Scientific Report on the Rice-Collection-Trip to the Philippines, New Guinea, Borneo and Java*

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The writer was sent to several countries of South Asia for wild and cultivated rice collecting under the projects, "Studies on the origin of cultivated rice" and "Genetic and cytological studies of wild and cultivated rice species", both undertaken on the grants from The Rockefeller Foundation bestowed on the National Institute of Genetics in Misima, Japan.

Reports on the distribution and taxonomy of various *Oryza* species have been published by many workers (PRODOEHL 1922; ROSCHEVICZ 1931; HITCHCOCK 1936; CHASE 1939; BACKER 1946; JANSEN 1953; TATEOKA 1962; etc.). The author follows mainly ROSCHEVICZ's classification (1931). On *Meyeriana* complex, however, the author follows TATEOKA (1962).

In the present report, some informations are given on the natural habitats, morphological and physiological characters of wild and cultivated rice collected in the Philippines, New Guinea, Borneo and Java.

PART 1.

I. Introduction

From January to March, 1961, the writer was sent to the Philippines and New Guinea in order to collect wild and cultivated rice under the project "Studies on the origin of cultivated rice" supported by a Grant (RF 57080) from The Rockefeller Foundation. He left Japan on January 21 and stayed in the Philippines for 22 days. Then he stayed in the Territory of Papua and New Guinea for 14 days and Netherlands New Guinea for 23 days. He returned to Japan on March 27, after a visit of Formosa.

During this trip, seven wild and one cultivated species including 147 strains, were collected.

II. Distribution and habitats of wild *Oryza* species in the Philippines

i) *O. officinalis* WALL.

Specimens collected have the following characteristics; plant perennial, clearly rhizomatous, vigorously growing, 40 to 178 cm long, leaf color light green, leaf blades linearly

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lanceolated, 13 to 32 cm long, 0.6 to 1.4 cm wide, ligule 1.5 to 2.7 mm long. Panicles exserted, 14 to 30 cm long with 5 to 9 primary branches, spreading at maturity. Spikelets easily shedding, 3.8 to 7.1 mm long, 1.0 to 2.8 mm wide, 0.5 to 1.4 mm thick, awn 0.1 to 25.0 mm long. Glume surface with distinct crosswise intersection rows of small tubercles and distinct bristles along the keel and the ribs. Empty glume always considerably shorter than the flowering ones and almost smooth, 0.6 to 1.2 mm long. Grain brownish yellow.

Population of this species was found in Zamboanga. The plants were growing in a slowly running stream, which was not shaded by trees and was about 40 cm deep and 1.5 m wide. Population was adjacent to a rice field separated by an embankment. The plants were growing at a distance of 10 to 15 m from one another. Plant-length depended upon the depth of the water, i.e., plants growing near the embankment were shorter than those growing in the middle of the stream. *Leersia hexandra* SWARTZ and *Hygroryza* sp., both closely related to *Oryza*, were found frequently in this area. At maturity, panicles of *O. officinalis* are inclined at an angle of 30 degrees. The plants are called by the natives "Compay de Manila", meaning "grass of Manila".

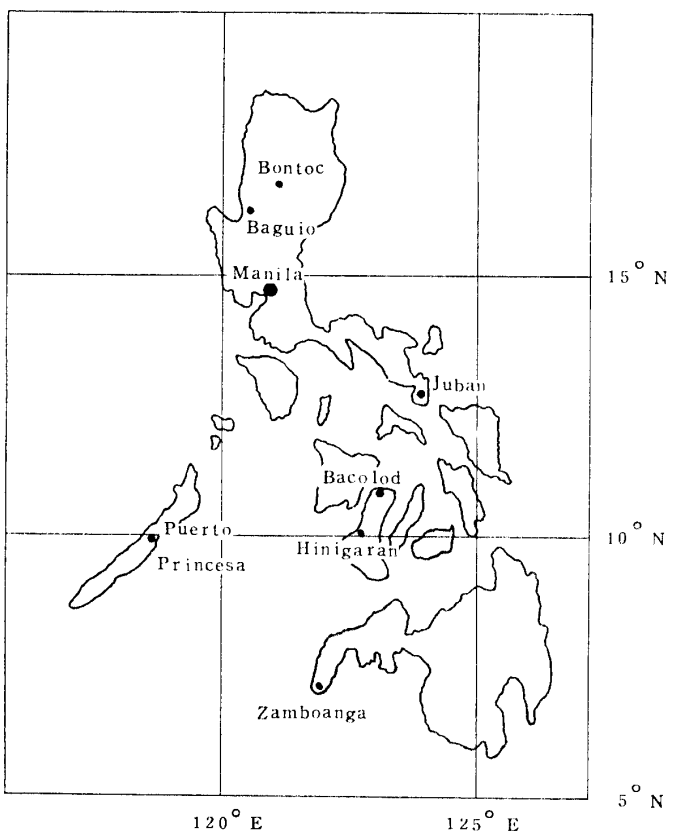

Fig. 1. Map showing several localities concerned in the Philippines

ii) *O. minuta* PRESL

Specimens of the species collected by the writer have the following characteristics; plant perennial, clearly rhizomatous, vigorously growing to 100 to 150 cm length; leaf color light green, leaf blades linearly lanceolate 25 to 30 cm long, 1.1 to 1.3 cm wide, ligule 3 mm long. Panicles well exserted and 16 to 23 cm long, with 6 to 9 primary

branches, spreading at maturity. Spikelets easily shedding, 4.1 to 5.5 mm long, 0.6 to 1.4 mm wide, awned, awn 0.0 to 10.8 mm long. Glume surface with distinct crosswise intersection rows of small tubercles and distinct bristles along the keel and ribs. Empty glume always considerably shorter than the flowering ones and almost smooth, 1.4 to 1.7 mm long. Grain brownish yellow.

On this trip, *O. minuta* PRESL was found in two districts, i.e., Hinigaran (74 km south from Bacolod) and Juban (70 km south from Legaspi, Luzon Island).

The plants of *O. minuta* found in Juban were growing in a slowly running stream, which was not shaded by trees and was about 40 cm deep and 1.5 m wide. The plants were growing at a distance of 10 to 15 m from one another. Their height depended upon the depth of the water, i.e., plants growing near the embankment were shorter than those growing in the middle of the stream.

It was very difficult to find the plants and especially to get mature grains in this district, because carabaos like to feed on them more than on other herbs. This is also true in the case of Hinigaran, where the plants were found on the side of a pond surrounded by rice fields and half-shaded by trees. Mature grains were not collected there by the writer himself, but by Prof. PANCHO of the College of Agriculture, who previously had sent us the seeds of this strain in 1960, moreover kindly allowed the writer on his way back from New Guinea in March, 1961, to take mature grains from the specimens growing in his own field.

iii) *O. meyeriana* subsp. *abromeitiana* TATEOKA

Specimens of the species collected by the writer have the following characteristics; plant perennial, rhizomatous, 50 cm high, leaf color dark green, leaf blades linear 13 to 20 cm long, 8 to 12 mm wide, ligule 1 mm long. Panicles 4 to 8 cm long, branches very few and not spreading even at maturity. Spikelets very easily shedding and 6.1 to 7.1 mm long, 1.9 to 2.1 mm wide, awnless. Glume surface having rectangularly arranged tubercles each composed of several tuberclets. Empty glume always considerably shorter than the flowering ones, 1.5 to 2.5 mm long and smooth. Grain light brown.

The plants were found only in Hinigaran, 75 km from Bacolod, half-shaded by coco palms and bamboo, on dry and poor soil. But in the vicinity of a stream, 5 m wide with fairly clear water, was found. The plants were growing at the distance of about 10 meter from one another. It was very difficult to find mature grains, because they are easily shedding.

The local name of this species is "Candumarao" or "Humay-Humay", meaning "rice-like".

iv) *O. meyeriana* subsp. *granulata* TATEOKA

Specimens collected by the writer have the following characteristics ; plant perennial, rhizomatous, 50 to 55 cm high, leaf color dark green, leaf blades linear 15 to 25 cm long, 17 to 26 mm wide, ligule 1 mm long. Panicles 8 to 13 cm long, branches of rachis very few and not spreading even at maturity. Spikelets very easily shedding and 6.9 to 7.2 mm long, 1.9 to 2.6 mm wide, awnless. Glume surface having rectangularly arranged tubercles composed of several tuberclets. Empty glume alway considerably shorter than the flowering ones, 1.6 to 2.0 mm in length and smooth. Grain light brown.

The plants were found only in a very restricted area of Bangcodo, Palawan Island, densely shaded by coco palms, bamboo and *Dipterocarpus* sp., on fairly dry soil.

As in *O. minuta*, it was very difficult to get mature grains, the writer having been able to collect only three. Plants were growing at the distance of 5 to 20 m from one another. They are called "Paray-Agay", meaning "rice, long long time ago".

It is very interesting to note that the local names of *O. meyeriana* subsp. *abromeitiana* TATEOKA and *O. meyeriana* subsp. *granulata* TATEOKA, as mentioned above, are related to rice, even though their morphological characteristics are quite different from those of the cultivated rice.

v) *O. perennis* MOENCH

Specimens collected by Prof. PANCHO have the following characteristics ; plant perennial, about 3.5 m high, leaf blades linearly lanceolate, ligule 9 mm long. Panicles exserted, 20 to 25 cm long, having 5 to 10 spreading primary branches of the rachis. Spikelets easily sheddig and 8 mm long, 2.5 mm wide, awned, awn 45 to 75 mm long. Empty glume 1.5 mm long. Grain red.

No report on the distribution of *O. perennis* MOENCH in the Philippines has been made. But the writer had the opportunity to examine dry and living specimens of this species collected by Prof. PANCHO in 1960 in Musuan of Mindanao Island, a mountainous area about 250 m high. The plants were growing on the shore of a lake.

The plants labelled *Oryza* sp., were identified by the writer with *Oryza perennis* MOENCH. Living plants were brought to Misima.

In addition to the species mentioned above, the existence of the one called *O. manilensis* MERR. has been reported in Tayabas and Rizal Province, Luzon Island (MERRILL, Philip. Jour. Sci., **3:219**, 1908). However, this species seems to be a synonym of *O. minuta* PRESL.

III. Some data on wild and cultivated rice collected in the Philippines

Eighty eight strains of cultivated rice were collected in the Philippines, with their phenol reaction, glume color, awnedness and shape investigated. The result is as given in Table 1, and seed and other characters of wild and cultivated strains are as given in Tables 2, 3 and 4.

Table 1. Some morphological and physiological characters of cultivated rice samples collected in the Philippines

			Length/width ratio of glume	
Phenol reaction	 40	strains	Ratio	No. of strains
	 48	〃	2.0	2
			2.1	2
			2.2	0
			2.3	4
Glume color yellow	 67	〃	2.4	6
brown	 21	〃	2.5	5
			2.6	8

Color of glume tip
yellow ..... 43 〃
brown ..... 13 〃
purple ..... 32 〃

Awnedness awnless ..... 66 〃
awned ..... 22 〃
(1.1 to 31.6 mm in length)

2.7 8
2.8 5
2.9 15
3.0 6
3.1 2
3.2 4
3.3 3
3.4 2
3.5 4
3.6 1
3.7 2
3.8 3
3.9 3
4.0 1
4.1 2

Table 2. Some morphological characters of grains of wild species collected in the Philippines

Strain	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
W 1198	4.79 ± 1.04	2.37 ± 0.19	1.11 ± 0.20	5.13 ± 1.94	20
W 1199	5.13 ± 0.30	2.27 ± 0.22	1.39 ± 0.21	11.40 ± 1.60	30
W 1200	4.90 ± 0.27	2.22 ± 0.16	—	—	5
W 1201	4.95 ± 0.37	2.10 ± 0.22	1.08 ± 0.10	—	12
W 1202	5.29 ± 0.39	2.33 ± 0.11	1.10 ± 0.10	8.75 ± 3.32	30
W 1203	5.06 ± 0.43	2.12 ± 0.27	1.28 ± 0.08	—	5
W 1204	5.16 ± 0.39	2.33 ± 0.17	1.25 ± 0.17	—	30
W 1205	4.88 ± 0.39	2.39 ± 0.08	1.26 ± 0.32	—	8
W 1206	6.90 ± 0.32	1.61 ± 0.25	1.31 ± 0.15	—	23
W 1207	6.90	1.20	0.90	—	1
W 1208	7.75 ± 0.27	1.50 ± 0.44	—	—	4
W 1209	8.23 ± 0.28	1.98 ± 0.28	1.58 ± 0.08	—	10
W 1210	8.10 ± 0.17	2.17 ± 0.16	0.76 ± 0.09	—	9
W 1211	7.92 ± 0.33	2.08 ± 0.17	1.06 ± 0.25	—	5
W 1212	4.70 ± 0.27	1.76 ± 0.09	0.60 ± 0.13	—	7
W 1213	4.96 ± 0.30	2.42 ± 0.14	1.32 ± 0.09	5.52 ± 2.13	30
W 1214	8.33 ± 0.37	2.20 ± 0.14	1.16 ± 0.17	7.47 ± 2.36	30

Table 3. Some morphological characters of grains of *O. sativa* collected in the Philippines

Strain	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
C 8340	8.41 ± 0.41	3.07 ± 0.13	1.97 ± 0.11	—	30
C 8341	9.14 ± 0.35	3.47 ± 0.11	2.10 ± 0.07	7.51 ± 1.81	30
C 8342	9.30 ± 0.35	2.64 ± 0.23	1.89 ± 0.06	34.66 ± 10.63	30

Strain	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
C 8343	9.56 ± 0.43	2.51 ± 0.10	1.81 ± 0.08	—	30
C 8344	9.26 ± 0.89	2.65 ± 0.10	1.82 ± 0.10	—	30
C 8345	9.43 ± 0.31	2.68 ± 0.15	1.81 ± 0.11	—	30
C 8346	9.01 ± 0.24	2.62 ± 0.09	1.78 ± 0.10	—	30
C 8347	9.43 ± 0.30	2.81 ± 0.09	1.87 ± 0.09	—	30
C 8348	7.98 ± 0.35	2.58 ± 0.13	1.68 ± 0.05	—	30
C 8349	9.58 ± 0.15	2.67 ± 0.13	1.93 ± 0.14	—	30
C 8350	8.72 ± 0.35	2.89 ± 0.11	1.96 ± 0.09	—	30
C 8351	8.83 ± 0.31	2.91 ± 0.06	1.98 ± 0.09	—	30
C 8352	6.67 ± 0.25	2.34 ± 0.13	1.65 ± 0.08	—	30
C 8353	8.84 ± 0.32	2.93 ± 0.12	1.87 ± 0.07	—	30
C 8354	8.86 ± 0.17	3.39 ± 0.15	1.96 ± 0.13	—	30
C 8355	9.51 ± 0.47	2.45 ± 0.11	1.78 ± 0.08	2.06 ± 1.07	30
C 8356	9.63 ± 0.33	2.43 ± 0.10	1.76 ± 0.07	2.87 ± 1.37	30
C 8357	8.48 ± 0.24	3.37 ± 0.16	2.02 ± 0.41	—	30
C 8358	8.84 ± 0.31	3.35 ± 0.11	1.98 ± 0.05	—	30
C 8359	9.29 ± 0.34	2.37 ± 0.09	1.75 ± 0.04	1.40 ± 0.56	30
C 8360	8.01 ± 0.21	3.07 ± 0.11	1.79 ± 0.04	—	30
C 8361	9.33 ± 0.43	2.54 ± 0.08	1.73 ± 0.08	1.63 ± 0.76	30
C 8362	9.74 ± 0.38	2.46 ± 0.10	1.73 ± 0.07	—	30
C 8363	9.41 ± 0.47	2.58 ± 0.14	1.82 ± 0.13	3.77 ± 2.14	30
C 8364	9.85 ± 0.13	2.49 ± 0.10	1.74 ± 0.07	—	30
C 8365	10.02 ± 0.54	2.36 ± 0.06	1.75 ± 0.03	—	30
C 8366	9.51 ± 0.13	2.36 ± 0.10	1.74 ± 0.08	2.41 ± 1.59	30
C 8367	9.11 ± 0.31	2.14 ± 0.11	1.71 ± 0.04	—	30
C 8368	9.28 ± 0.39	2.31 ± 0.08	1.67 ± 0.08	1.69 ± 0.28	30
C 8369	7.43 ± 0.27	3.07 ± 0.10	1.90 ± 0.18	—	30
C 8370	7.87 ± 0.27	3.13 ± 0.09	1.98 ± 0.05	—	30
C 8371	7.93 ± 0.34	2.73 ± 0.12	1.88 ± 0.10	—	30
C 8372	7.87 ± 0.23	3.19 ± 0.11	1.99 ± 0.08	—	30
C 8373	8.76 ± 0.37	2.83 ± 0.11	1.89 ± 0.13	19.01 ± 5.39	30
C 8374	7.75 ± 0.29	2.64 ± 0.12	1.79 ± 0.07	—	30
C 8375	8.19 ± 0.31	3.30 ± 0.13	2.02 ± 0.09	—	30
C 8376	8.57 ± 0.31	2.99 ± 0.15	1.94 ± 0.09	25.35 ± 8.11	30
C 8377	8.87 ± 0.24	3.05 ± 0.10	1.98 ± 0.10	34.94 ± 8.15	30
C 8378	8.38 ± 0.20	3.14 ± 0.14	2.02 ± 0.08	15.41 ± 6.80	30
C 8379	8.84 ± 0.27	3.20 ± 0.15	1.99 ± 0.06	29.42 ± 7.89	30
C 8380	8.01 ± 0.14	2.76 ± 0.08	1.76 ± 0.07	—	30
C 8381	8.01 ± 0.21	3.09 ± 0.07	1.86 ± 0.09	—	30
C 8382	8.10 ± 0.22	2.73 ± 0.06	1.81 ± 0.08	—	30
C 8383	8.56 ± 0.33	2.77 ± 0.11	1.91 ± 0.08	—	30
C 8384	8.09 ± 0.10	2.82 ± 0.17	1.82 ± 0.08	—	30
C 8385	8.25 ± 0.43	2.87 ± 0.11	1.86 ± 0.05	—	30

Strain	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
C 8386	8.02 ± 0.30	2.73 ± 0.09	1.84 ± 0.08	—	30
C 8387	7.98 ± 0.27	2.79 ± 0.11	1.89 ± 0.08	—	30
C 8388	7.80 ± 0.23	2.98 ± 0.09	1.94 ± 0.08	—	30
C 8389	7.94 ± 0.22	2.67 ± 0.10	1.78 ± 0.09	—	30
C 8390	7.62 ± 0.30	2.93 ± 0.13	1.97 ± 0.08	1.19 ± 0.58	30
C 8391	9.76 ± 0.43	2.70 ± 0.05	2.04 ± 0.06	1.95 ± 0.13	30
C 8392	8.46 ± 0.39	2.91 ± 0.12	2.01 ± 0.08	—	30
C 8393	7.09 ± 0.30	3.03 ± 0.10	1.93 ± 0.06	—	30
C 8394	7.29 ± 0.30	2.56 ± 0.09	1.76 ± 0.07	—	30
C 8395	7.74 ± 0.35	3.25 ± 0.12	2.03 ± 0.08	—	30
C 8396	9.25 ± 0.45	3.20 ± 0.10	2.02 ± 0.15	—	30
C 8397	7.82 ± 0.39	3.03 ± 0.47	2.01 ± 0.07	—	30
C 8398	7.23 ± 0.27	3.47 ± 0.12	2.31 ± 0.08	—	30
C 8399	8.35 ± 0.23	3.00 ± 0.09	2.00 ± 0.05	—	30
C 8400	9.34 ± 0.35	3.02 ± 0.09	2.18 ± 0.09	—	30
C 8401	7.58 ± 0.29	2.98 ± 0.09	1.97 ± 0.04	—	30
C 8402	9.89 ± 0.32	2.42 ± 0.06	1.87 ± 0.47	5.12 ± 4.28	30
C 8403	7.85 ± 0.39	2.94 ± 0.09	1.96 ± 0.09	—	30
C 8404	8.81 ± 0.41	3.09 ± 0.15	2.01 ± 0.11	—	30
C 8405	9.59 ± 0.44	2.62 ± 0.17	1.94 ± 0.11	2.18 ± 1.90	30
C 8406	9.65 ± 0.41	2.88 ± 0.08	1.91 ± 0.06	—	30
C 8407	9.03 ± 0.32	2.89 ± 0.16	1.91 ± 0.08	—	30
C 8408	9.09 ± 0.59	2.87 ± 0.14	1.97 ± 0.10	—	30
C 8409	8.37 ± 0.50	2.76 ± 0.17	1.88 ± 0.09	—	30
C 8410	8.53 ± 0.55	2.61 ± 0.15	1.80 ± 0.21	14.87 ± 7.84	30
C 8411	6.83 ± 0.43	2.69 ± 0.18	1.55 ± 0.25	—	12
C 8412	7.73 ± 0.25	3.47 ± 0.16	2.13 ± 0.10	—	30
C 8413	9.41 ± 0.49	3.04 ± 0.12	2.00 ± 0.09	—	25
C 8414	7.61 ± 0.41	2.51 ± 0.19	1.48 ± 0.32	—	30
C 8415	—	—	—	—	0
C 8416	9.38 ± 0.32	2.77 ± 0.21	1.99 ± 0.08	28.46 ± 8.14	30
C 8417	7.54 ± 0.30	3.65 ± 0.27	2.23 ± 0.10	—	30
C 8418	8.95 ± 0.41	3.58 ± 0.17	2.13 ± 0.14	0.80 ± 0.25	19
C 8419	8.17 ± 0.29	3.69 ± 0.15	2.07 ± 0.15	2.64 ± 1.13	30
C 8420	9.45 ± 0.49	3.03 ± 0.13	1.95 ± 0.29	—	30
C 8421	9.07 ± 0.16	3.11 ± 0.14	2.09 ± 0.20	13.35 ± 7.40	28
C 8422	7.89 ± 0.26	3.07 ± 0.12	2.04 ± 0.10	13.81 ± 5.93	30
C 8423	9.18 ± 0.39	2.81 ± 0.13	1.97 ± 0.08	1.18 ± 0.72	30
C 8424	8.56 ± 0.38	3.03 ± 0.18	2.00 ± 0.05	2.17 ± 1.49	30
C 8425	8.25 ± 0.39	3.63 ± 0.30	1.93 ± 0.27	19.60 ± 9.79	24
C 8426	9.00 ± 0.37	3.90 ± 0.24	1.97 ± 0.21	0.70 ± 0.14	30
C 8427	8.39 ± 0.38	3.00 ± 0.14	2.07 ± 0.07	—	30

Table 4. Some morphological characters of wild species collected in the Philippines

Strain	Plant height	Leaf character[1,2]			Panicle length	Shedding degree[3]	No. of first rachis	No. of panicles per plant	No. of seeds per panicle	Ligule length[1]	Apiculus color	Stigma color	No. of internodes elongated[4]
		angle	length	width									
W1199	108cm	10°	22 cm	1.4 cm	10.3cm	100 %	4.3	7	24.3	0.3 cm	—	+	5.0
W1201	134	5	25	1.4	15.0	100	5.0	12	44.0	0.5	—	+	5.0
W1203	113	10	26	1.3	12.3	84	3.3	8	23.3	0.3	—	+	6.3
W1204	104	7	27	1.4	14.7	100	5.0	5	50.7	0.3	—	+	4.3
W1205	130	7	29	1.5	14.0	83	4.3	11	33.3	0.3	—	+	5.7
W1206	38	30	15	0.8	5.3	100	1.0	19	7.7	0.1	—	—	—
W1209	37	90	12	1.7	7.7	100	1.0	6	16.7	0.1	—	—	3.3
W1213	117	10	25	1.6	14.5	19	4.5	12	36.0	0.4	—	+	5.5
W1214	158	10	62	0.9	20.3	0	5.7	13	29.3	3.3	—	+	6.7

1) Second leaf from the top.
2) All strains are of hairiness.
3) Panicles were run over six times by a rubber roller (500 gm, 3 cm in diameter) on a board inclined at 3°, and the number of grains dropped before and after this test was recorded in per cent of the total grain number.
4) Internode elongated means the internode whose length is more than 5 mm.

IV. Distribution and habitats of wild *Oryza* species in the New Guinea

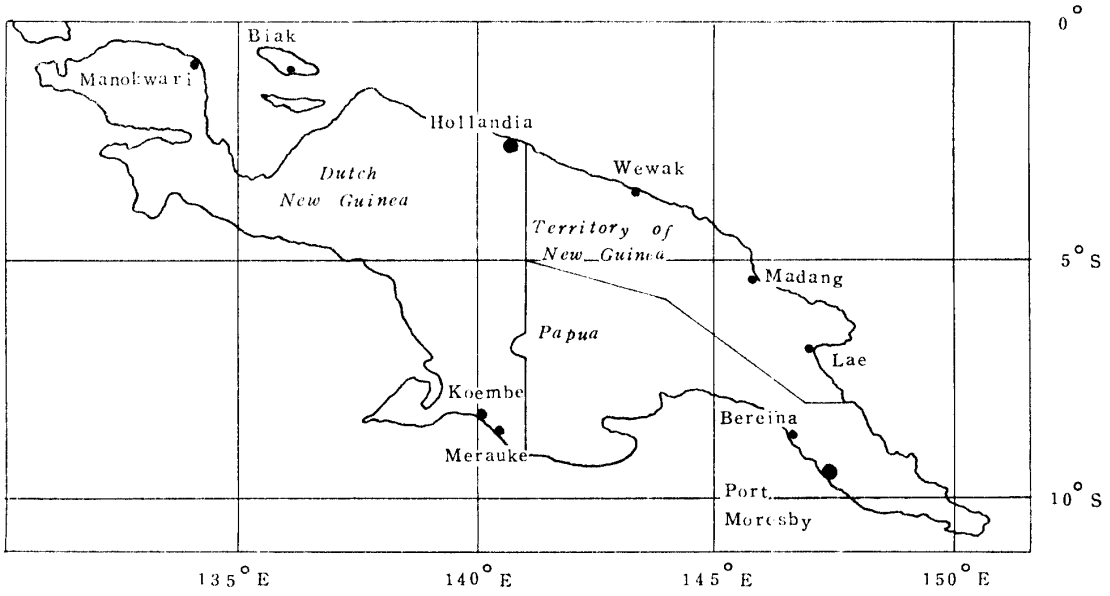

Fig. 2. Map showing several localities concerned in New Guinea

i) *O. perennis* MOENCH

Specimens of the species collected by the writer have the following characteristics; plant perennial, vigorously growing, 3 to 5 m tall, showing floating habit, leaf color light green, leaf blades linearly lanceolate 70 to 85 cm long, 1.5 cm wide, ligule 14 to 18 mm long. Panicles well exserted and 50 cm long having 10 to 17 primary branches, widely spreading at maturity. Spikelets easily shedding, 9 mm long, up to 2.5 mm wide, awned, awn 35 to 75 mm long. Empty glume 2.5 mm long and almost smooth. Grain dark brown.

In Madang, a population of about one hundred plants, not very crowded, was found in an open swamp. This habitat was distant far from rice fields and near to a forest composed of coco palms and other trees.

It is not yet ascertained whether the plants have rhizomes or not. They flower in April.

Several populations of this species were found near the Koembe River, Southern Netherlands New Guinea. In Opeco and Baad along this river, a few populations were found on the river side and in the large muddy swamps, four to six meters deep, connected with the river. The plants had a pronounced floating habit. In the dry season from June to November, this region turns out dry, having few rainy days. There was a strong current not only in the river but also in the swamp.

Occasionally, a batch of *O. perennis* plants was found flowing down the river. In this case, the plants appeared as if they were cut off, having no rhizomes and no basal roots but some adventitious roots recognized at the nodes. The peak of the flowering period seems to be in April. The plants are called "Yuni" by the natives.

This species is distributed in Daru District, Southern Papua. The writer had the op-

portunity to study the specimens collected by Mr. F. KLECKHAM at Masingara, Daru, on June 5, 1957. However, it was impossible to determine whether they were *O. perennis* MOENCH or *O. sativa* var. *spontanea* ROSCHEV., because of the missing low parts.

ii) *O. longiglumis* JANSEN

Specimens collected by the writer have the following characteristics; plant perennial, rhizomatous, vigorously growing, 1.5 to 2.5 m tall, showing floating habit; leaf color dark green, leaf blades linearly lanceolate 25 to 35 cm long, 9 to 12 mm wide, ligule 1 mm long. Panicles exserted and 15 to 23 cm long, having 6 to 9 primary branches of the rachis, only somewhat spreading at maturity. Spikelets easily shedding, 6.4 to 6.8 mm long and 2.1 to 2.3 mm wide, awned, awn 0 to 20 mm long. Empty glume always same length as the fertile ones, 6 to 7.1 mm long, almost smooth. Grain brownish yellow.

Populations of the species were found in Opeco, Baad and Wajaw along the Koembe River, Southern Netherlands New Guinea. The plants were growing in swamps densely shaded by trees such as *Eucalyptus*, *Pandanus*, *Artocarpus*, etc. The swamps were about two meters deep. The forest itself is growing in slowly running water. The motion of the water agitates the plants, making it difficult to find mature grains. The plants were growing in the interior of the forest, in the distance of about five meters from the river. This area dries out in the dry season from June to November, and natives set fire to the woods in order to catch animals, such as deer and kangaroos.

Mr. J. R. VICARY promised to send mature grains of *O. perennis* MOENCH growing in the vicinity of Madang.

Another species of the genus *Oryza*, namely, *O. schlechteri* PILGER is known to be growing in the Territory of New Guinea (North-East New Guinea). Collection of this species was unsuccessful on this trip. Further, *O. minuta* PRESL was confirmed to be distributed in Daru District, Southern Papua. Dr. D. SHAW, plant pathologist, keeps specimens of this species which were collected by Mr. F. KLECKHAM in Masingara, Daru, on June 24, 1957. Unfortunately the writer could not get into the Daru District and the Fly River Course. Mr. G. K. GRAHAM, Principal Soil Survey Officer, Konedobu, kindy promised the writer to collect and send mature grains of *O. minuta* PRESL, *O. perennis* MOENCH or *O. sativa* var. *spontanea* ROSCHEV. growing in this district.

V. Some considerations on rice cultivation in New Guinea

i) Territory of Papua and New Guinea

a: Experiment Stations

The writer visited two experiment stations, namely, Lowlands Agricultural Experiment Station in Bereina and Department of Agriculture in Madang.

In the former, they have hundred hectares for the experimental fields. Strains collected were those which had been introduced from several countries.

The main projects in Bereina are as follows; to screen strains adapted to this district; to select strains having relatively short growing period; to test irrigation systems; and to establish a method of weed protection, particularly, against *Saccharum spontaneum* L.

In the latter, there are a few experimental fields but no experiments are carried on.

b: Native cultivation of rice

1. Bereina District: The writer had a chance to visit Amoamo, Ioi and Imounga in the interior of Bereina and collect strains used by the natives. They cultivate about twenty hectares of upland fields only. Seeds are sown at the distance of about 40 cm by dibbling. In each hole about 30 grains are placed. In general, they are sown in plantations of *Xanthosoma* sp., *Colocasia* sp. or *Ipomoea batatas* L. Sowing period is from December to February and harvesting period is from May to July, requiring 180 days for complete development. These periods are very variable being dependent upon rain fall. The strains used by the natives seem to be photoperiodically insensitive. Manure is not used and yield is not measured. The strains seem to have been introduced from Italy more than fifty years ago by the missionaries.

2. Madang District: In this district, there are only three upland strains, namely China, Short Gapher and a third one. Among them China is the best from the view point of yield. Their origin is not clear. Until about five years ago, there was another strain called Long Gapher introduced from the Philippines; a red rice, short, only about fifty cm high. This strain has been abandoned owing to strong shedding. We can not find, at present, even a seed sample of this strain.

All of those strains are sown, in general, in November by dibbling at the distance of thirty × thirty-five cm or thirty ×sixty cm. They reach the length of 150 cm at maturity, The natives cultivate about forty hectares of upland fields. For about two months after sowing, weeding is practiced, but after that period there is no interference. No manure is used. As a rule, the rice fields are found on the ridge of some hill. After cutting and burning off the trees and herbs, rice is sown. If diseases or insect damages of rice become conspicuous, the area is simply abandoned and a new site is selected. This system of cultivation is common in this district.

According to literatures and an information obtained directly from a Government Officer, rice fields can be found in Ramu and Sepik River Districts. However, this information seems to be unreliable. The writer had no chance to visit those districts.

ii) Netherlands New Guinea

a: Experiment Stations

There are four Agricultural Experiment Stations here, i.e., Agricultural Experiment Station in Hollandia, Merauke Project, Oeroembe New Project and Koembe Project.

However, in three stations, i.e., Hollandia, Merauke and Oeroembe Station, experiments started only a few years ago. Oeroembe Project will become the largest Experiment Station in near future.

In Koembe Project, extensive experiments are carried on with eight specialists and about one hundred farmers. Cost of operation is estimated to be one million Guilder per year.

The farm occupies three hundred hectares used for experiments, and the soil consists mainly of marine clay. Only lowland varieties are under test in this station. Several years ago, there were about fifty strains, most of which were eliminated because of their unsuitability. Among them were Kuang Fu, a Formosana strain and Rikuto Mochi 24, a Japanese strain. Broadcasting method (about 3 bushels/hectare) is common and transplanting method is sometimes applied only to C8440, C8443 and C8444 (see the List of Collections).

Main projects carried on are as follows; manure tests, selection of strains suitable for this district, test of the best sowing period during October and April and weeding test. Percentage of germination is said to be about forty. It is so low, because after sowing, seeds are eaten by several kinds of birds, and because the field are deeply inundated in order to protect them from the bird attacking.

Yield is extremely variable from year to year on account of damages by deer, rats, ducks, wild geese, insects and mandars (kind of moor-hens), for example, 1.35 ton per hectare in 1956, 1.04 in 1957 and 1.8 in 1960. In general, sowing is done from February to March and harvesting from August to September. A report on this project was already published (VOLLEMA, 1958).

b: Native cultivation of rice

Rice-cultivation areas are found in Japen Island (Geelvink Bay), Coast of Amberbaken (Northwest of Manokwari) and Merauke (Southern New Guinea). About twenty hectares were found in each area. Average yield is calculated to be 0.5 ton per hectare in Japen and Amberbaken, and 0.6 in Merauke. Most of the strains used are upland rice called "Gogo Rancha". Weeding is occasionally practiced. Insect-pests and diseases are not as devastating as in other places. Main seasons of sowing and harvesting in Japen and Amberbaken are not known, but those in Merauke are the same as those in Koembe Project, i. e., sowing from February to March and harvesting from August to September. Seeding directly in rows or in holes is most common in those regions. Sometimes manure is used by the natives, helped by the Extension Officer.

As to the origin of strains used by the natives in Vogelkopf, it seems that they have been introduced from Indonesia, especially from Ceram Island, Moluccas, and others from Burma and Indonesia, especially Java.

Till about ten years ago, a rice area was also found in the vicinity of Manokwari, measuring ten hectares at a rough estimate, where three strains, "red", "white" and "black" seem to have been used.

At Biak, Sorong and Manokwari, a part of Vogelkopf Peninsula, a word "Pas" is used for living rice plants, husked rice and boiled rice. On the other hand, at Fakfak, the southern part of the peninsula, a similar word "Passa" is used.

Rice cultivation is almost strictly limited to the regions where Indonesian people are living. Recently those people have been routed from Netherlands New Guinea, so that rice cultivation has markedly been decreased. The natives in Netherlands New Guinea are not devoted to rice cultivation, although rice is their favored food. Main reason for it is that plenty of bananas, sago palms, coco palms, orange trees and so on can be taken without hard work. The Government Extension Officer of Agriculture is preparing a plan in detail in order to popularize the rice cultivation among the natives. But it seems to be very difficult, because the natives hate hard working.

Some morphological and physiological characters of wild and cultivated species collected in New Guinea have been investigated and are shown in Table 5, and the seed characters of each strain are given in the Tables 6, 7 and 8.

Table 5. Some morphological and physiological characters of cultivated rice collected in New Guinea

Phenol reaction	+ ..... 6 strains	
	— ..... 15 〃	
Glume color yellow	..... 13 〃	
brown	..... 8 〃	
Color of glume tip		
yellow	..... 10 〃	
brown	..... 5 〃	
purple	..... 6 〃	
Awnedness awnless	..... 20 〃	
awned	..... 1 〃	
(1 to 13.2 mm in length)		

Length/width ratio of glume

Ratio	No. of strains
2.0	1
2.2	1
2.3	2
2.4	2
2.5	1
2.6	4
3.0	2
3.1	2
3.6	1
3.9	2
4.0	2
4.2	1

Table 6. Some morphological characters of grains of wild species collected in New Guinea

Strain	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
W 1215	7.07 ± 0.49	1.82 ± 0.28	0.86 ± 0.15	12.57 ± 2.86	30
W 1216	7.32 ± 0.27	2.06 ± 0.23	1.02 ± 0.18	12.09 ± 3.17	30
W 1217	7.29 ± 0.40	1.86 ± 0.21	0.90 ± 0.15	7.57 ± 2.28	14
W 1218	7.88 ± 0.47	2.17 ± 0.12	1.14 ± 0.11	12.29 ± 2.59	30
W 1219	6.63 ± 0.48	1.89 ± 0.24	1.08 ± 0.31	9.65 ± 2.25	30
W 1220	7.04 ± 0.27	1.93 ± 0.19	1.33 ± 0.33	15.23 ± 3.02	18
W 1221	6.47 ± 0.49	1.87 ± 0.24	—	13.58 ± 2.28	30
W 1222	6.19 ± 0.52	1.91 ± 0.25	1.12 ± 0.15	8.81 ± 3.29	30
W 1223	7.67 ± 0.26	2.33 ± 0.10	1.24 ± 0.13	13.65 ± 3.13	30
W 1224	7.28 ± 0.31	2.19 ± 0.14	1.08 ± 0.17	13.53 ± 2.92	30
W 1225	7.03 ± 0.35	1.85 ± 0.29	0.63 ± 0.19	12.09 ± 2.77	14
W 1226	7.00 ± 0.23	2.10 ± 0.15	0.98 ± 0.19	11.25 ± 2.64	5
W 1227	7.33 ± 0.26	2.13 ± 0.22	1.20 ± 0.00	14.03 ± 2.09	7
W 1228	7.07 ± 0.47	1.83 ± 0.22	0.90 ± 0.15	10.30 ± 3.45	30
W 1229	7.50 ± 0.46	2.01 ± 0.17	0.99 ± 0.14	13.15 ± 3.41	30
W 1230	9.21 ± 0.45	2.48 ± 0.15	0.91 ± 0.19	36.54 ± 20.05	30
W 1235	8.26 ± 0.35	2.09 ± 0.10	1.28 ± 0.06	78.56 ± 10.91	30
W 1236	8.02 ± 0.47	2.39 ± 0.12	1.55 ± 0.17	12.72 ± 5.35	30
W 1238	8.97 ± 0.60	2.41 ± 0.23	1.46 ± 0.10	66.93 ± 15.73	18
W 1239	8.04 ± 0.38	2.26 ± 0.12	1.34 ± 0.10	59.38 ± 24.47	23

Table 7. Some morphological characters of *O. sativa* collected in New Guinea

Strain	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
C 8428	9.36 ± 0.44	3.03 ± 0.16	1.98 ± 0.08	4.19 ± 2.02	30
C 8429	8.52 ± 0.45	3.56 ± 0.16	2.03 ± 0.08	—	30
C 8430	9.26 ± 0.86	3.32 ± 0.23	1.92 ± 0.18	—	30
C 8431	9.99 ± 0.34	3.28 ± 0.13	2.08 ± 0.09	—	30
C 8432	9.78 ± 0.35	2.98 ± 0.20	1.99 ± 0.13	7.20 ± 4.71	30
C 8433	8.86 ± 0.34	3.58 ± 0.17	2.11 ± 0.11	—	30
C 8434	9.71 ± 0.38	3.14 ± 0.13	2.02 ± 0.10	1.70 ± 0.10	30
C 8435	8.59 ± 0.29	3.44 ± 0.07	2.00 ± 0.10	—	30
C 8436	8.13 ± 0.32	3.37 ± 0.12	1.99 ± 0.08	—	30
C 8438	9.30 ± 0.39	2.39 ± 0.09	1.81 ± 0.04	2.14 ± 1.15	30
C 8439	10.22 ± 0.34	2.49 ± 0.10	1.81 ± 0.06	1.90 ± 0.43	30
C 8440	10.74 ± 0.39	2.57 ± 0.12	1.95 ± 0.09	—	30
C 8441	10.74 ± 0.65	2.61 ± 0.12	1.87 ± 0.11	—	30
C 8442	8.39 ± 0.24	3.17 ± 0.13	2.18 ± 0.11	—	30
C 8443	8.87 ± 0.33	2.80 ± 0.11	2.01 ± 0.09	—	30
C 8444	10.00 ± 0.26	3.28 ± 0.14	2.02 ± 0.07	—	30
C 8445	9.15 ± 0.44	3.10 ± 0.13	1.98 ± 0.10	9.81 ± 9.62	30
C 8446	11.00 ± 0.31	2.64 ± 0.13	1.90 ± 0.07	—	30
C 8447	9.91 ± 0.34	3.07 ± 0.11	2.01 ± 0.08	—	30
C 8448	11.15 ± 0.38	2.49 ± 0.12	1.85 ± 0.09	—	30

Table 8. Some morphological characters of wild species collected in New Guinea

Strain	Plant height	Leaf character			Panicle length	Shedding degree	No. of first rachis	No. of panicles per plant	No. of seeds per panicle	Ligule length	Apiculus color	Stigma color	No. of internodes elongated
		angle	length	width									
W1215	121	40	21	1.0	20.0	84	7.0	8	83.5	0.1	—	+	7.0
W1216	108	45	24	—	18.0	69	6.7	8	72.0	0.1	—	+	4.7
W1217	154	45	19	1.3	20.5	32	7.0	16	57.5	0.2	—	+	5.5
W1218	197	20	19	—	28.7	71	9.3	7	148.3	0.2	—	+	6.7
W1220	109	45	27	1.3	22.0	13	8.0	16	100.0	0.1	—	+	6.3
W1221	110	45	24	1.1	21.3	72	5.7	3	62.7	0.1	—	+	5.7
W1222	138	65	28	—	22.3	60	7.7	6	121.3	0.1	—	+	7.3
W1223	135	10	15	—	21.7	83	7.3	12	91.3	0.1	—	+	7.0
W1224	90	50	14	—	20.0	93	5.7	17	89.3	0.1	—	+	6.3
W1227	86	45	16	—	23.0	42	6.0	3	81.0	0.1	—	+	5.0
W1229	98	60	15	0.8	12.3	85	4.7	9	41.0	0.2	—	+	6.3
W1230	144	60	47	1.1	15.0	100	3.5	8	17.5	1.8	—	+	7.5
W1235	81	10	31	1.2	15.0	100	8.7	21	54.0	0.9	—	+	5.0
W1236	90	13	25	—	14.7	71	5.7	9	30.3	1.6	—	+	9.0
W1238	215	0	—	—	22.7	79	5.0	6	27.3	1.6	—	+	7.0
W1239	94	25	39	1.3	16.0	100	8.7	19	57.7	1.2	—	+	4.0

VI. Some diseases and insect-pests of rice in New Guinea

1. Diseases

Two kinds of rice diseases were recognized, i.e., *Ramularia oryzae* DEIGHTON and SHAW and *Sphaerulina oryzina* HARA (=*Cercospora oryzae* MIYAKE).

The former called "white leaf-streak" is found in specimens collected at Amele Madang, Bainyik and other locations in the Territory of New Guinea, and Popondetta and Epo in the Territory of Papua. The pathogen of this disease is closely related to *Piricularia oryzae* CAVARA and was already reported (DEIGHTON and SHAW, 1960). The latter infects not only cultivated but also wild rice, such as *O. perennis* MOENCH or *O. sativa* var. *spontanea* ROSCHEV. and *O. minuta* PRESL. In the Department of Agriculture, Port Moresby, Dr. SHAW keeps specimens of unidentified plants. The writer examined them and determined the species name. On the label attached to them the following explanations were given: *O. minuta* PRESL ; collected by F. KLECKHAM No. 1455, Masingara, Daru, 1957, *Oryza* sp. Disease: leaf spot. *O. perennis* MOENCH or *O. sativa* var. *spontanea* ROSCHEV.; collected by F. KLECKHAM, 1957, Disease : *Cercospora oryzae* MIYAKE. The spots seem to be due to the same disease, called narrow brown leaf-spot. This disease was found by the writer in upland fields of cultivated rice in the vicinity of Madang. In this district, the disease covered a large area.

2. Insect-pests

Two kinds of insects were found in New Guinea. One is *Cnaphalocrocis medinalis* GUÉNÉE and the other is *Nephotettix bipunctatus cincticeps* UHLER.

The former was collected in the vicinity of Madang, where it populates a large area and is called grass-leaf-roller.

The latter was found at Merauke Project and, at present, has little influence upon rice cultivation. However, this seems to be due to the fact that the Project has been only recently established. This pest seems to become a serious problem in near future.

The natives usually leave rice fields which have been severely infected by insects or diseases lying idle for several years.

In addition to these, an insect called "valonk songet" is known paddy fields of Southern Netherlands New Guinea.

VII. List of seeds and specimens collected

i) Seeds

a : Collected in the Philippines

1. Wild species

NIG* No.	Collected No.	Species	Date	Place	Habitat
W1198	W 2	*O. officinalis*	Jan. 26	Zamboanga, Mindanao (3 km from City)	Small river, about 40 cm deep, plants growing at a distance of 10–15 m from one another. Adjacent to rice field. W2 to W7 are in the order of collecting positions; from the bank to the center of the river near the road. *Leersia* and *Hygroryza* growing in the same place. "Compay de Manila", meaning "grass in Manila".
W1199	W 3	〃	〃	〃	
W1200	W 4	〃	〃	〃	
W1201	W 5	〃	〃	〃	
W1202	W 6	〃	〃	〃	
W1203	W 7	〃	〃	〃	
W1204	W15	〃	〃	〃	Bulk
W1205	W16	〃	〃	〃	Single plant
W1206	W 8	*O. meyeriana* subsp. *abromeitiana*	Jan. 29	Hinigaran, (74 km from Bacolod City)	Forest, half-shaded by coco palms and bamboo. Plants growing at a distance 10–20 m from one another. Nearby no rice field. Nearby a small river about 5 m wide. Local name "Candumarao" or "Humay-Humay", meaning "rice-like".
W1207	W 9	〃	〃	〃	
W1208	W10	〃	〃	〃	
W1209	W11	*O. meyeriana* subsp. *granulata*	Feb. 1	Bangcodo, Palawan(165 km from Puerto Princesa)	Forest, half-shaded, coco palms, bamboo and *Dipterocarpus*. Plants growing at a distance 5–20 m from one another. Nearby no rice field. Very low soil humidity. Local name "Paray-Agay", meaning "rice, long long time ago".
W1210	W12	〃	〃	〃	
W1211	W13	〃	〃	〃	
W1212	W14	*O. minuta*	Feb. 4	Juban, Luzon (70 km from Legaspi)	Small ditch with a small embankment between paddy fields. On the other side, coco palms growing.
W1213	W17	*O. minuta*	—	Hinigaran, (74 km from Bacolod)	Collected by Prof. PANCHO in 1960. Growing in College of Agriculture, U. P. Collected there on March 21, '61.
W1214	W18	*O. perennis*	—	Musuan, Mindanao (Mountainous area) 250 m altitude	Collected by Prof. PANCHO in 1960. Growing in College of Agriculture, U. P. There, living plants were collected on March 21, '61. Growing in a small pond about 100 m in diameter.

* It means the succession number in the National Institute of Genetics, Misima, Japan.

2. Cultivated species

NIG No.	Collected No.	Date	Place	Habitat
C8340	C 1	Jan. 23	Dept. Agr. & Natural Resources, Bontoc, Luzon	s. March, h. June. Lowland native var. "Burik"*
C8341	C 2	〃	〃	s. Feb., h. July. Lowland var. Introduced from Manila in 1924. "Ladocon"*
C8342	C 3	〃	Lagawe, Luzon	Lowland var. "Canal"*
C8343	C 4	Jan. 24	Farm field between Santiago and San Jose, Luzon	〃 "Zenith $C_1$7787"*
C8344	C 5	〃	〃	〃 "G. Benton"*
C8345	C 6	〃	〃	〃 "Tjeremas"*
C8346	C 7	〃	〃	An off-type near a paddy field.
C8347	W 1	〃	〃	Another off-type.
C8348	C 8	Jan. 25	Central Luzon Agr. College, Nueva Eciya, Luzon	An improved lowland var. "BPI-76"*
C8349	C 9	〃	〃	Native var., cultivated in upland and lowland. "Azucena"*
C8350	C10	〃	〃	Improved lowland var. "Intan"*
C8351	C11	〃	〃	Improved lowland var. "Peta"*
C8352	C12	〃	〃	Improved upland var. "Macagim Bang"*
C8353	C13	〃	〃	Improved lowland var. "Raminad"*
C8354	C14	〃	〃	Introduced from U. S. A. "U.S. 8985"*, lowland var.
C8355	C15	〃	〃	"U.S. 9366"* 〃
C8356	C16	〃	〃	'U.S. 9370"* 〃
C8357	C17	〃	〃	"U.S. 8988"* 〃
C8358	C18	〃	〃	"U.S. 8318"* 〃
C8359	C19	〃	〃	"U.S. 1718"* 〃
C8360	C20	〃	〃	"U.S. 8989"* 〃
C8361	C21	〃	〃	"U.S. 9031"* 〃

s : sowing, h: harvesting, * : local name

NIG No.	Collected No.	Date	Place	Habitat
C8362	C22	Jan. 25	〃	"U.S. 9179"* 〃
C8363	C23	〃	〃	"U.S. 9370"* 〃
C8364	C24	〃	〃	"U.S. 9397"* 〃
C8365	C25	〃	〃	"U.S. 9439"* 〃
C8366	C26	〃	〃	"U.S. 9417"* 〃
C8367	C27	〃	〃	"U.S. 9418"* 〃
C8368	C28	〃	〃	"U.S. 9420"* 〃
C8369	C29	Jan. 25	Bureau of Plant Industry, Maligaya Exp. Station, Luzon	Improved lowland var. "Pinili Sa Mitao"*
C8370	C30	〃	〃	〃 "Macan Berong"*
C8371	C31	〃	〃	〃 "Sinibling"*
C8372	C32	〃	〃	〃 "Malinis"*
C8373	C33	〃	〃	〃 "Pinanique"*
C8374	C34	〃	〃	〃 "Macao Bocawe"*
C8375	C35	〃	〃	〃 "Sinariaya"*
C8376	C36	〃	〃	〃 "Simpolet"*
C8377	C37	〃	〃	〃 "Galaygay-3"*
C8378	C38	〃	〃	〃 "Galaygay-1"*
C8379	C39	〃	〃	〃 "Mugueu"*
C8380	C40	Jan. 26	Zamboanga, Mindanao	Lowland var. "Java"*, origin unknown.
C8381	C41	〃	〃	Lowland var. Introduced from Japan. "Chichin"*
C8382	C42	〃	〃	Off-type. Shallow swamp, about 30 cm deep, between paddy fields and small embankment.
C8383	C43	〃	〃	Another off-type similar to the above.
C8384	C44	Jan. 27	Zamboanga, Mindanao (5-10 km from City)	A popular lowland var. in Zamboanga. "Binirhin"*
C8385	C45	〃	〃	〃 "Kimsi"*
C8386	C46	〃	〃	〃 "Malaghit"*, glutinous.
C8387	C47	〃	〃	〃 "Cabal-3"*
C8388	C48	〃	〃	〃 "Trapeehe"*
C8389	C49	〃	Zamboanga-Labuan, Mindanao (10 km from Zamboanga)	〃 "Ramilon"*

NIG No.	Collected No.	Date	Place	Habitat
C8390	C50	Jan. 29	Bacon (20 km from Bacolod), Negros	A popular native upland var. in this district. "Mangarez"*
C8391	C51	〃	〃	〃 "Azucena"*
C8392	C52	〃	〃	〃 "Magsanaya"*
C8393	C53	〃	〃	〃 "Nagdami"*
C8394	C54	〃	〃	〃 "Pinulot"*
C8395	C55	〃	〃	〃 "Palawan"*
C8396	C56	〃	〃	〃 "Dinafor"*
C8397	C57	〃	〃	〃 "Dinalaga"*
C8398	C58	〃	〃	〃 "Kinandang Pulo"*
C8399	C59	〃	〃	〃 "Magnolia"*
C8400	C60	〃	〃	〃 "Milifor"*
C8401	C61	〃	〃	〃 "Inabaca"*
C8402	C62	〃	〃	〃 "Texas 331"*
C8403	C63	〃	〃	〃 "Maligaya"*
C8404	C64	〃	〃	〃 "Gaguari"*
C8405	C65	Jan. 31	Inagawan, Palawan (30 km from Puerto Princesa)	A popular native lowland var. "Malandi"*
C8406	C66	〃	〃	〃 "Milagrosa"*
C8407	C67	〃	〃	〃 "Ginaggang"*
C8408	C68	〃	〃	〃 "Apostoe"*
C8409	C69	〃	〃	〃 "Dayang-dayang"*
C8410	C70	〃	(more 16 km south)	〃 "Panakan"*
C8411	C71	〃	〃	An off-type, in the forest burned three years ago. *Panicum* with dominant growth.
C8412	C72	Feb. 1	Brooke's Point, Palawan (165 km from Puerto Princesa)	A popular native lowland var. "Pendinga"*
C8413	C73	〃	〃	〃 "Malandi-Puti"*
C8414	C74	Feb. 2	Santa Teresa River, Palawan	An off-type in a dry river bed.
C8415	C75	Feb. 4	Juban, Luzon (70 km from Legaspi)	An off-type in swamp near the paddy field.
C8416	C76	〃	〃	An off-type on road-side near an upland field.

NIG No.	Collected No.	Date	Place	Habitat
C8417	C77	Mar. 21	Agri. Ext. Worker, Fbulao, Efugao, Luzon	A popular lowland var. in "Rice Terraces"
C8418	C78	〃	〃	〃
C8419	C79	〃	〃	〃
C8420	C80	〃	〃	〃
C8421	C81	〃	〃	〃
C8422	C82	〃	〃	〃
C8423	C83	〃	〃	〃
C8424	C84	〃	〃	〃
C8425	C85	〃	〃	〃
C8426	C86	〃	〃	〃
C8427	C87	〃	〃	〃

b : Collected in New Guinea

1. Wild species

NIG No.	Collected No.	Species	Date	Place	Habitat
W1215	W101	*O. longiglumis*	Mar. 5	Opeco, Koembe	Muddy swamp 2–4 m deep, 5–100 m from Koembe River, half-shaded by *Eucalyptus*.
W1216	W102	〃	〃	〃	
W1217	W103	〃	〃	Baad, Koembe	Plants growing at a distance of 5–20 m from one another. W103–W114 were in the order of collecting positions; from the side to the center of the swamp.
W1218	W104	〃	〃	〃	
W1219	W105	〃	〃	〃	
W1220	W106	〃	〃	〃	
W1221	W107	〃	〃	〃	
W1222	W108	〃	〃	〃	
W1223	W109	〃	〃	〃	
W1224	W110	〃	〃	〃	
W1225	W111	〃	〃	〃	
W1226	W112	〃	〃	〃	
W1227	W113	〃	〃	〃	
W1228	W114	〃	〃	〃	

NIG No.	Collected No.	Species	Date	Place	Habitat
W1229	W116	〃	Mar. 6	Baad—Wajaw, Koembe	Similar to the above.
W1230	W115	*O. perennis*	Mar. 5	Baad, Koembe	Muddy swamp, Koembe riverside. Water running fast. Local name "Yuni".
W1235	W117	*O. sativa* var. *spontanea*	〃	〃	〃
W1236	W118	*O. perennis*	〃	〃	〃
W1238	W119	*O. sativa* var. *spontanea*	〃	〃	〃
W1239	W120	〃	〃	〃	〃

2. Cultivated species

NIG No.	Collected No.	Date	Place	Habitat
C8428	C101	Feb. 16	Amoamo, Bereina	A popular upland var. s. December to February, h. May to July. Introduced more than 50 years ago probably from Italy by Catholic Missionaries. Sown between *Colocasia* sp. or *Ipomoea batatas*. C102 best yielding.
C8429	C102	〃	〃	
C8430	C103	〃	〃	
C8431	C104	〃	〃	
C8432	C105	Feb. 18	Ioi, Bereina	An upland var. No local name. Origin unknown.
C8433	C106	〃	〃	〃
C8434	C107	Feb. 19	Imounga, Bereina	An upland var. No local name. Origin unknown. s. October, h. May.
C8435	C108	Feb. 24	Maiwyn, Madang	An upland var. "China"*. Best yielding in this district. s. November, h. April.
C8436	C109	〃	〃	An upland var. "Short Gapher"*.
C8437	C110	〃	〃	〃 Local name not certain.
C8438	C111	Mar. 3	Koembe Exp. Station, Koembe	A lowland var. s. January, h. May. "Rexoro"*. Introduced from Surinam.
C8439	C112	〃	〃	A lowland var. s. January, h. May. "Blue Bonnet"*. Introduced from Surinam. Most important variety in this district.
C8440	C113	〃	〃	A lowland var. s. January, h. May. "Skriviman Koti"*. Introduced from Surinam. Sometimes transplanted.
C8441	C114	〃	〃	A lowland var. s. January, h. June. "77.5.10.2 or Nickeri"*. Introduced from Surinam.

NIG No.	Collected No.	Date	Place	Habitat
C8442	C115	〃	〃	A lowland var., growing period 130 days. "Lead"*. Introduced from Sierra Leone.
C8443	C116	〃	〃	A lowland var., growing period 140 days. "Peta"*. Introduced from Indonesia. Sometimes transplanted.
C8444	C117	〃	〃	A lowland var., growing period 140 days. "Bengawan No. 9"*. Introduced from Indonesia. Sometimes transplanted.
C8445	C118	〃	〃	A lowland var., growing period 115 days. "U. V. S. No. 2"*. Introduced from U. S. Maeakka.
C8446	C119	〃	〃	A lowland var., growing period 120-130 days. "Shumed II"*. Probably introduced from India.
C8447	C120	〃	〃	An improved variety selected from hybrids between "Criollo"* and "Nero di Vialane".* Growing period 120 days.
C8448	C121	Mar. 9	Merauke	An upland var., "Markoenti"*. Oldest variety, mainly, grown by Indonesians.

ii) Specimens

a : Collected in the Philippines

Collected No.	Species	Date	Place	Habitat
S 1	*Leersia hexandra* SWARTZ	Jan. 26	Zamboanga, Mindanao	Brook, about 20 cm deep. Growing together with *O. minuta* PRESL.
S 2	*Hygroryza* sp.	〃	〃	〃 〃
S 3	*Oryza officinalis* WALL.	〃	〃	Brook, about 20 cm deep, same population as W1198.
S 4	〃	〃	〃	Brook, about 20 cm deep, same population as W1203.
S 5	*Oryza meyeriana* subsp. *abromeitiana* TATEOKA	Jan. 29	Hinigaran	Forest, half-shaded by coco palms and bamboo. Local name "Humay-Humay", meaning "rice-like".
S 6	〃		〃	
S 7	*Oryza meyeriana* subsp. *granulata* TATEOKA	Feb. 1	Bangcodo, Palawan	Forest, half-shaded by coco palms, bamboo and *Dipterocarpus*. Local name "Paray-Agay", meaning "rice, long long time ago".
S 8	〃	〃	〃	
S 9	〃	〃	〃	
S10	〃	〃	〃	
S11	〃	〃	〃	

Collected No.	Species	Date	Place	Habitat
S12	*Oryza minuta* PRESL	Feb. 4	Juban, Luzon	Small ditch separated from a paddy field by a small embankment. On the other side, coco palms growing. Carabaos like to eat it.
S13	〃	〃	〃	
S14	〃	〃	〃	
S15	*Oryza perennis* MOENCH	Feb. 7	—	Prof. PANCHO collected at Musuan, middle mountainous area of Mindanao Island in 1960. Specimens are a part of his collection.

b : Collected in New Guinea

Collected No.	Species	Date	Place	Habitat
S101	*O. sativa* L.	Feb. 17	Beipa, Bereina	In forest.
S102	*O. perennis* MOENCH	Feb. 23	Madang	A population consisting of about 100 plants growing in a swamp in the vicinity of coco palm grove.
S103	〃	〃	〃	
S104	〃	〃	〃	
S105	*O. sativa* L.	Feb. 24	Maiwyn, Madang	Disease spots.
S106	*O. perennis* MOENCH	Mar. 5	Opeco, Koembe	Swamp on the side of river. Stream fairly fast.
S107	〃	〃	〃	Local name "Yuni".
S108	〃	〃	〃	
S109	*O. longiglumis* JANSEN	〃	〃	Muddy swamp 2–4 m deep, half-shaded by *Eucalyptus*.
S110	〃	〃	〃	
S111	〃	〃	〃	
S112	〃	〃	〃	
S113	*O. perennis* MOENCH	〃	Baad, Koembe	Swamp on the side of river.
S114	〃	〃	〃	
S115	*O. longiglumis* JANSEN	Mar. 6	Band—Wajaw, Koembe	Similar to S109.
S116	*O. perennis* MOENCH	Mar. 7	Baad, Koembe	Same habitat as that of S113.
S117	*O. longiglumis* JANSEN	Mar. 5	〃	Swamp 2–5 m deep, half-shaded by *Eucalyptus* and *Pandanus*.

VIII. Abstract of diary

Jan. 21 (Sat.) Left Tokyo for the Philippines by KLM. Arrived in Manila in the afternoon. Met Dr. WORTMAN.

22 (Sun.) To Baguio by car. Visited Bureau of Plant Industry (BPI) and Baguio Exp. Station.

Jan. 23 (Mon.) To Lagawe by car. Visited Dept. Agri. & Natural Resources, Bureau of Agri. Extention, Provincial Agri., Bontoc Town and Agri. Ext. Worker, Fbulao, Kiangan.

24 (Tue.) To Santiago, Sant Mateo, Bayombong and San Jose by car. Visited Isabera BPI and Agri. College.

25 (Wed.) To Nueva Eciya and back to Manila by car. Visited Central Luzon Agri. College, Maligaya Exp. Station in Nueva Eciya and Univ. of the Philippines.

26 (Thu.) Met Dr. CHANDLER and Dr. WORTMAN. To Zamboanga via Cebu by PAL. Visited BPI in Zamboanga. Searched for wild rice populations (*O. officinalis*) in the vicinity of Zamboanga.

27 (Fri.) Searched for wild and cultivated rice in the vicinity of Zamboanga by car.

28 (Sat.) Searched for wild rice in the southern district of Zamboanga. Left Zamboanga to Bacolod via Cebu by PAL. Visited Univ. of San Carlos in Cebu City.

29 (Sun.) To Hinigaran by car. Searched for cultivated and wild rice (*O. minuta* and *O. meyeriana* subsp. *abromeitiana*). Visited BPI in Bacon. Back to Manila by PAL. Met Dr. OKA in Manila.

30 (Mon.) Visited International Rice Research Institute. To Puerto Princesa via San Jose by PAL. Visited BPI in Puerto Princesa.

31 (Tue.) To Inagawan, Aborlan and Brooke's Point by car. Visited Inagawan Sub-Colony in Inagawan and Agri. High School in Aborlan.

Feb. 1 (Wed.) Searched for wild rice (*O. meyeriana* subsp. *granulata*). To Narra by car.

2 (Thu.) Returned to Puerto Princesa by car. Visited again BPI in Puerto Princesa. To Manila via San Jose by PAL.

3 (Fri.) To Legaspi by PAL and to Sorsogon by bus.

4 (Sat.) Visited Government of Sorsogon. To Gubat, Casiguran and Juban by car. To Manila by PAL and Los Baños by bus.

5-6 (Sun.-Mon.) Stayed in Los Baños. Visited Dr. CAPINPIN in College of Agriculture, University of the Philippines and International Rice Research Institute.

7 (Tue.) To Manila by car.

8-10 (Wed.-(Fri.) Stayed in Manila to obtain the visa for Netherlands New Guinea.

11 (Sat.) Left Manila for New Guinea by QANTAS in the evening.

Feb. 12 (Sun.) Arrived in Port Moresby in the morning.

13 (Mon.) Visited Department of Agriculture, Stock & Fisheries, in Konedobu. Met Dr. SHAW, plant pathologist. Discussed and arranged about the next trip.

14 (Tue.) Searched the forest area in eastern and southern suburbs of Port Moresby by car.

15 (Wed.) Visited again Department of Agriculture, Stock & Fisheries. To Bereina

by PAT. Visited Lowlands Agricultural Experiment Station.

Feb. 16 (Thu.) Visited Beipa by car and Amoamo and Rarai on foot.

17 (Fri.) Walked to Engefa via Cacapunga River.

18 (Sat.) Walked to Ioi and Imounga.

19 (Sun.) Walked to Inawauni and Beipa. Returned to Bereina by car.

20 (Mon.) Left Bereina for Port Moresby by PAT.

21 (Tue.) To Lae by TAA. Visited Division of Botany and arranged the trip for the next day. Studied the specimens kept here and visited Botanical Garden.

22 (Wed.) Went to Mumeng by car to search the mountain and meadowy areas.

23 (Thu.) To Madang by TAA. Visited Department of Agriculture. Searched the swampy area in the vicinity of Madang.

24 (Fri.) To Maiwyn by car to collect cultivated rice in the eastern suburbs of Madang.

25 (Sat.) Left Madang to Hollandia via Wewak by TAA.

26-28 (Sun.-Tue.) Stayed in Hollandia, visited Department of Agriculture. Searched the mountainous area in the vicinity of Hollandia.

Mar. 1 (Wed.) Visited Agricultural Experiment Station and Inland Fish Experiment Station in Hollandia.

2 (Thu.) To Merauke by De Kroonduif and to Koembe by boat and car.

3 (Fri.) Visited Stichting Agrarische Bedrijven in Koembe. Investigated the experimental rice field and arranged for the next trip.

4 (Sat.) To Opeco by boat in the Koembe River.

5 (Sun.) To Baad by boat. Searched for wild rice (*O. perennis* and *O. longiglumis*) by canoe.

6 (Mon.) To Wajaw by boat. Searched also for wild rice (*O. perennis* and *O. longiglumis*) by canoe.

7 (Tue.) To Sarors by boat. Searched for wild rice.

8 (Wed.) Returned to Koembe by boat, visited again Stichting Agrarische Bedrijven in Koembe.

9 (Thu.) To Merauke by boat and car. Visited New Project of Stichting Agrarische Bedrijven in Oeroembe, and Department of Agriculture in Merauke.

10 (Fri.) To Biak via Hollandia by De Kroonduif.

11-12 (Sat.-Sun.) Stayed in Biak searching the suburbs of Biak.

13 (Mon.) To Manokwari by De Kroonduif.

14 (Tue.) Visited Forestry Division in Manokwari. To Agricultural Experiment Station.

15 (Wed.) To Maroeni by car to explore the sea-side and mountainous area.

16-18 (Thu.-Sat.) Searched the mountainous area.

Mar. 19 (Sun.) Returned to Biak by De Kroonduif.

20 (Mon.) To Manila by KLM.

21 (Tue.) Visited College of Agriculture, University of the Philippines to receive wild rice (*O. minuta* and *O. perennis*). Left Manila for Taiwan by CAT.

22 (Wed.) Visited Agricultural Experiment Station and National Taiwan University.

23 (Thu.) To Tainan by train. Visited Taiwan Sugar Research Institute.

24 (Fri.) To Chiayi by train. Visited Chiayi Branch Station, Agricultural Improvement Station of Tainan District and Chiayi Agricultural Experiment Station. To Taichung by bus.

25 (Sat.) Visited Taiwan Provincial Agricultural College, Taichung District Agricultural Improvement Station and Taiwan Provincial Seed Testing Laboratory.

26 (Sun.) Looked around in the suburbs of Taichung. Returned to Taipei by bus.

27 (Mon.) From Taipei to Tokyo by CPA.

PART 2.

I. Introduction

From March to May, 1963, the writer was sent to North Borneo, Brunei, Sarawak and Indonesia in order to collect wild and cultivated rice under the project "Genetic and cytological studies of wild and cultivated rice species" supported by a Grant (RF 62027) from The Rockefeller Foundation. He left Japan on March 16 and stayed in North Borneo for 14 days. Then he stayed in Brunei for 9 days, Sarawak for 14 days and Indonesia for 21 days. He returned to Japan on May 23, after visiting Singapore and the Philippines.

During this trip, six wild and one cultivated species including 122 strains were collected.

II. Distribution and habitats of wild *Oryza* species

1. North Borneo

i) *Oryza officinalis* WALL.

Specimens collected by the writer have the following characteristics; plant perennial, clearly rhizomatous, vigorously growing, 70 to 135 cm long; leaf color light green, leaf blades linearly lanceolate 14 to 29 cm long, 0.8 to 1.2 cm wide, ligule 3 mm long. Panicles well exserted, 16 to 24 cm long with 5 to 9 primary branches, spreading at maturity. Spikelets easily shedding, 4.1 to 6.1 mm long, 2.1 to 2.7 mm wide, 0.9 to 1.4 mm thick, awn 0 to 16.8 mm long. Glume surface with distinct crosswise intersection rows of small tubercles and distinct bristles along the keel and ribs. Empty glume always considerably

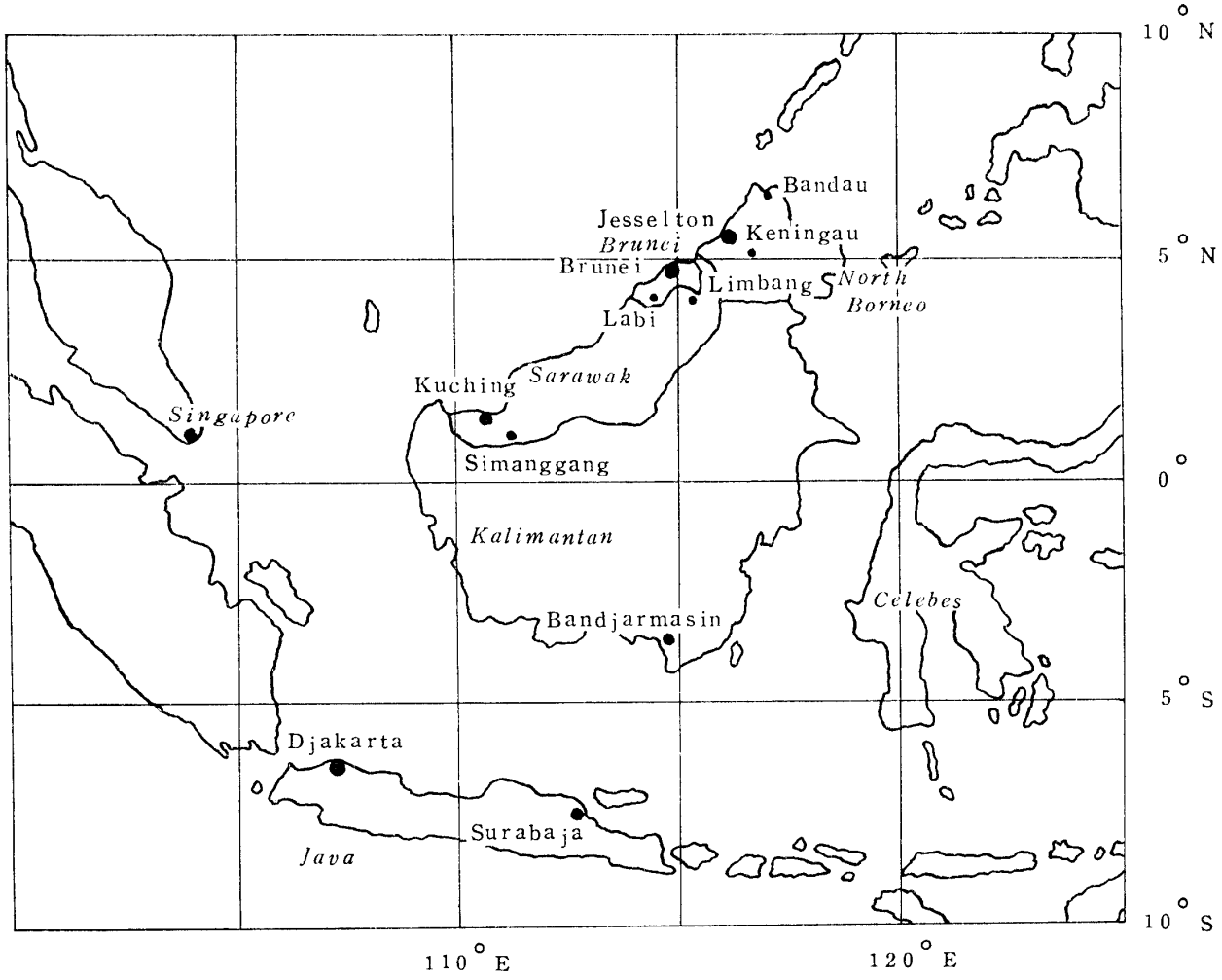

Fig. 3. Map showing several localities concerned in Borneo and Java

shorter than the flowering ones and almost smooth, 1.3 to 1.5 mm long. Grain brownish yellow.

Oryza officinalis WALL. was found in the following districts, i. e., Bandau (West Coast Residency), Melalap (Interior Residency) and Keningau (Interior Residency).

The plants of *O. officinalis* found in Bandau were growing on the road side, in swamps and in a slowly running small stream; they were not shaded or sometimes shaded by nipa palms or other trees. In Bandau-Langkon Track, they were growing in a swamp about 1 to 1.5 m deep. The swamp was separated from the nearest paddy field. The plants were growing at a distance of 10 to 300 m from one another. Their height depended upon the depth of the water, i. e., plants growing near the embankment or railway track were shorter than those growing in the middle of a stream or a swamp. They are called by the natives "Padi Hutan" or "Padi Babi", meaning "wild rice" or "pig rice", respectively.

In the case of Melalap and Keningau, conditions of the natural habitat seem to be almost the same as in Bandau, except for the shade cast mainly by the rubber trees and other tall trees. It was difficult to find the plants especially in Keningau, because often buffalos rather prefer to feed on them than on other grasses.

ii) *Oryza meyeriana* subsp. *meyeriana* TATEOKA

Specimens of the species collected by the writer have the following characteristics; plant perennial, rhizomatous, 50 to 98 cm long, leaf color dark green, leaf blades linear 17 to 21 cm long, 0.7 to 2.5 cm wide, ligule 1.5 to 2.8 mm long. Panicles 6 to 11 cm long, branches very few and not spreading even at maturity. Spikelets very easily shedding and 8.5 to 9.3 mm long, 2.2 to 2.9 mm wide, 1.5 to 2.1 mm thick, awnless. Glume surface has rectangularly arranged tubercles, each composed of several small tuberculets. Empty glume always considerably shorter than the flowering ones, 1.3 to 1.5 mm long and smooth. Grain light brown.

The plants were found only in Bunsit 9 miles from Keningau (Interior Residency). The plants were half-shaded by bamboo and *Dipterocarpus*, and growing on dry poor soil and on top of a cliff. In the vicinity of the plants a stream, 10 m wide with fairly clear water, was found. The population was very small on an area of 1 m×20 m. The plants were growing at the distance of about 1 m from one another. It was very difficult to find mature grains, because they are easily shedding. They have no local name.

iii) Off-type plants of *Oryza sativa* L.

Many off-type plants of this species were found in Donggongan and Penampong near Jesselton (West Coast Residency). They were growing in small ditches, adjacent to a rice field separated by an embankment, half-shaded by tall trees and about 30 cm deep and 1.5 m wide. The panicles were not drooping even at maturity. The plants are called by the natives like *O. officinalis* "Padi Hutan", meaning "wild rice".

2. Brunei

i) *Oryza officinalis* WALL.

Specimens of the species collected by the writer have the following characteristics; plant perennial, 50 to 180 cm long, leaf blades 28 to 35 cm long, 1.0 to 1.6 cm wide, ligule 2.5 to 3.1 mm long. Panicles 18 to 31 cm long, with 7 to 12 primary branches. Spikelets 4.2 to 6.5 mm long, 2.0 to 2.6 mm wide, 1.2 to 1.4 mm thick, awn 0 to 15.6 mm long. Empty glume 1.0 to 1.2 mm long. Other characters were like those of plants collected in North Borneo.

O. officinalis WALL. was found in two districts, i. e., Lemunin (Tutong District) and Labi (Belait District).

The plants of *O. officinalis* found in Lemunin were growing in paddy fields, in slowly running streams, in waste land and under native houses. They grow on open land, not shaded, except those found under a house. In the paddy field, only 20 plants were found on 1 acre. Each or both of *Leersia hexandra* SWARTZ and a *Hygroryza* species, closely related to *Oryza*, were frequently found on waste land together with *O. officinalis*. At maturity, the panicles of *O. officinalis* are inclined at a 20° angle. The plants growing under the houses are short and have relatively small grains in comparison with those growing on open land. The plants are called by the natives "Padi-Padi Yang", meaning "rice-like". It is very interesting to note that the base and lower part of culms are cut off and their diffusates are used for curing malaria.

In Labi, the largest Borneo population was found. The plants, in this district, were growing near a paddy field in the distance of about one mile.

3. Sarawak

i) *Oryza officinalis* WALL.

Specimens of the Sarawak species have the following characteristics; plant 43 to 140 cm long, leaf blades 20 to 30 cm long, leaf blades 20 to 30 cm long, 1.3 to 1.7 cm wide, ligule 1.5 to 2.3 mm long. Panicles 20 to 26 cm long, with 7 to 11 primary branches. Spikelets 4.5 to 7.0 mm long, 2.0 to 2.6 mm wide, 1.1 to 1.4 mm thick, awn 0 to 17.4 mm long. Empty glume 0.8 to 1.2 mm long.

The plants were found in four districts, i.e., Serian (1st Division), Simanggang (2nd Division), Miri (4th Division) and Limbang (5th Division).

The plants found in Serian, Miri and Limbang were growing in small road-side ditches. Some were shaded by tall trees and others were not shaded, growing together with a *Miscanthus* species. In Limbang the population was found near a paddy field. On the contrary, the plants found is Simanggang were growing in the garden of a "Kampong" house on wet humus. Widest variability was found in Simanggang from the view point of morphological characters, especially plant height.

Natives call it "Padi Pipit", meaning "sparrow rice".

One specimen of *O. officinalis* was collected in Miri (4th Division) by Mr. TREMEER, Agricultural Officer.

ii) *Oryza ridleyi* HOOK.

Specimens collected have the following characteristics ; plant perennial, rhizomatous, vigorously growing, 90 to 150 cm long, leaf color dark green, leaf blades linearly lanceolate 38 to 43 cm long, 1.0 to 1.5 cm wide, ligule 2.5 to 5.5 mm long. Panicles exserted and 17.5 to 25.0 cm long having 5 to 10 primary branches, only somewhat spreading at maturity. Spikelets easily shedding, 9.2 to 11.2 mm long, 2.1 to 2.8 mm wide, 1.1 to 1.4 mm thick, awn 5.1 to 10.1 mm long. Glume surface having minute longitudinal, smooth stripes. Empty glume 5.9 to 6.2 mm long, almost smooth. Grain brown.

The plants were found only in the forest along Kupong Road 4 miles south from Limbang (5th Division). The plants were heavily shaded by tall trees, and growing in very wet humus soil. The population consisted, on an area of 10 m × 10 m, of about 20 plants. The forest was adjacent to a paddy field.

4. Kalimantan (South Borneo)

i) *Oryza officinalis* WALL.

Specimens collected have the following characteristics ; plant 170 cm long, leaf blades 20 to 30 cm long, 1.3 to 1.5 cm wide, ligule 2 mm long. Panicles 23 to 25 cm long, 11 primary branches. Spikelets 5.6 to 6.8 mm long, 2.1 to 2.7 mm wide, 1.0 to 1.3 mm thick, awn 5.3 to 15.0 mm long. Empty glume 1.0 mm long.

Only 5 plants were found in Handilmanarap, which were growing in an open small canal on muddy soil. They were growing in the vicinity of a paddy field, which was established in 1958. The plants were called "Padi Kujang".

ii) *Oryza perennis* MOENCH

Specimens collected have the following characteristics ; plant perennial, about 250 cm long, leaf blades 75 to 93 cm long, 1.5 cm wide, ligule 15 to 18 mm long. Panicles 50 cm

long, widely spreading at maturity. Spikelets easily shedding, 8 mm long, up to 2.5 mm wide, awn 30 to 70 mm long. Glume surface with distinct crosswise intersection rows of small tubercles. Empty glume 2.5 mm long and almost smooth. Grain dark brown.

Ten plants were found only in Handilmanarap. They had a creeping growth in a canal, which was about 1m deep. It was adjacent to a rice field separated by an embankment. *Leersia hexandra* SWARTZ was frequently found in this district. The local name is "Padi Hijang".

iii) *Oryza sativa* var. *spontanea* ROSCHEV.

Specimens have the following characteristics ; plant 150 cm long, leaf blades 50 to 75 cm wide, ligule 13 mm long. Panicles 45 cm long. Spikelets 7.1 to 8.7 mm long, 1.8 to 2.3 mm wide, 1.4 mm thick, awn 25.9 to 74.6 mm long. Empty glume 2 mm long.

Populations of the species were found in the three districts, i. e., Bandjarmasin Town, swamps of Bandjarmasin and Belandeau. In Bandjarmasin, several plants were found on wet waste land near the native houses and in a small open swamp. The plants were growing at a distance of 100 m from one another. It was very difficult to collect the grains, because they were eaten by birds. The local name is "Padi Djuluk".

5. Java

i) *Oryza officinalis* WALL.

Specimens have the following characteristics; plant 160 cm long, leaf blades 30 cm long, 1.5 cm wide, ligule 2 mm long. Panicles 25 cm long. Spikelets 5.4 to 6.2 mm long, 2.1 to 2.4 mm wide, 1.2 to 1.4 mm thick, awn 5.7 to 25.1 mm long. Empty glume 1.0 mm long.

One plant was originally collected by Dr. N. WIRAWAN, Herbarium Bogoriense, Bogor, in Tamanjiaya, West Java. The specimen labelled *Oryza* sp. was identified by the writer with *Oryza officinalis* WALL.

ii) *Oryza perennis* MOENCH

The specimen has the following characteristics ; plant 230 cm long, leaf blades 70 cm long, 1.5 cm wide, ligule 16 mm long. Panicles 50 cm long. Spikelets 8.3 to 9.3 mm long, 2.2 to 2.4 mm wide, 1.0 to 1.4 mm thick, awn 3.6 to 36.3 mm long. Empty glume 3 mm long. Grain dark brown.

The plant was originally collected by some botanist in West Java. The locality was not clearly confirmed.

iii) *Oryza sativa* var. *spontanea* ROSCHEV.

Specimen has the following characteristics ; plant 130 cm long, leaf blades 50 to 80 cm long, 1.5 cm wide, ligule 15 mm long. Panicles 40 cm long. Spikelets 8.0 to 9.7 mm long, 1.9 to 2.3 mm wide, 1.0 to 1.4 mm thick, awn 8.9 to 68.1 mm long. Empty glume 2 mm long.

The plants were found in the three districts, i. e., Depok, Bidaratjina and West Java. Those of the last locality were originally collected by some botanist in the West Java, with no clear data obtained. Those of the former two were found in a small pond with clay bottom. Only one plant was found in each district.

It would gradually become difficult to collect wild rice in Java, because many places, where previously occurrence of wild rice was recorded, for example, Bidaratjina, Djarpang, were being transformed into paddy fields or used for the construction of

buildings.

III. Some morphological characters of grains of wild and cultivated rice collected

Forty strains of wild rice and 63 strains of cultivated rice were used for morphological investigations. The results are given in the Table 9 for wild and in the Table 10 for cultivated rice. Moreover, some morphological characters are given in the Table 11.

Table 9. Some morphological characters of grains of wild species

Strain No.	Length (mm)	Width (mm)	Thickness (mm)	Awn (mm)	No. of grains tested
W1249	4.96 ± 0.23	2.29 ± 0.13	1.21 ± 0.06	7.85 ± 2.32	30
W1250	4.83 ± 0.27	2.29 ± 0.13	1.14 ± 0.17	6.05 ± 1.24	30
W1251	4.47 ± 0.26	2.21 ± 0.11	1.20 ± 0.07	1.65 ± 2.53	30
W1252	4.87 ± 0.16	2.35 ± 0.69	1.19 ± 0.14	9.05 ± 2.71	30
W1253	4.78 ± 0.25	1.80 ± 0.39	—	4.83 ± 4.31	4
W1254	4.93 ± 0.42	2.34 ± 0.11	1.16 ± 0.14	4.10 ± 5.54	30
W1255	4.94 ± 0.34	2.14 ± 0.15	1.01 ± 0.13	0.15 ± 0.65	19
W1256	5.54 ± 0.24	2.45 ± 0.10	0.99 ± 0.24	3.00 ± 3.99	30
W1257	5.60 ± 0.37	2.46 ± 0.12	0.99 ± 0.27	2.40 ± 3.56	30
W1258	5.23 ± 0.27	2.40 ± 0.10	0.85 ± 0.19	2.60 ± 4.42	30
W1259	5.62 ± 0.23	2.38 ± 0.79	1.19 ± 0.24	3.40 ± 5.08	30
W1260	5.86 ± 0.40	2.47 ± 0.12	1.19 ± 0.27	4.51 ± 5.00	30
W1261	5.60 ± 0.32	2.48 ± 0.10	1.01 ± 0.26	1.29 ± 2.33	30
W1262	5.55 ± 0.22	2.30 ± 0.14	1.00 ± 0.10	5.97 ± 3.30	30
W1263	5.69 ± 0.30	2.40 ± 0.09	1.33 ± 0.05	6.19 ± 1.79	30
W1265	8.81 ± 0.28	2.57 ± 0.17	1.90 ± 0.15	—	30
W1266	5.47 ± 0.41	2.50 ± 0.08	1.10 ± 0.08	--	3
W1267	5.28 ± 0.49	2.51 ± 0.18	1.22 ± 0.18	4.31 ± 3.67	30
W1268	4.91 ± 0.25	2.41 ± 0.04	1.40 ± 0.13	3.74 ± 3.12	15
W1269	5.54 ± 0.65	2.36 ± 0.11	1.29 ± 0.11	8.65 ± 2.30	30
W1270	5.98 ± 0.32	2.48 ± 0.07	1.38 ± 0.04	7.46 ± 1.82	30
W1271	5.26 ± 0.28	2.21 ± 0.12	1.23 ± 0.10	2.72 ± 4.13	30
W1272	5.71 ± 0.31	2.45 ± 0.08	1.24 ± 0.15	4.97 ± 4.55	30
W1273	5.87 ± 0.34	2.43 ± 0.07	1.28 ± 0.06	8.09 ± 3.16	30
W1274	5.94 ± 0.40	2.44 ± 0.08	1.36 ± 0.11	7.85 ± 3.35	30
W1275	5.74 ± 0.26	2.29 ± 0.10	1.29 ± 0.10	8.73 ± 3.12	30
W1276	5.67 ± 0.30	2.28 ± 0.09	1.27 ± 0.07	7.46 ± 4.01	30
W1277	5.28 ± 0.40	2.31 ± 0.09	1.26 ± 0.03	3.05 ± 4.01	14
W1278	5.13 ± 0.33	2.34 ± 0.09	1.23 ± 0.12	6.80 ± 1.91	30
W1279	10.87 ± 0.47	2.53 ± 0.16	1.28 ± 0.08	7.30 ± 1.35	30
W1280	5.85 ± 0.22	2.47 ± 0.09	1.37 ± 0.06	9.40 ± 1.92	30
W1281	6.07 ± 0.49	2.30 ± 0.10	1.23 ± 0.05	4.09 ± 4.79	30
W1282	5.88 ± 0.61	2.27 ± 0.12	1.27 ± 0.08	8.70 ± 2.96	30
W1283	6.28 ± 0.40	2.19 ± 0.12	0.81 ± 0.11	12.56 ± 3.07	30
W1284	5.48 ± 0.40	2.23 ± 0.14	0.90 ± 0.09	5.05 ± 4.20	28
W1285	8.70 ± 0.36	2.08 ± 0.15	1.19 ± 0.23	40.84 ±21.54	30
W1288	8.80 ± 0.30	2.31 ± 0.07	1.18 ± 0.11	16.69 ±12.59	20
W1289	5.64 ± 0.24	2.30 ± 0.11	1.36 ± 0.07	15.74 ± 7.00	30
W1291	6.02 ± 0.50	2.48 ± 0.11	1.22 ± 0.07	8.73 ± 4.08	30
W1293	8.14 ± 0.40	2.14 ± 0.13	1.30 ± 0.08	51.94 ±15.51	30

Table 10. Some morphological characters of grains of cultivated rice

Strain No.	Length (mm)	Width (mm)	Thickness (mm)	Awn	No. of grains tested
C8454	7.44 ± 0.54	3.15 ± 0.25	2.06 ± 0.17	—	30
C8455	7.87 ± 0.46	2.88 ± 0.17	1.98 ± 0.10	—	30
C8456	10.43 ± 0.49	2.79 ± 0.05	1.86 ± 0.26	—	30
C8457	7.12 ± 0.31	2.65 ± 0.27	1.17 ± 0.35	—	30
C8458	9.48 ± 0.96	3.00 ± 0.12	1.50 ± 0.40	—	30
C8459	9.83 ± 0.44	2.80 ± 0.15	1.34 ± 0.41	—	30
C8460	8.10 ± 0.33	2.62 ± 0.14	1.81 ± 0.11	—	30
C8461	8.07 ± 0.28	2.67 ± 0.11	1.78 ± 0.11	—	30
C8462	9.33 ± 0.62	2.88 ± 0.63	1.98 ± 0.10	+	30
C8463	9.55 ± 0.52	3.03 ± 0.11	2.06 ± 0.20	—	30
C8464	7.74 ± 0.49	3.45 ± 0.14	2.04 ± 0.17	—	30
C8465	10.32 ± 0.34	2.81 ± 0.09	1.39 ± 0.12	—	30
C8466	10.72 ± 0.53	3.00 ± 0.13	1.60 ± 0.22	—	30
C8467	7.78 ± 0.35	3.47 ± 0.77	1.83 ± 0.18	—	30
C8468	10.28 ± 0.58	3.01 ± 0.14	1.95 ± 0.23	—	30
C8469	8.83 ± 0.37	2.89 ± 0.13	—	—	30
C8470	7.27 ± 0.70	2.32 ± 0.29	1.68 ± 0.12	+	30
C8471	9.21 ± 0.52	3.18 ± 0.14	1.99 ± 0.19	+	30
C8472	8.48 ± 0.45	2.97 ± 0.18	2.04 ± 0.15	—	15
C8473	8.60 ± 0.64	2.89 ± 0.22	1.44 ± 0.29	+	22
C8474	8.64 ± 0.31	2.97 ± 0.21	0.88 ± 0.26	—	30
C8475	9.15 ± 0.62	3.40 ± 0.11	2.05 ± 0.11	—	30
C8476	8.74 ± 0.35	2.77 ± 0.12	1.90 ± 0.10	—	30
C8477	9.35 ± 0.37	2.60 ± 0.11	1.90 ± 0.07	—	30
C8478	8.25 ± 0.34	3.61 ± 0.14	2.09 ± 0.09	—	30
C8479	8.87 ± 0.41	2.78 ± 0.13	1.97 ± 0.09	—	30
C8480	7.76 ± 0.33	3.38 ± 0.16	1.94 ± 0.11	—	30
C8481	9.58 ± 0.42	3.34 ± 0.11	1.95 ± 0.13	—	30
C8482	9.87 ± 0.56	2.62 ± 0.20	1.90 ± 0.07	—	30
C8483	7.79 ± 0.25	3.40 ± 0.10	1.93 ± 0.11	—	30
C8484	7.66 ± 0.47	2.56 ± 0.14	1.82 ± 0.08	—	30
C8485	9.15 ± 0.43	2.58 ± 0.12	1.97 ± 0.06	—	30
C8486	8.40 ± 0.41	2.95 ± 0.07	1.95 ± 0.10	—	30
C8487	9.40 ± 0.73	2.75 ± 0.09	1.99 ± 0.08	—	30
C8488	8.15 ± 0.52	2.85 ± 0.12	1.88 ± 0.08	—	30
C8489	8.11 ± 0.32	3.44 ± 0.17	1.99 ± 0.73	—	30
C8490	7.95 ± 0.36	2.77 ± 0.11	1.94 ± 0.10	—	30
C8491	7.94 ± 0.43	3.58 ± 0.13	1.82 ± 0.22	—	30
C8492	7.53 ± 0.39	2.68 ± 0.39	1.76 ± 0.07	—	30
C8493	9.81 ± 0.40	2.54 ± 0.10	1.85 ± 0.07	—	30
C8494	9.47 ± 0.57	3.16 ± 0.17	2.00 ± 0.07	—	30
C8495	8.64 ± 0.33	2.46 ± 0.12	1.83 ± 0.08	—	30
C8496	8.90 ± 0.46	3.65 ± 0.17	2.08 ± 0.07	—	30
C8497	9.36 ± 0.42	2.66 ± 0.16	1.97 ± 0.15	—	30
C8498	9.71 ± 0.51	3.06 ± 0.81	1.98 ± 0.81	—	30
C8499	9.51 ± 0.37	2.82 ± 0.17	1.99 ± 0.20	—	30
C8500	8.08 ± 0.29	3.52 ± 0.22	2.03 ± 0.13	—	30
C8501	9.32 ± 0.43	2.96 ± 0.11	2.01 ± 0.06	—	30
C8502	9.03 ± 0.46	2.39 ± 0.12	1.84 ± 0.78	—	30
C8503	9.66 ± 0.40	3.08 ± 0.20	1.93 ± 0.78	—	30

Strain No.	Length (mm)	Width (mm)	Thickness (mm)	Awn	No. of grains tested
C8504	9.08 ± 0.62	2.67 ± 0.13	1.80 ± 0.78	—	30
C8505	8.81 ± 0.32	2.82 ± 0.14	1.97 ± 0.07	—	30
C8506	9.68 ± 0.48	3.00 ± 0.12	1.88 ± 0.20	—	30
C8507	8.33 ± 0.43	2.91 ± 0.14	1.91 ± 0.17	—	30
C8508	8.92 ± 0.38	2.96 ± 0.85	1.94 ± 0.06	—	30
C8509	8.22 ± 0.31	3.45 ± 0.11	2.00 ± 0.07	—	30
C8510	7.87 ± 0.29	2.98 ± 0.20	1.94 ± 0.10	—	30
C8511	8.61 ± 0.36	2.49 ± 0.09	1.72 ± 0.09	—	30
C8512	8.02 ± 0.56	2.98 ± 0.15	1.97 ± 0.06	—	30
C8513	8.72 ± 0.65	2.69 ± 0.18	1.96 ± 0.10	—	30
C8514	9.10 ± 0.46	2.84 ± 0.20	2.03 ± 0.13	+	30
C8515	7.07 ± 0.37	2.89 ± 0.07	1.67 ± 0.05	—	30
C8516	7.99 ± 0.29	2.67 ± 0.15	1.68 ± 0.10	—	30

Table 11. Some morphological characters of wild species collected in Borneo and Java

Strain	Plant height	Leaf character			Panicle length	Shedding degree	No. of first rachis	No. of panicles per plant	No. of seeds per panicle	Ligule length	Apiculus color	Stigma color	No. of internodes elongated
		angle	length	width									
W1249	118	10	31	1.3	15.0	9	6.3	8	55.3	0.2	—	+	6.0
W1251	92	10	23	1.2	11.0	25	4.0	10	32.7	0.2	—	+	5.3
W1252	103	5	26	1.0	16.3	14	5.3	13	57.3	0.2	—	+	6.0
W1254	100	5	30	1.2	13.3	59	4.7	12	41.3	0.2	—	+	5.3
W1256	123	10	39	1.6	13.3	60	5.3	13	41.6	0.4	—	+	5.7
W1259	110	5	26	1.2	11.0	100	3.3	12	16.7	0.1	—	+	6.0
W1260	88	5	36	1.3	11.0	100	2.0	12	17.5	0.3	—	+	5.5
W1263	157	5	38	1.2	24.3	82	8.0	11	85.7	0.3	—	+	7.0
W1265	41	80	11	1.4	4.5	100	1.0	12	6.5	0.1	—	—	8.0
W1267	113	10	30	1.6	10.0	5	4.5	12	31.5	0.4	—	+	5.5
W1269	145	5	—	1.5	13.0	11	5.0	9	46.7	0.3	—	+	8.7
W1270	135	15	25	1.6	15.7	85	6.3	8	56.3	0.4	—	+	7.3
W1271	142	5	32	1.6	13.3	59	5.3	12	54.3	0.3	—	+	6.7
W1278	144	7	28	1.6	13.3	39	5.3	7	45.7	0.2	—	+	6.3
W1281	69	5	22	1.0	9.5	100	3.0	13	16.0	0.2	—	+	5.0
W1282	52	10	27	1.3	12.0	20	5.0	16	30.0	0.3	—	+	4.0
W1283	78	15	25	1.0	12.3	100	4.0	12	27.7	0.2	—	+	4.3
W1288	177	40	31	1.4	25.5	64	12.5	2	157.5	2.9	+	+	6.5
W1289	166	30	40	1.9	30.7	100	10.3	13	159.7	0.5	—	+	4.3
W1291	196	5	19	1.1	19.7	45	6.3	5	68.0	0.4	—	+	7.0
W1292	124	—	35	—	16.0	100	6.3	18	40.7	1.4	+	+	5.0
W1349	59	60	21	1.9	6.0	100	1.0	12	11.0	0.1	—	—	5.0
W1353	48	60	12	1.5	6.0	100	1.0	4	8.5	0.1	—	—	6.0
W1356	46	55	13	1.3	6.0	100	1.0	4	7.0	0.1	—	—	6.0
W1358	39	—	19	1.9	10.0	100	2.0	3	12.0	0.1	—	—	4.0
W1359	52	55	19	1.6	7.3	100	1.3	4	9.3	0.1	—	—	5.5

IV. List of seeds and specimens collected

1) Wild species

NIG No.	Collected No.	Species	Date	Place	Habitat
W1248	W 1	*O. officinalis*	Mar. 23, '63	Bandau, North Borneo	Road-side ditch, several hundred m apart from nearest paddy field, half-shaded by tall trees. Only one plant was found. (Specimen, S201)
W1249	W 2	〃	Mar. 24, '63	Bandau, North Borneo	Road-side small ditch about 1 m deep. (Specimens, S202, S203 and S204)
W1250	W 3	〃	〃	〃	Same habitat as above. 100 m distant from the above specimens. Native name "Padi Babi", meaning "pig rice".
W1251	W 4	〃	〃	Bandau-Langkon Track, North Borneo	2 miles from Bandau. Open swamp about 1 m deep. Growing 10 m from one another.
W1252	W 5	〃	〃	〃	3 miles from Bandau. Track side. Heavily shaded by trees, nipa palms and others.
W1253	W 6	〃	〃	〃	4 miles from Bandau. Plants growing at a distance 20-30 m from one another, in mud, shaded by trees.
W1254	W 7	〃	〃	〃	4.5 miles from Bandau. Track-side swamp about 2 m deep, heavily shaded by trees.
W1255	W 8	〃	〃	Langkon, North Borneo	Road-side swamp, shaded by rubber trees.
W1256	W 9	〃	Mar. 28, '63	Melalap, North Borneo	Road-side ditch, from Tenom to Melalap. 1.5 miles from Melalap. Half-shaded by rubber trees.
W1257	W10	〃	〃	〃	Rubber forest. Plants growing at a distance of 100 m from one another.
W1258	W11	〃	〃	〃	Similar to the above.
W1259	W12	〃	〃	〃	Railway track, open swamp, about 1 m deep. (Specimens, S205 and S206)
W1260	W13	〃	〃	〃	Similar to the above.
W1261	W14	〃	〃	〃	Rubber plantation, half-shaded. 2 miles from W1260. (Specimens, S207 and S208)
W1262	W15	〃	〃	〃	Open swamp near railway track, 2 miles from W1261.

NIG No.	Collected No.	Species	Date	Place	Habitat
W1263	W16	〃	〃	〃	A part of the above population adjacent to rice field.
W1264	W17	〃	Mar. 30, '63	Keningau, North Borneo	8 miles west from Keningau. Small canal, shaded by trees. Only one plant was found. (Specimen, S209)
W1265	W18	*O. meyeriana* subsp. *meyeriana*	〃	Bunsit, North Borneo	Dry waste land near small river. Half-shaded by bamboo. Plants growing at a distance of 1 m from one another. Population area only 1 m×20 m. (Specimens, S210, S211 and S212)
W1266	W19	*O. officinalis*	〃	Pangi, North Borneo	72 miles from Jesselton. Small ditch near railway track.
W1267	W20	〃	Apr. 3, '63	Lemunin, Brunei	Paddy field, growing together with cultivated (C8510). Only 20 plants on 1 acre. Natives called it "Padi-Padi Yang". Underground parts used for cure of malaria. (Specimen, S213)
W1268	W21	〃	〃	〃	25 miles from Brunei Town. Road-side swamp. (Specimen, S214)
W1269	W22	〃	〃	〃	27 miles from Brunei Town. Open swamp near road. Lalangrass growing together.
W1270	W23	〃	〃	〃	30 miles from Brunei Town. Road-side swamp.
W1271	W24	〃	〃	〃	Under a native house.
W1272	W25	〃	Apr. 4, '63	Labi, Brunei	Open waste land. Only 4 plants.
W1273	W26	〃	〃	〃	Road-side swamp, shaded by tall trees. 2 m long.
W1274	W27	〃	〃	〃	Similar to the above, but 1 m long.
W1275	W28	〃	〃	〃	2 miles from W1274. Irrigation canal. Large population near a paddy field (C8511).
W1276	W29	〃	〃	〃	Forest, heavily shaded. Only two plants were found.
W1277	W30	〃	Apr. 5, '63	〃	Road-side swamp, 2 m long, curly awn. Growing in poor soil.
W1278	W31	〃	Apr. 10, '63	Limbang, Sarawak	Road-side ditch, 2 miles from Limbang. Half-shaded by rubber and other trees. 20 plants were found. (Specimen, S215)
W1279	W32	*O. ridleyi*	〃	〃	4 miles south of Limbang. Forest, about 100 m apart from road, and near paddy field. Heavily shaded by trees. (Specimens, S216, S217, S218 and S219)

NIG No.	Collected No.	Species	Date	Place	Habitat
W1280	W33	*O. officinalis*	〃	〃	6.5 miles south of Limbang. Open waste land near paddy field, growing together with a *Miscanthus* species.
W1281	W34	〃	Apr. 16, '63	Hillir, Simanggang, Sarawak	1 mile west of Simanggang. Garden of Kampong house. On wet humus, together with weeds other than *Gramineae*. Native called it "Padi Pipit", meaning "sparrow rice". (Specimen, S220)
W1282	W35	〃	Apr. 19, '63	Ulu, Simanggang, Sarawak	5 m lever above sea. Garden of Kampong house.
W1283	W36	〃	—	Miri, Sarawak	Collected by Mr. TREMEER.
W1284	W37	〃	—	Serian, Sarawak	Similar to the above.
W1285	W101	*O. sativa* var. *spontanea*	May 1, '63	Bogor, Indonesia	Pond in the Botanic Gardens of Bogor. Originally collected in West Java. No clear data obtained.
W1286	W102	〃	May 2, '63	Depok, Indonesia	Pond in Fishery Experiment Station of Depok. Only 1 plant was found.
W1287	W103	〃	May 3, '63	Bidaratjina, Indonesia	In pond growing together with some other *Gramineae*. Only 1 plant was found.
W1288	W104	*O. perennis*	May 4, '63	Bogor, Indonesia	Experimental Field of Agriculture.
W1289	W105	*O. officinalis*	〃	〃	Similar to the above.
W1290	W106	*O. sativa* var. *spontanea*	May 11, '63	Bandjarmasin, Indonesia	Small open swamp. Only 3 plants were found. Growing at a distance of 100 m from one another. Natives called it "Padi Djuluk". (Specimen, S301)
W1291	W107	*O. officinalis*	〃	Handilmanarap, Indonesia	Open canal, muddy soil. Only 5 plants were found. This district was opened to culture in 1958. Natives called it "Padi Kujang".
W1292	W108	*O. perennis*	〃	〃	Similar to the above. Creeping in a canal. Natives called it "Padi Hijang".
W1293	W109	*O. sativa* var. *spontanea*	May 12, '63	Belandeau, Indonesia	Along Sungai Pantai. Open small ditch. Plants growing at a distance of 50 m from one another. (Specimens, S302 and S303)
W1348	W110	*O. meyeriana* subsp. *meyeriana*	Mar. 30, '63	Bunsit, North Borneo	Dry waste land near small river. Half-shaded by bamboo.
〜	〜				
W1360	W122	〃	〃	〃	

2) Cultivated species, *O. sativa*

NIG No.	Collected No.	Date	Place	Habitat
C8454	C 1	Mar. 18, '63	Jesselton, North Borneo	Escaped from cultivation, on railway track, 100 m from the bay. On lime. Off-type.
C8455	C 2	Mar. 19, '63	Tuaran, North Borneo	Lowland variety.
C8456	C 3	〃	Menggatal, North Borneo	Lowland variety.
C8457	C 4	Mar. 20, '63	Telipok, North Borneo	Most popular variety in this district.
C8458	C 5	〃	Inanam, North Borneo	Similar to the above.
C8459	C 6	Mar. 21, '63	Papar, North Borneo	12 miles from Papar Railway Station. Old strain in North Borneo.
C8460	C 7	Mar. 23, '63	Kudat, North Borneo	8 miles from Kudat toward the interior. Lowland variety. 10 m altitude.
C8461	C 8	〃	〃	Similar to the above.
C8462	C 9	〃	Bandau, North Borneo	1 mile south of Bandau. Lowland variety.
C8463	C10	〃	〃	Similar to the above. Local name "Padi Belachu".
C8464	C11	〃	〃	Similar to the above.
C8465	C12	〃	〃	Similar to the above.
C8466	C13	〃	〃	Similar to the above.
C8467	C14	〃	〃	Similar to the above. Local name "Padi Kandiga".
C8468	C15	〃	〃	1 mile south of Bandau. Lowland variety.
C8469	C16	〃	〃	Similar to the above. Local name "Padi-Kuningam".
C8470	C17	Mar. 24, '63	〃	1 mile north of Bandau. Lowland variety. Smell grains.
C8471	C18	〃	〃	Similar to the above.
C8472	C19	Mar. 25, '63	Pandasan, North Borneo	Upland variety. 50 m altitude.
C8473	C20	Mar. 27, '63	Tenom, North Borneo	8 miles from Tenom. Upland variety. 100 m altitude, in mountainous area.
C8474	C21	Mar. 29, '63	Tambunan, North Borneo	Lowland variety, very old strain. 200 m altitude.
C8475	C22	Apr. 1, '63	Kilanas, Brunei	Lowland variety. Local name "Badus".
C8476	C23	〃	〃	〃 "Galoh"
C8477	C24	〃	〃	〃 "Karang Kijang"

NIG No.	Collected No.	Date	Place	Habitat	
C8478	C25	Apr. 1, '63	Kilanas, Brunei	Lowland variety.	"Kerangan"
C8479	C26	〃	〃	〃	"Kutai"
C8480	C27	〃	〃	〃	"Mariau"
C8481	C28	〃	〃	〃	"Mempueh"
C8482	C29	〃	〃	〃	"Mirah Isi"
C8483	C30	〃	〃	〃	"Nagalang Takun"
C8484	C31	〃	〃	〃	"Pusu"
C8485	C32	〃	〃	〃	"Saba"
C8486	C33	〃	〃	〃	"Sengkidau"
C8487	C34	〃	〃	〃	"Siam"
C8488	C35	〃	〃	〃	"Si-Ludin"
C8489	C36	〃	〃	〃	"Si-Rendah Ampal"
C8490	C37	〃	〃	〃	"Tidong"
C8491	C38	〃	〃	Upland variety.	"Arang"
C8492	C39	〃	〃	〃	"Bangang"
C8493	C40	〃	〃	〃	"Karangan"
C8494	C41	〃	〃	〃	"Lakatan Badus"
C8495	C42	〃	〃	〃	"Lakatan Balek"
C8496	C43	〃	〃	〃	"Lakatan Piasau"
C8497	C44	〃	〃	〃	"Lakatan Sidop"
C8498	C45	〃	〃	〃	"Lapis"
C8499	C46	〃	〃	〃	"Lumpor II"
C8500	C47	〃	〃	〃	"Perak"
C8501	C48	〃	〃	〃	"Pulot Harom"
C8502	C49	〃	〃	〃	"Radin Amau"
C8503	C50	〃	〃	〃	"Samali"
C8504	C51	〃	〃	〃	"Sasi Layan"
C8505	C52	〃	〃	〃	"Sembayong"
C8506	C53	〃	〃	〃	"Simuda"
C8507	C54	〃	〃	〃	'Si-Rendah Ekor Payau"
C8508	C55	〃	〃	〃	"Si-Rasau"
C8509	C56	〃	〃	〃	"Tamangong"

NIG No.	Collected No.	Date	Place	Habitat
C8510	C57	Apr. 3, '63	Lemunin, Brunei	23 miles from Brunei Town near Agricultural Department of Lemunin. Lowland variety. Strain found together with W1267.
C8511	C58	Apr. 4, '63	Labi, Brunei	Lowland variety. Popular rice in this district.
C8512	C59	Apr. 10, '63	Limbang, Sarawak	4 miles south of Limbang. Popular lowland variety in this district.
C8513	C60	Apr. 12, '63	Serian, Sarawak	9 miles from center of Serian. Upland variety. Shifting method used.
C8514	C61	〃	〃	11 miles from center of Serian. Upland variety. Shifting method used. Growing together with *Coix* sp.
C8515	C62	〃	〃	6 miles from center of Serian. Popular lowland strain in this district.
C8516	C63	Apr. 17, '63	Stumbin, Sarawak	Lowland variety, low yield. Local name "Padi Selasah", meaning "smell rice".

3) Wild species other than *Oryza*

Collected No.	Species	Date	Place	Habitat
M201	*Hygroryza* sp.	Mar. 18, '63	Jesselton, North Borneo	Railway track leading to mountains. Plants growing at a distance of 5 m from one another. Small population.
M202	*Citrus* sp.	Mar. 21, '63	Papar, North Borneo	Popular orange in this district. Teste not good but very juicy.
M203	*Hygroryza* sp.	Mar. 25, '63	Pandasan, North Borneo	Waste grass land, large population on about 100 m×50 m area.
M204	*Leersia hexandra* SWARTZ	Apr. 1, '63	Kilanas, Brunei	Irrigation canal near paddy field. Large population, area about 1 m×100 m along the canal.
M205	*Ipomoea* sp.	Apr. 7, '63	Brunei Town, Brunei	Dry waste grass land and hedge of a house. Flowering at 10 a.m.
M206	*Coix* sp.	Apr. 12, '63	Serian, Sarawak	Growing together with C8514, in upland rice. Natives use it for bread.
M207	*Ipomoea* sp.	〃	Kuching, Sarawak	Hedge of school.
M208	*Musa* sp.	Apr. 23, '63	〃	One finger had 2 seeds, other 6 were seedless.
M301	*Musa* sp.	May 1, '63	Bogor, Indonesia	One finger had one seed, other 10 were seedless.
M302	*Ipomoea aquatika* FORSK	May 3, '63	Soenter, Indonesia	Waste land near paddy field. Natives use its leaves for vegetable. Growing on about 2 m×2 m area.

Collected No.	Species	Date	Place	Habitat
M303	—	May 15, '63	Tretes, Indonesia	Tall tree, red flowers. Growing in mountainous area. Local name "Pohon Spatudia".
M304	*Ipomoea* sp.	May 19, '63	Sedili, Johore, Malaya	2 miles from Sedili Town. Creeping on road.

V. Characteristics of *Oryza officinalis* WALL. found in Borneo

The plants of *O. officinalis* collected in Borneo were conspicuously different from those collected in other tropical Asiatic regions in the following characteristics. 1) Native localities were widely scattered over the whole island in Borneo, whereas those of strains found in other regions were rather limited to narrow areas. Population size of each strain found in Borneo was much larger than that of the strains found in other regions of tropical Asia. 2) In Borneo, *O. officinalis* was found not only in shady places under the trees or houses but also in open fields. Sometimes it was growing sympatrically with *O. sativa* in the paddy fields. On the contrary, the natural habitats of most strains of this species collected in other regions were shady spots in the forest. 3) High variation was found in size and shape of grains, leaf length and plant height of *O. officinalis* collected in Borneo. 4) The ratio of photoperiodically sensitive vs. insensitive plants among whole strains collected in Borneo was 7 to 5. The value indicates a considerable difference from the ratio, 1 sensitive to 3 insensitive, obtained for the strains of this species found in other regions (KATAYAMA, 1964). It is noteworthy that many sensitive strains were detected even in Borneo, an equatorial island, situated between 7°N to 4°S latitude.

VI. Abstract of diary

March 16 (Sat.) Left Tokyo for the Philippines by SAS.

17 (Sun.) Stayed in International Rice Research Institute, Los Baños. Met Dr. T. T. CHANG.

18 (Mon.) Left Manila for North Borneo by CPA. Arrived in Jesselton in the afternoon. Met Mr. K. G. MALET, Agricultural Officer, Jesselton.

19 (Tue.) To Tuaran by car. Visited Mr. M. SMITH, Agricultural Officer, Department of Agriculture, Central Agricultural Station at Tuaran. Returned to Jesselton and visited Department of Agriculture, Jesselton. Observed some grass specimens collected by Mr. R. H. FOSTER in 1952.

20 (Wed.) To Telipok, Penampang by car. Returned to Jesselton in the evening.

21 (Thu.) To Papar by train, accompanied by Mr. MALET. Visited Department of Agriculture. Returned to Jesselton in the evening.

22 (Fri.) To Kudat by Straits Steamship Co., LTD.

23 (Sat.) Met Mr. S. PONNUDURAI, Agricultural Officer in Kudat. To Sikuati, interior of Kudat, by car and returned to Kudat. In the afternoon to Bandau by boat, accompanied by Mr. G. GINIBON, Junior Agricultural Assistant. One plant of *O. officinalis* (W1248) was found in a swamp.

24 (Sun.) To Langkon on foot. A population of *O. officinalis* (W1249-W1255) in the vicinity of Bandau and from Bandau to Langkon Track.

25 (Mon.) To Pandasan on foot.

26 (Tue.) To Kota Belud on foot. Visited Mr. P. W. H. WALSH-REMMIS in Department of Agriculture at Kota Belud. Returned to Jesselton by land rover in the evening.

27 (Wed.) To Tenom by train. Met Mr. M. A. LOGAN, Department of Agriculture in Keningau. Looked around in the vicinity of Tenom and its mountainous area on foot.

28 (Thu.) Field trip to Melalap on foot. A population of *O. officinalis* (W1256-W1263) was found. In the evening to Keningau by land rover.

29 (Fri.) Visited Mr. M. A. LOGAN, Department of Agriculture, Keningau. To Tambunan and returned to Keningau by land rover.

30 (Sat.) Trip to Bunsit by land rover. Populations of *O. officinalis* (W1264 and W1266) and *O. meyeriana* subsp. *meyeriana* (W1265 and W1348-W1360) were found. Proceeded to Tenom by land rover and to Jesselton by train in the evening.

31 (Sun.) Stayed in Jesselton.

April 1 (Mon.) Left Jesselton for Brunei by MA. Visited Agricultural Station of Kilanas.

2 (Tue.) Visited Mr. A. D. HAMIDOON, State Agricultural Officer, in Brunei Town. Trip to Tanjong Langgir and Jerudong by car, accompanied by Mr. W. G. AGNE, Department of Agriculture.

3 (Wed.) Visited Mr. S. SOO, Agricultural Station in Lemunin. Found *O. officinalis* (W1267-W1271).

4 (Thu.) Trip to Labi via Kuala Belait by land rover and boat. Visited Department of Agriculture in Kuala Belait. Found a population of *O. officinalis* (W1272-W1276).

5 (Fri.) A small population of *O. officinalis* (W1277) was found. Returned to Brunei Town by boat and land rover.

6 (Sat.) Field trip to Bangar by boat. Visited Department of Agriculture in Bangar.

7 (Sun.) Stayed in Brunei Town.

8 (Mon.) Field trip to Lumapas by boat and land rover. Visited Agricultural Station in Lumapas. Returned to Brunei Town in the evening.

9 (Tue.) To Muara by car. Returned to Brunei Town.

10 (Wed.) Trip to Limbang, Sarawak, by boat. Visited Mr. BARBANIE, Department of Agriculture in Limbang. Collected *O. officinalis* (W1278 and W1280) and *O. ridleyi* (W1279). Returned to Brunei Town in the evening.

11 (Thu.) Flight from Brunei to Kuching, Sarawak, by MA. Visited Drs. L. J.

FOSTER and J. R. DUNSMORE, Department of Agriculture, Kuching.

12 (Fri.) Field trip to Serian, Tarat and Tebakang. Visited Agricultural Experimental Station in Tarat. Found *O. officinalis* but could not collect mature grain. Returned to Kuching in the evening.

13–15 (Sat.–Mon.) Stayed in Kuching and looked around in the vicinity of Kuching.

16 (Tue.) To Simanggang by land rover. Looked around swamps in the vicinity of Simanggang. *O. officinalis* was found (W1281).

17 (Wed.) Trip to Stumbin by boat, accompanied by Mr. A. WHITE. Visited Agricultural Experimental Station in Stumbin. Returned to Simanggang in the evening.

18 (Thu.) To Betong by boat and land rover. Visited Department of Agriculture in Betong. Looked around swamps and paddy fields in the vicinity of Betong.

19 (Fri.) Returned to Simanggang by land rover and boat. *O. officinalis* (W12 82) was found.

20 (Sat.) To Kuching by land rover.

21 (Sun.) Stayed in Kuching.

22 (Mon.) Visited Department of Agriculture in Kuching.

23 (Tue.) Field trip to paddy fields in the vicinity of Kuching on foot.

24 (Wed.) Flight from Kuching to Singapore by MA.

25 (Thu.) Visited Botanic Gardens and Herbarium, Singapore. Met Drs. M. BURKILL, Director and A. G. ALPHONSO. Studied the specimens collected in Malaya and Singapore.

26 (Fri.) Flight from Singapore to Djakarta by JAL.

27 (Sat.) Visited Consulate General of Japan.

28 (Sun.) Stayed in Djakarta.

29 (Mon.) To Bogor by car. Met Mr. H. SIREGAR, Director of Cereals Research Institute. Visited Dr. N. WIRAWAN, Herbarium Bogoriense.

30 (Tue.) Studied the specimens at Herbarium Bogoriense. Detected and identified some specimens.

May 1 (Wed.) Visited Botanic Gardens of Bogor. Collected *O. sativa* var. *spontanea* (W1285).

2 (Thu.) Field trip to Depok by car accompanied by Mr. M. SUNDARU, Cereals Research Institute. *O. sativa* var. *spontanea* (W1286) was found.

3 (Fri.) Trip to Tandjong, Soenter, Bidaratjina by car. *O. sativa* var. *spontanea* (W1287) was found.

4 (Sat.) Trip to Tjibodas by car. Visited Botanic Gardens of Tjibodas. Collected *O. perennis* (W1288) and *O. officinalis* (W1289).

5 (Sun.) Returned to Djakarta by car.

6–8 (Mon.–Wed.) Stayed in Djakarta. Looked around the paddy fields and river in the vicinity of Djakarta.

9 (Thu.) Flight from Djakarta to Bandjarmasin via Surabaja by GIA.

10 (Fri.) Trip to Gambut and Bandjarbaru by land rover and on foot.

11 (Sat.) Visited Department of Agriculture, Bandjarmasin. Field trip to Handilmanarap by car and on foot, accompanied by Mr. NOORSJAMSI. Collected *O. sativa* var. *spontanea* (W1290), *O. officinalis* (W1291) and *O. perennis* (W1292).

12 (Sun.) To Belandeau by boat. A population of *O. sativa* var. *spontanea* (W1293) was found. Proceeded to Bandjarbaru via Bandjarmasin.

13 (Mon.) Flight to Surabaja by GIA.

14 (Tue.) Visited Consulate General of Japan in Surabaja. Trip to Tretes by car.

15 (Wed.) Returned to Surabaja by car. Looked around paddy fields.

16 (Thu.) Flight from Surabaja to Djakarta by GIA.

17 (Fri.) Flight from Djakarta to Singapore by JAL.

18 (Sat.) Stayed in Singapore and visited Botanic Gardens.

19 (Sun.) Field trip to Johore by car, accompanied by Dr. A. G. ALPHONSO. Returned to Singapore in the evening.

20 (Mon.) Stayed in Singapore.

21 (Tue.) Flight from Singapore to Manila via Saigon by PAA.

22 (Wed.) Stayed in International Rice Research Institute, Los Baños, and gave to the Institute some seeds and specimens collected in Borneo.

23 (Thu.) Left Manila to Tokyo by KLM.

PART 3.

ABSTRACT The writer was sent to the Philippines, Territory of Papua and New Guinea and Netherlands New Guinea in 1961, and to North Borneo, Brunei, Sarawak, Kalimantan and Java in 1963. Two hundred sixty nine strains of several species were collected, namely, 172 of *Oryza sativa* L., 8 of *O. sativa* var. *spontanea* ROSCHEV., 5 of *O. perennis* MOENCH, 45 of *O. officinalis* WALL., 6 of *O. minuta* PRESL, 17 of *O. meyeriana* BAIL., 1 of *O. ridleyi* HOOK. and 15 of *O. longiglumis* JANSEN.

Judging from some characteristics of *O. officinalis* found in Borneo, it may reasonably be assumed that the origin of *O. officinalis* is to be followed in Borneo or in its adjacent islands, and that photoperiodically sensitive strains of this species might be the original form from which the insensitive strains would have been derived.

In Southern New Guinea it was found that the large population of *Oryza perennis* was floating and being carried away in Koembe River. It is presumable that such migration behavior is one of the most important method by which the plant is differentiated and spreads their population size.

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