obtuse or rounded at the base, at the apex rapidly narrowed into a rather robust straight, scabrid, 4—5 mm long awn, very closely and finely longitudinally nerved (nerves imperceptible to the naked eye), irregularly and very minutely granulate (granules imperceptible to the unaided eye), on the central nerve and on both marginal nerves bearing many rather distant, erecto-patent moderately long bristles; two other nerves glabrous or near the top minutely bristly; p_3 slightly longer than III (awn disregarded), with a rounded-subcompressed, densely and minutely granulate (like III) back, shortly acuminate; mid-nerve near the top with rather distant erecto-patent, moderately long bristles; lodicles acute, 1½—2 mm long; anthers in dried specimens ± 2 mm long (in vivo perhaps considerably longer); styles (including stigmas) 3—4 mm long; caryopsis long, narrow.

Rhizome not seen. Culms tufted?; ligule of leaves 2½—6 mm long, often lacerate; blade linear-lanceolate, narrowed to the very base, smooth, herbaceous, not strongly veined, 17½—42 cm long, 1¾—2½ cm wide. Ascending, sometimes over considerable lenghth rooting from the nodes. Plant 0.75—2.20 m long.

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