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MATHEMATICAL STUDIES ON THE INFLUENCE OF TEMPERATURE AND MOISTURE ON NITRIFICATION

BY

KOJI MIYAKE and YOSHIAKI ISHIZUKA

Introduction

It is a well known fact that nitrification is the phenomena of transforming ammoniacal nitrogen into nitric nitrogen by the action of microorganisms. The nature of this biochemical process was proved, some years ago, by one[1] of the authors, to be autocatalitic monomolecular reaction.

The influences of enviromental conditions upon the nitrification have been studied hitherto by many investigators,[2] from the stand point of soil bacteriology. But no papers have as yet been presented which formulate the relation between the sorrounding conditions and the bacterial activity. On this account, we here attempt to elucidate a phase of the formulation.

The present paper contains the results obtained in experiments with temerature and moisture.

Materials used for Experiment

The soil used was taken from the unmanured plot in the experimental field of our University, in which indian corn had been cultivated continuously for five years without manures.

For the experiment air dried soil was used after it was passed through a 0.5 mm. sieve.

The moisture content and water capacity of the soil was determined to be 7.9 % and 53.7 % respectiuely.

Ammoniunm sulfate was used as the material to be nitrified, 0.0472 g. of which being equivalent to 10 milligrams of nitrogen.

Experiment on the Influence of Temperature

Ten grams of the soil were mixed with ammonium salfate equivalent to 10 milligrams of nitrogen. To this was added water, equivalent to 70% of the water capacity of the soil. After mixing well, the soil was placed in a 150 c. c. Erlenmayer flask with a stoppered cork. The flask was then allowed to stand in a thermostat at constant temperature of 0°C, 12°C, 20°C, 27°C, 32°C and 37°C respectively.

After the definite intervals of time indicated in Table 1, the flask was taken out from the thermostat and the nitrates formed were determined colorimetrically by the method of phenyldisulfonic acid as follows:

From 100 c. c. to 300 c. c. of distilled water were added to the flask according to the amount of nitrate formed. After addition of a small amount of aluminium-hydroxide, it was shaken for a few minutes in order to obtain a clear liquid. After standing for an hour it was filtered through dried filter paper. The definite amount of the filtrate thus obtained was placed in a glass basin and evaporated nearly to dryness on a water bath. 1 c. c. of phenyldisulfonic acid was then added to the residue and mixed. After standing for 15 minutes, about 15 c. c. of distilled water were added and well stirred. Ammoniumhydroxide was then added until the solution was alkaline, then distilled water bringing it up to 500 c. c.. The yellow color produced was compared colorimetrically with the standard solution which contains 0.01631 g. of pure crystallized potassium nitrate to a litre.

The results obtained are tabulated as follows.

Table 1 Amount of Nitrate produced in milligrams

Time (days)	0°C	12°C	20°C	27°C	32°C	37°C
0	0.065	0.065	0.065	0.065	0.065	0.065
1	0·065	0.065	0.065	0.065	0.065	0.065
2	0.065	0.070	0.080	0.083	0.092	0.085
3	0.066	0.077	0.105	0.107	0.114	0.110
4	0.068	0.096	0.116	0.126	0.150	0.134
5	0.c80	0.115	0.122	0.160	0.214	0.186
7	0.081	0.120	0.135	0.180	0.330	0.192
9	0.080	0.140	0.154	0.272	0.410	0.268

Time (days)	0°C	12°C	20°C	27°C	32°C	37°C
11	0.085	0.158	0.263	0.395	0.614	0.384
13	0.109	0.173	0.412	0.507	0.769	0.507
15	0.105	0.175	0.522	0.660	0.883	0.550
18	0.105	0.190	0.665	0.805	0.979	0.603
21	0.109	0.190	0.771	0.904	1.054	0.650
24	0.107	0.210	0.861	0.983	1.085	0.685
27	0.099	0.214	0.902	1.021	1.106	0.720

As seen in the above table, the bacterial activity at a temperature of 0°C is very feeble. It is then difficult to prove whether the nitrification at this temperature proceeded autocatalitically or not. At the temperature of 12°C, it was barely seen to be autocatalytic. At a temperature higher than 12°C, it proceeded typically according to the monomolecular reaction of autocatalytic.

The equation of autocatalytic monomolecular reaction is

$$\log \frac{X}{A-X} = K\,(t-t_1)$$

where X: Amount of nitrate produced at the intervals of time t
A: Maximum amount of nitrate produced
t_1: Time for ½A nitrate production
K: Constant

In the above equation the constants are K, A and t_1. To see the influence of temperature on the process, it is then reasonable to compare the value of the constants. Among these, however, the comparison of constant K alone is seen to be most reasonable, as the value of K represents the velocity of the reaction.[3)]

So the authors attempted to deduce a formula which shows a change of the value of K in relation to temperature.

In Table 2 the value of K is calculate from the data in Table 1;

Table 2 Values of K calculated from Data in Table 1

Temperature (T)	K
12 C	0.069±0.005
20 C	0.091±0.002
27 C	0.106±0.001
32 C	0.120±0.001
37 C	0.105±0.003

In order to find the influence of temperature upon the constant K, the authers calculated, at first, the value of the so-called Q_{10} quotient[4] as follows:

$$Q_{10}=\left(\frac{K_{20}}{K_{12}}\right)^{\frac{10}{20-12}}=\left(\frac{0.091}{0.061}\right)^{\frac{5}{4}}\doteqdot 1.6$$

$$Q_{10}=\left(\frac{K_{27}}{K_{20}}\right)^{\frac{10}{27-20}}=\left(\frac{0.106}{0.091}\right)^{\frac{10}{7}}\doteqdot 1.3$$

$$Q_{10}=\left(\frac{K_{32}}{K_{27}}\right)^{\frac{10}{32-27}}=\left(\frac{0.120}{0.106}\right)^{5}\doteqdot 1.3$$

$$Q_{10}=\left(\frac{K_{27}}{K_{32}}\right)^{\frac{10}{32-27}}=\left(\frac{0.105}{0.120}\right)^{5}\doteqdot 0.7$$

As the results show, the value of K increases 1.3 times with each increas of 10°C in temperature until it reaches 32°C, then it decreases to 0.7 times as seen at 37°C.

These results tell us that the nitrification process shows the tendency of pure chemical reaction at the temperatures between 12 and 32°C. But a rapid decrease of the value of Q_{10} in temperature above 32°C, clearly shows that the process is biochemical.

Then to represent mathematically the influence of temperature we must take into a consideration especially these relationships existing between the temperature and the nature of the phenomena. So the writers deduced the following empirical equation with the aid of the method of least squares paying attention to the above facts.

$$K=0.038+0.014\frac{T}{5}-0.015\,e^{\frac{T-32}{5}}$$

The values of K calculated form the above equation are compared with the values of K cited already in Table 2 as follows:

Table 3 The Values of K calculated from above Equation and in Table 2

Temperature	K in Table 2	K calculated	difference
12 C	0.069	0.074	0.005
20 C	0.c91	0.074	0.006
27 C	0.106	0.108	0 002
32 C	0.120	0.113	0.007
37 C	0.105	0.106	0.001

The above table shows that both the values K agree well.

Experiment on the Influence of Moisture

On the effect of moisture content in soils on nitrification, the results obtained are shown in Table 4.

The experiment was carried out in the constant temperature of 30°C having the moisture content of soils at 20%, 40%, 50%, 60%, 70% and 80% of the water bapacity.

Table 4 Amount of nitrate produced in milligrams

Time (days)	20%	40%	50%	60%	70%	80%
0	0.065	0.065	0.065	0.065	0.065	0.065
1	0.065	0.065	0.065	0.065	0.065	0.065
2	0.c65	0.067	0.071	0.090	0.092	0.092
3	0.088	0.083	0.087	0.110	0.125	0.098
4	0.114	0.149	0.140	0.140	0.143	0.140
5	0.115	0.160	0.180	0.182	0.210	0.180
7	0.150	0.224	0.235	0.250	0.295	0.252
9	0.151	0.240	0.340	0.363	0.410	0.371
11	0.152	0.260	0.401	0.494	0.600	0.501
13	0.145	0.281	0.535	0.642	0.786	0.678
15	0.152	0.297	0.643	0.722	0.850	0.770

Time (days)	20%	40%	50%	60%	70%	80%
18	0.145	0.308	0.739	0.846	0.924	0.880
21	0.152	0.320	0.800	0.905	1.003	0.952
25	0.152	0.340	0.875	0.993	1.090	1.002
30	0.140	0.340	0.897	1.028	1.100	1.002

The values of K were first calculated from the above data putting them into the autocatalytic monomolecular equation and secondly, the Q_{10} quotient was calculated from the value of K as shown in Table 5.

Table 5 The Values of K and Q_{10}

% of water capacity (M)	K	Q_{10}
40	0.090 ± 0.005	
50	0.102 ± 0.002	1.1
60	0.110 ± 0.001	1.1
70	0.119 ± 0.003	1.1
80	0.114 ± 0.000	0.9

In the case of the influence of moisture content, the change of K can be represented by linear function up to 70 % of the water capacity, but abobe 70% it decreases gradually.

So the writers deduced the following empirical equation as in the case of temperature effect.

$$K = 0.056 + 0.0018\frac{M}{5} + 0.005\ e^{\frac{M-70}{5}}$$

And the values of K calculated from the above equation are compared with the values of K cited already in Table 5 as follows:

Table 6 Values of K calculated from the above Equation and in Table 5

% of water capacity	K in Table 5	K calculated	Difference
40	0.090	0.c92	0.002
50	0.102	0.101	0.001
60	0.110	0.110	0.000
70	0.119	0.116	0.003
80	0.114	0.114	0.000

Summary

1) The influence of enviromental conditions on the nitrification process were studied mathematically. In the present experiment, temperature and moisture were taken as the enviromental conditions.

2) Considering that the influence of the enviromental conditions on the nitrification process can be represented by the change of reaction constant K of the autocatalytic monomolecular equation which represents the process mathematically, the writers observed the influence of the change of temperature and moisture on the value of K.

3) Within the extent of temperature and moisture at which the reaction can proceed autocatalytically, the value of K increases linearly as the temperature and the moisture increase, but after it reaches a certain point of increment the value of K decreases rapidly.

So the change of K can be represented empiriclly by an equation as follows:

In the case of the effect of temperature,

$$K=0.038+0.014\frac{T}{5}-0.015\ e^{\frac{T-32}{5}}$$

In the case of the effect of moisture content,

$$K=0.056+0.0018\frac{M}{5}-0.005\ e^{\frac{M-70}{5}}$$

Literature

(1) MIYAKE, K. and SOMA, S.: On the nature of ammonification and nitrification. J. Biochem. (Japan) 1922 1, 123, 129.

(2) LÖHNIS, F.: Handbuch der landwirtschaftlichen Bakteriologie. 1910.

GREAVES, T. E. and CASTER, E. G.: Influence of moisture on the bacterial activity of the soil. Soil Science, 10 361, 1920.

OGASAWARA, K.: On the decomposition of soy-bean cake and rape-seed cake in soils. (written in Japanese). Graduation Thesis of Hokkaido Imp. Univ. 1921.

SHIRAHAMA, K.: Nitrification in acid soils. Graduation Thesis of Hokkaido Imp. Univ. 1925.

(3) LEWIS.: A system of physical chemistry. Vol. 1.

(4) vant HOFF, J. H.: Etudes de dynamique chimique. 1896.

摘　　要

硝酸化生作用に及ぼす溫度及濕度の影響に關する數學的硏究

三　宅　康　次　　石　塚　喜　明

(1) 硝酸化生作用に及ぼす溫度及び濕度の外圍條件につき、之れが影響を數學的に考察した。

(2) 而して、此の種外圍條件の影響は硝酸化生作用を示す所の自己觸媒的一分子反應式の恒數Ｋの變化に依つて表はさるるものとしてＫの上に及ぼす是等條件の影響を測定した。

(3) 反應の自己觸媒的一分子反應的に營まれ得る條件を得るときは、其の條件の好都合なるに從がひＫの値は直線的に增加し、一定限度に到つて急激に減少する傾向を示す。

溫度の影響の場合には

$$K = 0.048 + 0.014\frac{T}{5} - 0.015\, e^{\frac{T-32}{5}}$$

濕度の影響の場合に於ては

$$K = 0.056 + 0.0018\frac{T}{5} - 0.005\, e^{\frac{M-70}{5}}$$

なる實驗式にて示し得ることを認めた。

A REVISION OF BRACONID-SPECIES PARASITIC IN THE INJURIOUS INSECTS OF RICE-PLANT AND SUGAR-CANE IN JAPAN AND FORMOSA

BY

CHIHISA WATANABE

Up to the present time about fifteen *Braconid*-species which are parasitic in the injurious insects of rice-plant or sugar-cane, *Chilo simplex* BUTL., *Chilo infuscatellus* SNELL., *Schoenobius incertellus* WK., *Diatraea venosata* WK., *Sesamia inferens* WK., etc., have been recorded by many entomologists in Japan and Formosa. According to previous authors, however, certain species have already become synonyms. In the course of my study I found that the species identified by U. NAWA as *Amyosoma chilonis* VIERECK, being different from the real *A. chilonis* VIERECK, is new to science; thus, as far as my investigations go, there are seven species and one form of *Braconid* in total known to exist in Japan and Formosa.

Before going further I wish to acknowledge my indebtendness to Messrs. M. ISHIDA, S. KUWAYAMA, J. SONAN, and T. UCHIDA for much valuable advice and for their kindness in reading the manuscripts. Further I wish to express my sincere thanks to Messrs. M. EGUCHI, C. HARUKAWA, and S. TAKANO, who kindly sent material for my use.

Subfamily *BRACONINAE*

Genus ***Shirakia*** VIERECK

Shirakia VIERECK, Proc. U. S. Nat. Mus., Vol. 44, p. 643 (1913).

1. ***Shirakia schoenobii*** VIERECK

Bracon dorsalis MATUMURA (nec BRULLÉ), Schädl. u. Nützl. Ins. Zucker. Pflan. Formosas, pp. 49 & 84, ♀, Pl. XXX, Fig. 7, ♀ (1910); id., Mén. Soc. Ent. Belg., XVIII, p. 148, ♀ (1911).

Shirakia schoenobii VIERECK, Proc. U. S. Nat. Mus., Vol. 44, p. 643, ♀ ♂ (1913).

Shirakia dorsalis SHIRAKI, Extra Report Agr. Exp. Stat. Formosa, no. 15, p. 125, ♀ ♂, Pl. XII, Fig. 1–8, ♀ ♂ (1917).

Host. Prof. T. SHIRAKI describes exactly the life-history of this species: it is reared from *Chilo simplex* BUTL., *Schoenobius incertellus* WK., and *Sesamia inferens* WK. in Formosa.

Cocoon. Generally white, the upper end somewhat truncate, broadened towards the lower end, both ends more or less yellowish gray. Length. 7.4 mm.; width 2.3 mm. or more mm. (after SHIRAKI).

Hab.—Formosa (Kagi, 4 ♂ ♂, 20/IV. 1907; Ako, 1 ♀, 7/II. 1906; Tainan, 1 ♀, 2/III. 1909, S. MATSUMURA; Kosen, 2 ♀ ♀, 1 ♂, 19/III. 1929, J. SONAN).

Distr.: Formosa.

J. N.: *Seaka-komayu.*

Genus *Stenobracon* SZÉPLIGETI

Stenobracon SZÉPLIGETI, Term. Füz. p. 359 (1901).

2. *Stenobracon trifasciatus* SZÉPLIGETI

Stenobracon trifasciatus SZÉPLIGETI, Notes Leyden Mus., Vol. 29, p. 214, ♀ ♂ (1904); FAHRINGER, Entom. Mitteilungen, XVII, p. 27, ♀ ♂ (1928).

Stenobracon maculata MATSUMURA, Schädl. u. Nützl. Ins. Zucker. Pflan. Formosas, pp. 50 & 84, ♀, Pl. XXX, Fig. 8, ♀ (1910); id., Mén. Soc. Entom. Belg., XVIII, p. 148, ♀ (1911); SHIRAKI, Extra Report Agr. Exp. Stat. Formosa, no. 15, p. 135, ♀ ♂, Pl. XI, Fig. 1, ♀ (1917); SONAN, Trans. Nat. Hist. Soc. Formosa, p. 333, ♀ ♂ (1929); MATSUMURA, 6000 Ill. Ins. Japan-Empire, p. 75, Fig. 410, ♂ (1930).

Stenobracon maculatus FAHRINGER, Entom. Mitteilungen, XVII, p. 28 (1928).

Macrocentrus sp. DEVENTER, Handboek ten dienste van de Suikerriet-Cultuur en de Rietsuiker-Fabricage op Java, p. 123, Pl. 18, Fig. 14, ♀ (1906).

Macrocentrus javanicus ISHIDA, Kansho Meichu Chosa Hokoku, I, p. 109, ♀ ♂, II, Pl. XVI, Fig. 1-3, ♀ ♂ (1915).

Hemibracon elegantulus ENDERLEIN, Arch. Naturg., 84 A. p. 62, ♀ ♂ (1918).

Host. According to Prof. T. SHIRAKI it is parasitic in the larva of *Schoenobius incertellus* WK. in Formosa, and it is also recorded by M. ISHIDA as a parasite of *Chilo infuscatellus* SNELL. in Formosa, and of *Scirpophaga nivella* FABR. in Java.

Hab.—Formosa (Ako, 1 ♂, 10/VII, 1906; Shinka, 3 ♀ ♀, 2 ♂ ♂, 23/IV, 1908, 1 ♂, 30/V, 1926, S. MATSUMURA; Kagi & Hoozan after ENDERLEIN)—China (Hong-kong, 2 ♂ ♂, 10/V, 1926, S. TAKANO).

Distr.: Java, Sumatra, Formosa, China (Hong-kong).

J. N.: *Kiiro-madara-komayu.*

Genus *Bracon* FABRICIUS

Bracon FABRICIUS, Syst. Piez., p. 120 (1804).

Subgenus *Amyosoma* VIERECK

Amyosoma VIERECK, Proc. U. S. Nat. Mus., Vol. 44, p. 640 (1913).

I have placed "*Amyosoma*" under genus *Bracon* as a subgenus, because I can not find any particular character to distinguish it as a genus, the only difference from the latter is in having a parallel-sided plate of the 1st abdominal tergite.

3. *Bracon (Amyosoma) chinensis* SZÉPLIGETI

Bracon chinensis SZÉPLIGETI, Term Füz., XXV, p. 30, ♂ (1902); id., Gen. Insect., 22–24, p. 35, ♂ (1904); FAHRINGER, Opusc. bracon., Bd. I, p. 445, ♂ (1928).

Amyosoma chilonis VIERECK, Proc. U. S. Nat. Mus., Vol. 44, p. 640, ♀ ♂ (1913); SHIRAKI, Extra Report Agr. Exp. Stat. Formosa, no. 15, p. 132, ♀ ♂, Pl. XII. Fig. 9–16, ♀ ♂ (1917).

Agathis noiratum ISHIDA, Kansho Meichu Chosa Hokoku, I, p. 100, ♀, II, Pl. XIV, Fig. 9–11, ♀ (1915).

The *Braconid* figured on plate 16, figure 13 by *Deventer* (3) may be the same species, and *Amyosoma leuzerae* ROHWER* may be a variety of this species, only differing in the front legs which are black and in the ovipositor which is longer than the abdomen.

Host. According to M. ISHIDA it is reared from the larva of *Chilo infuscatellus* SNELL. in Formosa, and of *Sesamia inferens* WK. in Java. Prof. T. SHIRAKI gives *Schoenobius incertellus* WK. as the host of this species. I have specimens bred by M. EGUCHI from the larva of a *Diatraea* species, which was feeding on Italian millet (*Setaria italica*) in Korea.

Cocoon. Grayish white, cylindrical. Length 4 mm.; width 1.4 mm.

Hab.—Formosa (Tansui, 1 ♀, 2 ♂ ♂, 26/VII, 1926; Hoppo, 1 ♀, 7/VII, 1906, S. MATSUMURA; Kosen, 1 ♂, 19/VII, 1928, J. SONAN)—Riukiu Is. (4 ♀ ♀, 1909, S. SAKAGUCHI)—Korea (Shariin, 2 ♀ ♀, 5 ♂ ♂, 1930, M. EGUCHI).

Distr.: Formosa, Riukiu Is., Korea, China, Java (?).

J. N.: *Zuimushi-kurobara-komayu.*

Subgenus *Bracon* s. str.

4. *Bracon (Bracon) onukii* nov. sp.

Braconid-sp. ONUKI, Jitsuyo Konchugaku, p. 253, Fig. 173 (1903).

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*ROHWER, Proc. U. S. Nat. Mus., Vol. 54, p. 567 (1918).

Amyosoma chilonis NAWA, Insect World, p. 354, ♀ ♂, Pl. XVIII, Fig. 1–13, ♀ ♂ (1913); id., l. c., p. 455 (1915).

This species identified by NAWA as *Amyosoma chilonis* VIERECK is not the real *A. chilonis* VIERECK, but is new to science, belonging to FAHRINGER's Section *Orthobracon* under genus *Bracon*.

♀. Reddish yellow; eyes, tips of mandibles, claws, and ovipositor-sheaths black; three lobes of the mesonotum, propodeum, and the first three abdominal tergites often with black markings. Antennae yellowish brown, darkend towards the apex. Wings hyaline, stigma and veins yellow.

Head smooth and shining, antennae filiform, shorter than the body, 37 jointed, the scape cylindrical. Thorax smooth and shining; parapsidal furrows of the mesonotum deep, reaching to the apex; mesopleural fovae broad. Second abcissa of the radius 2½ times longer than the 1st; 1st intercubital nervure oblique, the 2nd vertical; 2nd cubitus 1½ times longer than the 2nd abcissa of the radius. Legs normal. Propodeum almost smooth and shining, with a median longitudinal carina from the apex to the middle, crossed by some transverse carinae. Abdomen rugosely reticulate, dull; 1st tergite margined laterally, the median raised area round; 2nd tergite longer than the 3rd, with a fine short median carina at the base; suture between the 2nd and the 3rd being broad and deep, almost straight. Ovipositor as long as half the length of abdomen, 1 mm. Length 3.5 mm.

♂. Closely resembles the female, but differs from it in having the antennae which are longer than the body, 39–40 jointed. Length 3–3.5 mm.

Bracon japellus ASHMEAD* from Hokkaido is very closely allied to this species but differs from the latter in having the propodeum which is entirely smooth and shining, lacking carina.

Host. According to ONUKI, NAWA, the report of Agr. Exp. Stat. Nagasaki (16), and ISHIKAWA (9) it is a parasite of the larva of *Chilo simplex* BUTL. in Japan. I have specimens bred from the same host by C. HARUKAWA, and from the larva of a *Diatraea* species by M. EGUCHI, which was feeding on Italian millet in Korea.

Cocoon. Grayish white. Length 5 mm.; width 1.5 mm.

Hab.—Honshu (Gifu after NAWA; Niigata after ISHIKAWA; Kurashiki 3 ♀ ♀, 2 ♂ ♂, V, 1930, C. HARUKAWA)—Kiushu (Nagasaki after Rep. Agr. Exp. St. Nagasaki; Kumamoto, 3 ♀ ♀, 10/X, 1907, H. KAWAMURA)—Korea (Shariin, 8 ♀ ♀, 7 ♂ ♂, 1930, M. EGUCHI).

J. N.: *Zuimushi-kiiro-komayu.*

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*ASHMEAD, Proc. U. S. Nat. Mus., Vol. 30, p. 196, ♀ (1906).

Subfamily *CHELONINAE*

Genus ***Chelonus*** JURINE

Chelonus JURINE, in Panzer, Krit. Revis., Vol. 2, p. 99 (1806).

5. ***Chelonus munakatae*** MUNAKATA

Chelonus munakatae MUNAKATA, Extra Report Agr. Exp. Stat. Aomori, no. 2, p. 68, ♀ ♂, Pl. 2, ♂ (1912); NAWA, Insect World, p. 457 (1915); KUWAYAMA, Report Agr. Exp. Stat. Hokkaido, no. 47, p. 36 (1928); SONAN, Trans. Nat. Hist. Soc. Formosa, p. 115 (1930).

Chelonus chilonis CUSHMAN, Proc. Hawaii. Ent. Soc. p., 244, ♀ ♂ (1928).

In MUNAKATA's original description the female is mistaken for the male; in the series of my specimens the female is distinguished from the male in having the antennae which are shorter than the body, compresso-dilated beyond the middle, 33-34 jointed, and the abdomen with 2 yellowish basal spots as in CUSHMAN's description. The *Braconid* figured on plate 2, figures 5 (♀) and 8 (♂), by OKAMOTO (20) as a parasite of *Chilo simplex* BUTL. from Hokkaido is apparently the same species.

Host. It is well known as a parasite of *Chilo simplex* BUTL. I have specimens bred from the same host by T. MUNAKATA and C. HARUKAWA, and from the larva of a *Diatraea* species by M. EGUCHI, which was feeding on Italian millet in Korea.

Cocoon. White, transparent, and cylindrical. Length 10 mm.; width 3mm.

Hab.—Hokkaido (Sapporo after OKAMOTO & KUWAYAMA)—Honshu (Aomori, 1 ♀, X, 1911, T. MUNAKATA; Kurashiki, 4 ♀ ♀, 3 ♂ ♂, V, 1930, C. HARUKAWA)—Kiushu (Nagasaki after Rep. Agr. Exp. St. Nagasaki)—Korea (Shariin, 3 ♀ ♀, 3 ♂ ♂, 1930, M. EGUCHI).

Distr.: China (Foochow), Korea, Japan.

J. N.: *Munakata-marubara-komayu.*

Subfamily *MICROGASTERINAE*

Genus ***Microgaster*** LATREILLE

Microgaster LATREILLE, Hist. Nat. Crust. & Insect. III, p. 189 (1802).

6. ***Microgaster russata*** HALIDAY

Microgaster russatus HALIDAY, Ent. Mag. II, p. 237 (1834); RUTHE, Berlin Entom. Zeits., IV, p. 109, ♀ ♂, (1860); REINHARD, Deutsch. Ent. Zeits., XXIV, p. 355 (1880); MARSHALL, Trans. Entom. Soc. London, p. 249, ♀ ♂, Pl. VI, Fig. 1 ♀ (1885); id., Spec. Hymén. Europe IV, p. 530, ♀ ♂ (1890).

Microgaster russata SZÉPLIGETI, Gen. Ins., 22-24, p. 113 (1904).

Microplitis aomoriensis MUNAKATA, Extra Report Agr. Exp. Stat. Aomori, no. 2, p., 69 ♀ ♂, Pl. 2 Fig. 4, ♀ (1912); NAWA, Insect World, p. 457 (1915).

Comparing some of the male specimens collected in Japan with the female, I find some difference in colour between them; the 3rd abdominal tergite in the former entirely black and sometimes the first two tergites finely tinged with black.

The *Braconid* figured on plate 2, figure 6 by OKAMOTO (21) is identical with this species.

Cocoon. White, cylindrical, woolly, and transparent. Length 8 mm.; width 2.5 mm.

Host. As MUNAKATA remarks, it is a solitary parasite of the larva of *Chilo simplex* BUTL. I have specimens bred from the same host by MUNAKATA, HARUKAWA, and a member of the Agr. Exp. Stat. Nagano.

Hab.—Hokkaido (Sapporo after OKAMOTO)—Honshu (Aomori, 5 ♀ ♀, 1911, T. MUNAKATA; Nagano, 2 ♂ ♂, non data; Kurashiki, 2 ♀ ♀, 3 ♂ ♂, V. 1930, C. HARUKAWA)—Kiushu (Nagasaki after Rep. Agr. Exp. St. Nagasaki).

Distr.: Europe, Japan.

J. N.: *Aomori-samuraikomayu.*

Genus *Apanteles* FÖRSTER

Apanteles FÖRSTER, Verh. Naturh. Ver. Preuss. Rheinl. XIX, p. 245 (1862).

7. *Apanteles flavipes* CAMERON

Cotesia flavipes CAMERON, Men. Proc. Manch. Phil. Soc., IV, p. 185, ♂ (1891).

Apanteles nonagriae OLLIFF, Agric. Gaz. N. S. Wales IV, p. 381 (1893); WILKINSON, Bull. Ent. Res., p. 136 (1928).

Apanteles flavipes SZÉPLIGETI, Gen. Ins., 22–24, p. 109 (1904); WILKINSON, Bull. Ent. Res., p. 93, ♀ ♂, Fig. 2, e (1928); id., l. c., p. 108 (1929); id., l. c., p. 151 (1930).

Apanteles (*Stenopleura*) *nonagriae* VIERECK (nec OLLIF), Proc. U. S. Nat. Mus., Vol. 44, p. 645, ♀ ♂ (1913).

Apanteles (*Stenopleura*) *simplicis* VIERECK, Proc. U. Nat. Mus., Vol. 44, p. 645, ♀ ♂ (1913).

Apanteles flavatus ISHIDA, Kansho Meichu Chosa Hokoku, I, p. 97, ♀ ♂, II, Pl. XIV, Fig. 1–8, ♀ ♂ (1915).

I much incline to agree with WILKINSON who treats that *A. nonagriae* VIERECK, *A. simplicis* VIERECK, and *A. nonagriae* OLLIF are all synonymous.

Apanteles flavatus ISHIDA is also synonymous: I have seen ISHIDA's type-specimens, in whose original description the figures of the antennae in both sexes are mistaken for each other, and I received from S. TAKANO a series reared from *Chilo infuscatellus* SNELL.; these are not separable from *A. flavipes* CAMERON.

Host. This species is recorded as a parasite of *Chilo simplex* BUTL. by CAMERON, WILKINSON, VIERECK, and NAWA in India, Formosa, and Japan.

M. ISHIDA gives four hosts, *Chilo infuscatellus* SNELL., *Diatraea venosata* WK., *Eucosoma schistaceana* SNELL., and *Leucaria loreyi* L. from Formosa. According to VIERECK it is also a parasite of *Sesamia inferens* WK. in Formosa.

Cocoon. White, heaped indiscriminately together. Length 3 mm.; width 1 mm.

Hab.—Honshu (Gifu after NAWA)—Kiushu (Nagasaki after Rep. Agr. Exp. St. Nagasaki)—Formosa (Shinka, 15 ♀♀, 9♂♂, 20/XII, 1928, S. TAKANO; Taihoku after VIERECK).

Distr.: India, Australia, Formosa, Japan.

J. N.: *Zuimushi-samuraikomayu.*

7a. *Apanteles flavipes* CAMERON f. *chilonis* MUNAKATA

Apanteles chilonis MUNAKATA, Extra Report Agr. Exp. Stat. Aomori, no. 2, p. 69, ♀, Pl. II, Fig. 5, ♀, in June (1912).

Apanteles (Stenopleura) chilocida VIERECK, Proc. U. S. Nat. Mus., Vol. 43, p. 582, ♀, in December (1912); NAWA, Insect World, p. 455 (1915); WILKINSON, Bull. Ent. Res., p. 94 (1928).

Comparing my specimens bred from *Chilo simplex* BUTL. by T. MUNAKATA with the Formosan specimens of *A. flavipes* CAM., I can not find any difference in structure between them as in VIERECK's description, but distinguish from the latter by the colour of hind coxae, which are blackish.

♂. Essentially as in the female except that the antennae not submoniliform but filiform. Second abdominal tergite not longer, rather shorter than the 3rd as in the typical specimen.

Host. According to MUNAKATA, NAWA, VIERECK, and the report of Agr. Exp. Stat. Nagasaki (16), it is a parasite of the larva of *Chilo simplex* BUTL.

Cocoon. Closely allied to that of the typical specimen.

Hab.—Honshu (Aomori, 3♀♀, 2♂♂, 1911, T. MUNAKATA; Gifu after NAWA)—Kiushu (Nagasaki after Rep. Agr. Exp. Stat. Nagasaki).

An enumeration of the Braconid-parasites and their host-species

Host \ Parasite	*Shirakia schoenobii* VIERECK	*Stenobracon trifasciatus* SZÉPLIGETI	*Bracon (Amyosoma) chinensis* SZÉPLIGETI	*Bracon (Bracon) onukii* WATANABE	*Chelonus munakatae* MUNAKATA	*Microgaster russata* HALIDAY	*Apanteles flavipes* CAMERON	f. *chilonis* MUNAKATA
Chilo simplex BUTL.	×		×	×	×	×	×	×
Chilo infuscatellus SNELL.		×	×				×	
Schoenobius incertellus WK.	×	×	×				×	×
Scirpophaga nivella FABR.		×						
Diatraea venosata WK.							×	
Diatraea sp.			×	×	×			
Sesamia inferens WK.	×						×	

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摘 要

稻及び甘蔗の害蟲に寄生する小繭蜂に就て

渡 邊 千 尙

稻及び甘蔗の害蟲 *Chilo simplex* BUTL. (イネメイガ)、*Chilo infuscatellus* SNELL. (ウスグロメイガ)、*Schoenobius incertellus* WK., (イツテンオホメイガ)、*Diatraea venosata* WK. (スヂメイガ)、*Sesamia inferens* WK. (イネヨトウ) 等に寄生する小繭蜂は、先進學者に依り約十五種發表せられ其の中數種は既に *Synonym* となり居れども、著者の研究の結果、七種、一形たることを知るを得たり。從來、名和梅吉氏に依り *Amyosoma chilonis* VIERECK と同定されし一種は、*A. chilonis* VIERECK にあらずして、明らかに新種と認むべきものなれば、玆に *Bracon (Bracon) onukii* nov. sp. として記載せり。

著者が本文に擧げたる七種の小繭蜂の學名、和名、和名異名及び分布は次の如し。

	分布
1. *Shirakia schoenobii* VIERECK セアカコマユ(松村)	臺灣
2. *Stenobracon trifasciatus* SZÉPLIGETI キイロマダラコマユ(松村) 異名 クロモンコマユバチ(松村)、マダラコマユバチ(素木)、クロフアメイロバチ(石田)	臺灣、支那(香港)、ジャバ、スマトラ
3. *Bracon (Amyosoma) chinensis* SZÉPLIGETI ズイムシクロバラコマユ(改稱) 異名 ズイムシハラグロコマユバチ(素木)、ムネアカヤドリバチ(石田)	臺灣、琉球、朝鮮、支那、ジャバ (?)
4. *Bracon (Bracon) onukii* WATANABE (nov. sp.) ズイムシキイロコマユ(改稱) 異名 ズイムシヤドリバチ(名和)、ズイムシセグロヤドリバチ(小貫)	本州、九州、朝鮮
5. *Chelonus munakatae* MUNAKATA ムナカタマルバラコマユ(改稱) 異名 ムナカタコマユバチ(棟方)	北海道、本州、九州、朝鮮、支那(福州)
6. *Microgaster russata* HALIDAY アワモリサムライコマユ(改稱) 異名 アワモリコマユバチ(棟方)、キアシコマユバチ(岡本)	北海道、本州、ヨーロッパ
7. *Apanteles flavipes* CAMERON ズイムシサムライコマユ(改稱) 異名 ズイムシキアシヤドリ(名和)、キゴシヤドリバチ(石田)	本州、九州、臺灣、インド、オスートラリヤ
7a. f. *chilonis* MUNAKATA 異名 ズイムシキオビヤドリ(名和)、メイチウコマユバチ(棟方)	本州、九州

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NEUE UND WENIG BEKANNTE JAPANISCHE OPHIONINEN-ARTEN (*Hym.*)

VON

TOICHI UCHIDA

(Mit 2 Figuren)

In vorliegender Arbeit möchte ich die folgenden 5 neuen und 2 wenig bekannten *Ophioninen*-Arten beschreiben: *Campoplegidea novitia* MORL., *Omorgus tosensis* sp. nov., *O. sugiharai* sp. nov., *Angitia argyloplocevora* sp. nov., *Cremastus (Tarytia) uchiyamai* sp. nov., *Epicremastus matsumuraeanus* sp. nov. und *Pristomerus rufiabdominalis* UCH., von denen die 4 ersteren zur Tribus Campoplegini, die 2 nächsten zur Tribus Cremastini und die letztere zur Tribus Pristomerini gehören. Unter diesen Arten ist nur der Wirt von *Angitia argyloplocevora* bekannt, und zwar sie von Herrn A. TOSHIMA aus der Puppe von *Argyloploce schreberiana* L., welche eine Art von Schädlingen der Apfelbäume ist, gezogt wurde.

Schliesslich den Herren A. TOSHIMA, K. YASUMATSU, Y. SUGIHARA und S. UCHIYAMA, die mir diese Materialien geliefert haben, sage ich meinen besten Dank.

Campoplegidea novitia MORL.

Campoplex novitius MORLEY, Faun. Brit. Ind. Hym. III, Ichn. I, p. 450, ♂ (1913).

Fundorte: Japan (Kiushu) und Indien (Mussoori). Allotypus (♀, Fukuoka in Kiushu, am 28. III, 1928, K. YASUMATU).

Da das Weibchen bis jetzt noch nicht bekannt ist, gebe ich im folgenden Beschreibung desselben. Kopf nach hinten etwas verengt, graulichweiss behaart und dicht punktiert. Antennen gegen das Ende zu wenig verdünnt. Punktierung der Mesopleuren grösser und stärker als die des Mesonotums; Propodeum hinten schräg abfallend, runzelig punktiert, oben schwach eingedrückt. Bohrer kurz vorragend. Hinterschienen und -tarsen mit einigen Borsten; Klauen nur an der Basis zerstreut gekämmt.

Schwarz und matt. Mandibeln ganz schwarz, die Vorderschenkel vorn, die Vorder- und Mittelschienen, ihre Tarsen und alle Schienenendsporen dunkel-

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 2, May, 1932]

braun. Hinterleib in der Mitte (das 2te-3te Segment) rot. Körperlänge: 11 mm.

Sonst stimmt mit dem Männchen völlig überein. Nach der MORLEY'schen Diagnose sind die Mandibeln, die Vorderhüften am Ende und die inneren Seiten der Vorderschenkel und -schienen des Männchens schalgelb, während sie beim japanischen Exemplar gelb gefärbt sind. Diese Art ist neu für Japan.

Omorgus tosensis sp. nov.

♀. Kopf und Thorax fein weisslich behaart. Gesicht fein runzelig, matt; Clypeus vorn breit abgerundet; Kopf quer, nach hinten verschmälert, so breit wie der Thorax. Antennen etwa 2/3 der Körperlänge, gegen das Ende verdünnt. Mesonotum dicht fein runzelig punktiert, ganz matt; Schildchen rundlich konvex, nicht gerandet; Brustseiten und Propodeum ziemlich glänzend, die ersteren zerstreut fein punktiert, oben grob längsgerunzelt, Speculum glänzend; das letztere unregelmässig gerunzelt, der Länge nach deutlich gefurcht, Costula kräftig, Area superomedia quer, hinten offen, Luftlöcher oval und klein. Hinterleib linear, nur am Ende seitlich zusammengedrückt, glatt, matt, der Postpetiolus ziemlich verdickt, das 2te Segment 2 mal so lang wie breit; Thyridien gross; das 3te Segment quadratisch. Bohrer etwas länger als die halbe Hinterleibslänge. Flügel hyalin; Stigma schwärzlich; Areola klein, gestielt, der rücklaufende Nerv nahe dem Ende der Areola vorspringend; Diskokubitalnerv gekrümmt; Nervulus interstitial; Nervellus weit unter der Mitte gebrochen. Beine mässig schlank. Körperlänge: 10 mm.

Schwarz und matt. Palpen, Tegulen und Bauchfalt des Hinterleibs gelblich; Vorder- und Mittelbeine, mit Ausnahme der Hüften, gelbrot, die Hinterschienen in der Mitte braun, ihre Tarsen schmutzig braun.

Fundort: Shikoku (Kōchi). Holotypus (♀, am 25. X, 1929, Y. SUGIHARA); Paratopotypus (1 ♀, am 25. 1929, Y. SUGIHARA).

Omorgus sugiharai sp. nov.

♀. Kopf und Thorax matt, fein weisslich behaart. Kopf nach hinten verengt; Stirn und Gesicht punktiert. Fühler faderförmig, fast von 2/3 der Körperlänge. Mesonotum und Schildchen lederartig, matt; Mesopleuren vorn dicht gerunzelt, hinten punktiert, Speculum nicht glänzend; Propodeum hinten schwach längsgefurcht, Area superomedia ganz fehlend, Costula vorhanden. Hinterleib vom 3ten Segment an zusammengedrückt, das erste und 2te Segment lederartig fein punktiert, die übrigen glatt. Bohrer etwa so lang wie die halbe Hinterleibslänge. Flügel hyalin; Areola klein, gestielt; Diskokubitalnerv nicht gekrümmt; Nervellus weit unter der Mitte gebrochen. Körperlänge: 10 mm.

Schwarz. Mandibeln, Palpen, Tegulen und Vorder- und Mittelbeine gelbbraun, die 4 vorderen Hüften mit Ausnahme der Spitze schwarz, die Hinterschenkel dunkelbraun, ihre Trochantern, Schienen und Tarsen braun. Hinterleib vom 3ten Segment an an den Seiten bräunlich.

Fundort: Shikoku (Kôchi). Holotypus (♀, am 2. X, 1930, Y. SUGIHARA); Paratopotypus (1 ♀, am 2. X, 1930).

Angitia argyloplocevora sp. nov.

♀ ♂. Kopf hinter den Augen etwas verschmälert; Stirn, Gesicht und Clypeus dicht fein punktiert. Fühler kürzer als der Körper. Mesonotum lederartig fein punktiert, matt; Schildchen konvex, nicht gerandet; Mesopleuren oben sehr fein runzelig, Speculum wenig glänzend; Propodeum runzelig punktiert, Costula undeutlich, Area superomedia pentagonal, nicht quer, hinten offen; beim Männchen die Costula kräftig. Flügel hyalin; Areola nicht oder sehr kurz gestielt; Nervulus nach aussen schräg; Nervellus nicht gebrochen. Bohrer etwas länger als das erste Segment. Postpetiolus schwach bucklig. Körperlänge: 8,5 mm.

Schwarz. Mandibeln mit Ausnahme der Spitze, Palpen, Tegulen und die 4 vorderen Trochantern blassgelb. Beine gelbot, die Hintertrochantern an der Basis, ihre Schienen am Ende und jedes Glied der Hintertarsen am Ende schwärzlich; beim Männchen die Hinterschienen nahe der Basis und am Ende und ihre Tarsen fast ganz dunkelbraun bis schwärzlichbraun. Bauchfalte blassgelb. Stigma schwarzbraun.

Fundort: Honshu (Aomori). Holotypus (♀, 1931, A. TOSHIMA); Allotopotypus (♂); Paratopotypus (1 ♂).

Cremastus (Tarytia) uchiyamai sp. nov.

♀. Kopf hinter den Augen stark verschmälert; Gesicht dicht fein punktiert; Clypeus deutlich vom Gesicht getrennt, vorn abgerundet. Antennen schlank, fadenförmig, kürzer als der Körper. Thorax ziemlich lang gestreckt; Mesonotum matt, lederartig punktiert; Schildchen nicht gerandet; Mesopleuren unten unregelmässig gerunzelt, Speculum deutlich; Propodeum mässig lang, oben querrunzelig, am Ende zwischen den Hüften vorragend, deutlich gefeldert, Area superomedia pentagonal, länger als breit, Costula in der Mitte. Hinterleib lang, stark zusammengedrückt, der Postpetiolus und das 2te Segment dicht fein längsrissig, der erstere rundlich verdickt. Bohrer fast von der halben Hinterleibslänge. Flügel hyalin; Stigma dreieckig, blassgelb; beide Radialabschnitte gerade; Nervulus interstitial; Nervellus unter der Mitte gebrochen. Körperlänge: 11 mm.

Rötlichgelb. Kopf gelb; Stirn rotbraun; Stemmaticum schwärzlichbraun. Fühler dunkel gelbbraun. Prothorax, Tegulen und Beine gelblich, die Hinterschienen an Basis und Spitze bräunlich; das erste und 2te Segment ganz schwarz.

Fundort: Mikronesien (Insel Panope). Holotypus (♀, am 19. VI, 1930, S. UCHIYAMA).

Epicremastus matsumuraeanus sp. nov.

♀. Kopf kaum breiter als der Thorax, hinter den Augen rundlich verschmälert; Occiput breit ausgerandet; Schläfen glatt, glänzend; Stirn spärlich punktiert, beiderseits gewölbt, in der Mitte eingedrückt; Gesicht zerstreut punktiert, quer; Clypeus viel breiter als lang, vorn breit abgerundet; Mandibeln mässig lang, einfach; Augen mit parallelen Innenseiten. Thorax ziemlich glänzend, zerstreut punktiert, fast 2 mal so lang wie breit; Schildchen rundlich gewölbt, nicht gerandet, die Basalgrube sehr tief, mit zahlreichen kurzen Längskielen; Propodeum rundlich, nicht gefeldert, mit 2 Querleisten, am Ende kaum vorragend; Luftlöcher klein und rundlich. Beine kurz; Metatarsus länger als die übrigen Glieder zusammen; Klauen an der Basis gekämmt. Flügel hyalin; Stigma dunkelbraun; Radius hinter der Mitte des Stigma vorspringend; Nervulus interstitial; Nervellus nicht gebrochen. Fühler fadenförmig, schlank, kürzer als der Körper. Bohrer etwas kürzer als der Hinterleib. Hinterleib gegen die Spitze zu seitlich zusammengedrükt, der Postpetiolus und das 2te Segment dicht fein längsrissig, der erstere stark erweitert, das letztere länger als breit und so lang wie das folgende. Körperlänge: 10 mm.

Fig. 1
von oben gesehen des Propodeums von *E. matsumuraeanus* sp. nov.

Gelb. Schwarz sind: Stemmaticum, Occiput, ein kleine Makel unterhalb der Fühler auf dem Gesicht, 3 grosse Flecke des Mesonotums, Basalgrube des Schildchens, je ein Fleck unter den Flügeln, 3 Flecke des Propodeums, wovon der mittlere herzförmig und deutlich grösser als die anderen, rötlichgelb, die Hinterschienen am Ende und ihre Tarsenglieder an jeder Spitze verdunkelt. Hinterleib gelbrot, der Postpetiolus, das 2te Segment, mit Ausnahme des Hinterrands, und das 3te an der Basis schwärzlich gefleckt.

Fundort: Formosa (Kôshun). Holotypus (♀, am 2. VII, 1906, S. MATSUMURA).

Pristomerus rufiabdominalis UCH.

Pristomerus rufiabdominalis UCHIDA, Journ. Fac. Agr., Hokkaido Imp. Univ., XXI, p. 248, Taf. VI, fig. 14, ♀ (1928).

♂. Die Vorderschenkel unten nahe dem Ende eingeschnürt, mit undeutlichen 2 kleinen Kerbzähnen*. Scheitel nicht verschmälert, die Ocellen weit entfernt von den Augen. Schildchen glatt, stark glänzend wie beim Weibchen; Area squeromedia sehr schmal und lang. Hinterschenkel schwarz, ihre Schienen am Ende verdunkelt. Hinterleib in der Mitte bräunlich; jedes Segment am Hinterrand hell gesäumt. Körperlänge: 10 mm.

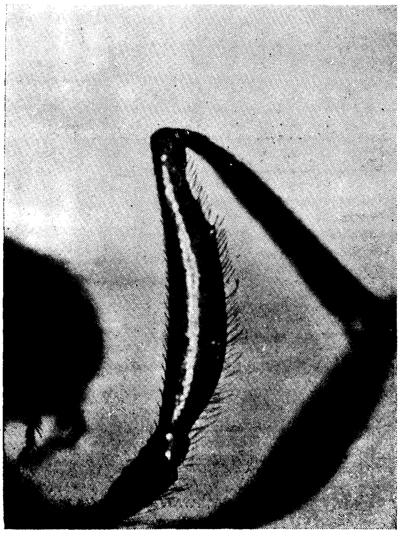

Fig. 2
von der Seite gesehen des Vorderschenkels von *E. rufiadominalis* UCH. (♂)

Fundort: Kiushu (am Berg Manho). Holotypus (Sapporo); Allotypus (♂, Kiushu, am 20. IX, 1925, K. YASUMATSU); Paratopotypus (♀, Sapporo).

(aus dem entomologischen Instituts der kaiserlichen Hokkaido Universität)

*Im Jahre 1905 hat G. V. SZÉPLIGETI in Gen. Ins., XXXIV, p. 48 nur durch dieses Merkmal des Männchens eine neue Gatt. *Pristocelus* festgestellt, da aber das Merkmal sehr unzuverlässig ist, scheint *Pristocelus* SZÉPL. mir ein Synonym von *Pristomerus* CURT. zu sein.

摘　　要

數種の本邦產アメバチの記載

內　田　登　一

本文に於ては、次の本邦產アメバチ亞科の五新種及び雌雄何れか一方のみ知られたる二既知種を公表せんとするものなり。

Tribus ***Campoplegini***

Campoplegidea novitia MORL.　アトウスアメバチ
Omorgus tosensis UCH. (sp. nov.)　トサクロアメバチ
Onorgus sugiharai UCH. (sp. nov.)　スギハラクロアメバチ
Angitia argyloplocevora UCH. (sp. nov.)　シロモンハマキクロアメバチ

T. ***Cremastini***

Cremastus (*Tarytia*) *uchiyamai* UCH. (sp. nov.)　ウチヤマヤセアメバチ
Epicremastus matsumuraeanus UCH. (sp. nov.)　マツムラヤセアメバチ

T. ***Pristomerini***

Pristomerus rufiabdominalis UCH.　トゲチビアメバチ

A SUPERNUMERARY CHROMOSOME FOUND IN A *PODISMA SAPPOROENSE* SHIRAKI, AND ITS RELATION TO THE SEX-CHROMOSOME.

BY

BUKÔ NATORI

(With One Plate)

The occurence of the supernumerary chromosome is of significance from the view point of cytology in relation to the problem of mutation. So it has long attracted the attention of many investigators such as WILSON (1907, 1908), McCLUNG (1914, 1917), CARROL (1920), CAROTHERS (1919) ROBERTSON (1915, 1916, 1917), VOINOV (1914) and WOOLSEY (1914) etc., who have reported emphatically the fact in various cases. The present author during his cytological study of *Podisma sapporoense* SHIRAKI in 1928, one of the common acridids in Hokkaido, found a supernumerary chromosome in the meiotic divisions of germ cells.

The material and the method. *Podisma sapporoense* SHIRAKI was collected abundantly in the suburbs of Sapporo in July 1928, since in this season generally, the meiotic divisions in the testis had been proved to take place very actively. The testis was taken out from the fresh material and was fixed in strong FLEMMING's fixative solution for twenty-four hours. After washing carefully in running water, dehydration was carried out in alcohol. The testis was imbedded in paraffine and stained with HEIDENHAIN's *Fe*-haematoxylin. It was cut in serial sections with a thickness of twenty micra.

The drawings were made by the aid of Abbe's drawing apparatus using a Leiz objective 1/12, and a Leiz ocular 4 with the tube length 190 mm., the drawing plate being placed about 11 cm. beneath the stage of the microscope. By the suggestion of Mr. K. SHIMAKURA, the figures were shaded so as to make any chromosome or any part of a chromosome at the deeper focus to appear darker than the shallower. In this way, the depth of a chromosome is made easily visible which would otherwise be very unclear.

Observations. ***The spermatogonia.*** The supernumerary chromosome is to be identified by its size and form as well as the sex-chromosome already in

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 2, 1932].

the spermatogonial metaphase; in this stage, twenty-four chromosomes are found of which twenty-two are autosomes, one is the supernumerary chromosome and the remaining one is the sex-chromosome. The supernumerary chromosome marked s in the fiqures is a bipartite V-shaped chromosomes of medium size, as shown in Fig. 2 a, b, c. We see at present that the supernumerary chromosome and the sex-chromosome are in a more diffused state than the others; the condition was more marked in the sex-chromosome. From the fact that every cell in the spermatogonia in different stages, thus far observed, contains one supernumerary chromosome and one sex-chromosome, it is highly probable that the supernumerary chromosome undergoes mitotic division normally like the other chromosomes.

Apparently there is no definite relation in position between the supernumerary chromosome and the sex-chromosome during the spermatogonial metaphase. In the normal* case we find only twenty-three chromosomes and no supernumerary chromosome, as is seen in Fig. 1, which shows the spermatogonial metaphase in the normal *Podisma sapporoense* SHIRAKI. Though V-shaped chromosomes are generally to be seen in the species of Stenobothrus-type (after McCLUNG), it is peculiar that it also occurs in the species of Hippiscus-type (after McCLUNG) such as *Podisma sapporoense* SHIRAKI.

The early leptonema stage. The sex-chromosome appears in this case prior to the supernumerary chromosome in any stage during the prophase of the first spermatocyte, even at the time when the chromosome substances are in a state of condensed karyotin mass. It constantly takes a peripheral position in the nucleus, and is clearly distinguishable from the other autosomes by its heavy heteropycnosis.

The leptonema stage. The sex-chromosome becomes a more condensed karyotin mass, keeping the same position as before, but the supernumerary chromosome, which is now a condensed karyotin thread, approaches nearer to the sex-chromosome so as to be arranged ready for the bouquet stage (Fig. 3).

The bouquet stage. The sex-chromosome condenses intensely in this stage and shows at the same time an irregular U-shaped thread or sometimes an open ring. Here apears then the bouquet stage, in which karyotin threads come into sight between the sex-chromosome and the supernumerary chromosome (Fig. 4). The two chromosomes approach each other still further.

The pachynema stage. The sex-chromosome and the supernumerary chromosome become confused with each other to make a karyotin mass, consisting of unequal halves in size. We see a vesicle attaching to one end which

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*The normal nucleus was described by the writer in a recent work (1931) is forked (Fig. 5). Judging from the size and the form of the karyotin mass and the position of the vesicle just mentioned, the larger half may represent the sex-chromosome and the smaller half the supernumerary chromosome. So it is to be understood that we have a modified diakinesis, as regards to these two chromosome. From this stage, the heteropycnosis of the bivalent chromosome, consisting of the supernumerary chromosome and the sex-chromosome, becomes more precocious than in the sex-chromosome of the normal individuals.

The strepsinema, the diplonema and the diakinesis stage. During these stages, the karyotin mass takes a tetrad form, but the sex-chromosome and the supernumerary chromosome are each identified clearly by their size and form (Fig. 6). The terminal vesicle in these stages attaches to the neck part of the pointed end of the sex-chromosome. A peculiar fiber, having the staining quality of karyotin, is distinctly recognized between the tip of the sex-chromosome and the vesicle (Fig. 6, Fig. 14). Now the segregation of the tetrad takes place (Fig. 7).

Even after the segregation, the vesicle always attaches to the sex-chromosome (Fig. 7, Fig. 14 b). There is a question whether the vesicle has some direct functional mechanism in the segregation of the tetrad in this case. However, it is highly probable that the vesicle does have some attraction to the sex-chromosome, while the supernumerary chromosome is separated from the sex-chromosome indirectly (Fig. 5, Fig. 6, Fig. 7, Fig. 14 a, b). It seems true that the behavior of the vesicle in this case differs from what was reported by Dr. CAROTHERS (1916), who is of the opinion that the vesicle actually divides the tetrad into two.

The metaphase of the first spermatocyte. Fig. 8 a, b and Fig. 9 a, b show the stage in which eleven out of the thirteen chromosomes are tetrads, and the remaining two, namely, the sex-chromosome and the supernumerary chromosome are dyads. The supernumerary chromosome is now a compact spherical chromosome with a ring skeletal structure.

While the other tetrads are arranged in the equatorial plate, the supernumerary chromosome appears at the pole region and the sex-chromosome is seen a little apart from the equatorial plate (Fig. 8 b, Fig. 9 b). They never segregate in the metaphase of the first spermatocyte. After this stage the supernumerary chromosome becomes more conspicuous than the sex-chromosome in appearance. The vesicle of the sex-chromosome, however, has disappeared by this time. In some of the cells the supernumerary chromosome and the sex-chromosome, together go toward the same pole (Fig. 8. a, b), while in the other they are separated (Fig. 9 a, b).

With a view to determine the mechanism of division of the sex-chromosome and the supernumerary chromosome, the investigation of 146 nuclei was carried out as follows.

toward one pole	both X & S	X only
frequency	76	70
ratio	1.08	1.00

From the above the conclusion is that they divide only by chance. Consquently, it is obvious that four kinds of daughter nuclei are produced according to the combination of the sex-chromosome, the supernumerary chromosome and the autosomes. In other words, in case the sex-chromosome and the supernumerary chromosome go toward the same pole, one daughter nucleus will contain thirteen chromosomes, namely, eleven autosomes, one supernumerary chromosome and one sex-chromosome, while the other daughter nucleus will contain eleven autosomes. In another case, in which the sex-chromosome and the supernumerary chromosome go toward the opposite poles, both nuclei will contain twelve chromosomes of which eleven are autosomes. The four kinds of nuclei thus produced are shown in the following table.

chromosome number	chromosome formula	type
13 chromosomes	11A+X+S	a-type
12 chromosomes	11A+S	b-type
12 chromosomes	11A+X	c-type
11 chromosomes	11A	d-type

A=autosome, S=supernumerary chromosome, X=sex-chromosome

The second spermatocyte. The sex-chromosome is no longer identified in this stage, but the supernumerary chromosome is clearly recognized by its size and form as well as strong staining capacity. It is a heart shaped chromosome and segregates in this stage as the other chromosome (Fig. 10, Fig. 11).

The four kinds of nuclei which are supposed to come forth in the previous stage are actually traced in this stage as shown in the fiqures representing a-type (Fig. 10), b-type (Fig. 11), c-type (Fig. 12) and d-type (Fig. 13) respectively.

The spermatid. The sex-chromosome and the supernumerary chromosome can no longer be distinguished from other autosomes. However, the four kinds of spermatids, still to be identified in this stage by their chromosomal constitution, develope into spermatozoa respectively without any disturbance. The ripe spermatozoa are seen filling the cysts as normal in this insect.

From the above observations the following facts are summerised: A supernumerary univalent chromosome shows heteropycnosis like the sex-chromosome. A supernumerary univalent chromosome takes a sex-chromosome as a mate for tetrad formation. The abnormal tetrad, consisting of a supernumerary chromosome and a sex-chromosome, undergoes the division precociously. Especially it is worthy of notice that the tetrad is able to divide into two in the early diakinesis stage of the nucleus which has not yet complete achromatic figure. Taking part in the tetrad formation the supernumerary chromosome accelerates the process of heteropycnosis of the sex-chromosome.

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Explanation of Figures

(× 1200)

Fig. 1 Spermatogonial metaphase from a normal individual without super numerary chromosome. (23 in number).

Fig. 2 a, b, c. Spermatogonial metaphase showing V-shaped supernumerary chromosome (S) and rod-shaped sex-chromosome (X). (24 in number).

Fig. 3 Leptonema stage showing supernumerary chromosome (S) and sex-chromosome (X). (optical section).

Fig. 4 Amphinema stage showing supernumerary chromosome and sex-chromosome with vesicle. (optical section).

Fig. 5 Pachynema stage. A tetrad consisting of supernumerary chromosome and sex-chromosome with vesicle. (optical section).

Fig. 6 Early diakinesis stage showing completed tetrad with vesicle. (optical section).

Fig. 7 Early diakinesis stage. Showing segregated supernumerary chromosome and sex-chromosome with vesicle. (optical section).

Fig. 8 a, b. Metaphase of the first spermatocyte; a, polar wiew. b, oblique side view. Supernumerary chromosome and sex-chromosome go toward the same pole. (11 tetrads & 2 dyads).

Fig. 9 a, b. Metaphase of the first spermatocyte; a, polar view. b, side view. Supernumerary chromosome and sex-chromosome go toward opposite poles. (11 tetrads & 2 dyads).

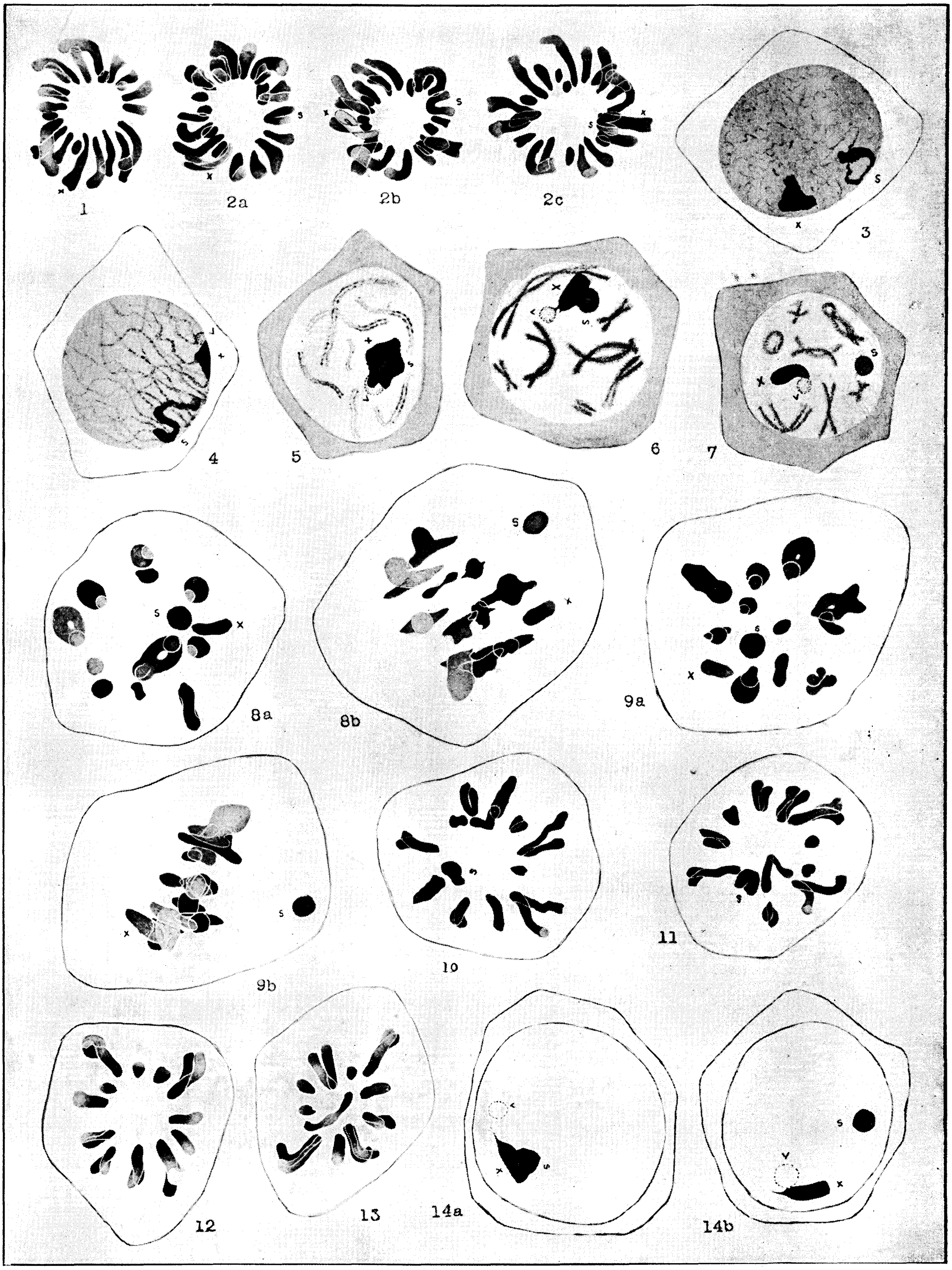
Fig. 10 Metaphase of the second spermatocyte, containing supernumerary chromosome and sex-chromosome. (13 dyads).

Fig. 11 Metaphase of the second spermatocyte, containing supernumerary chromosome. (12 dyads).

Fig. 12 Metaphase of the second spermatocyte, containing the sex-chromosome. (12 dyads).

Fig. 13 Metaphase of the second spermatocyte, containing autosomes only. (11 dyads).

Fig. 14 a, b. Segregation process of a modified tetrad in later prophase of the first spermatocyte.



BUKÔ NATORI del.

摘　　要

アシマダラフキバッタ (*Podisma sapporoense* SHIRAKI) に見出されたる過剰染色體と其の性染色體との關係

名　取　武　光

精蟲發生の過程に於ける過剰染色體の運命は、種の突然變異の問題に關聯して細胞學的に又遺傳學的に興味ある研究問題なり。されば此の問題につき研究を進めたる學者も尠しとせず。就中 WILSON, MCCLUNG, CARROL, CAROTHERS, ROBERTSON, VOINOV 及 WOOLSEY の諸氏は、直翅類の過剰染色體につきて業績を遺す。余も亦 1928年 アシマダラフキバッタに於て過剰染色體を見出し特に其の性染色體との關係に於て特殊なる現象を認めたれば、茲に記して該問題に關する研究補遺となす。

精原細胞に於ける過剰染色體は、V字型の中形染色體にして、性染色體は棒狀の大形染色體なり。兩者間に一定せる位置的關係なきも共に diffused state を示す。本種の如く Hippiscus-type に屬するものに於て Stenobothrus-type 特有の V字型染色體を有する事は奇異と云ふべし。第一精母細胞の分裂前期に於て兩者とも其の早熟性に依りて識別せらる。厚絲期に達するや過剰染色體と性染色體は融合し、不對稱の karyotin mass を形成するに至る。大にして vesicle を附隨せる部分は性染色體にして小なる部分は過剰染色體より成るものなり。此の期より兩者は著しく早熟性を增す。更に核分裂の過程の進むに從ひ此の Karyotin mass は形を整へ tetrad formation を完成するに至る。過剰染色體は外見に於て球形を呈するも環狀の螺旋絲を骨格となす。染色體移動期に達する頃 tetrad は分裂して獨立せる行動をとる。未だ完成せる紡錘絲を備へざる核分裂の過程に於て、過剰染色體と性染色體とより成る tetrad が、完全に分離し得るは興味ある事實なり。Vesicle は分裂後と雖も性染色體の尖端部に附隨す。此の vesicle は tetrad の分裂に關係を有するものゝ如く思惟せらるゝも CAROTHERS (1917) の見たる材料の如く之が能動的に tetrad を二分するや否や速斷し難し。寧ろ余の材料に於ては、此の vesicle が性染色體に對して有する attraction が、間接に過剰染色體の分離を誘導すると解釋するを妥當とす。分裂後に於ける過剰染色體と性染色は、同一極に移行する場合と各異りたる極に移行する場合とあり。余は 146 の分裂像につきての統計により、過剰染色體及性染色體は全く chance に依りて極に移行するものにして、兩者の間に特種の親和性又は反撥性なき事を確めたり。何れも第二分裂の中期に於て正常なる分裂を行ふ。從つて常染色體、過剰染色體及性染色體の組合せによりて四種の相異りたる遺傳質を有する精蟲を生ずるなり。

ON THE VERTICAL DISTRIBUTION OF *DIAPTOMUS DENTICORNIS* WIERZEJSKY VAR. *YEZOENSIS* KOKUBO IN LAKE SHIKOTSU

BY

TEIJIRO HAYASHI and BUKÔ NATORI

(With 2 tables and 2 figures)

KIKUCHI (1930) as well as others has described how the diurnal change in the vertical distribution of certain species of plankton is not constant but varies greatly according to the limnological condition of the lake. According to TAKAYASU, IGARASHI and SAWA (1930) in Lake Akan *Diaptomus* does not show any diurnal change in vertical distribution being found all the times abundantly on the surface of the water, while in Lake Shikotsu the same species was stated to undergo a remarkable migration, the exact data however being not given. KOKUBO with TANAKADATE (1925) mentioned briefly that in Lake Shikotsu *Diaptomus* becomes more frequent in the night on the surface but in the daytime most of them migrate downwards.

Now for us, it is most desirable to ascertain first of all whether the plankton migrates regularly or not in general .

Observation I

Diaptomus in Lake Shikotsu was investigated as it is one of the most important plankton from the economical point of view for the freshwater fishery.

To collect the plankton from various depths, about two liters of water were obtained by means of a 1050 ccm. water-bottle designated after KITAHARA. The water was examined from three different depths, namely from the surface, 25 and 50 meters.

The first series of observations was made on July 23–24, 1931. The weather was not entirely fair with weak sunlight and no moon at night.

At that season most of *Diaptomus* were adult and some of them were in the metanauplius stage. The result of the observations is shown by the table and the figure as follows:

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 2, 1932]

Table I. The vertical distribution of *Diaptomus* in Lake Shikotsu on July 23-24, 1931.

Hour	Weather	Depth (m.)	Temperature (°C)	Number
1 a. m.	C., M. b.	0	13.6	16
		25	7.0	8
		50	5.0	7
4 a. m.	C., L. b.	0	13.0	16
		25	7.0	13
		50	5.0	12
7 a. m.	C., L. b.	0	14.0	0
		25	7.5	15
		50	5.0	3
10 a. m.	C., L. b.	0	14.5	0
		25	7.5	8
		50	5.1	5
1 p. m.	C., Ca.	0	15.0	1
		25	8.0	8
		50	5.1	5
4 p. m.	M., Ca.	0	14.5	23
		25	7.5	5
		50	5.1	2
7 p. m.	R., L. b.	0	14.6	27
		25	7.6	4
		50	5.1	6
10 p. m.	C., M. b,	0	14.0	22
		25	7.5	3
		50	5.1	6

Ca. ... Calm, C. ... Cloud, L. b. ... Light breeze, M. ... Misty, M. b. ... Moderate breeze, R. ... Rain.

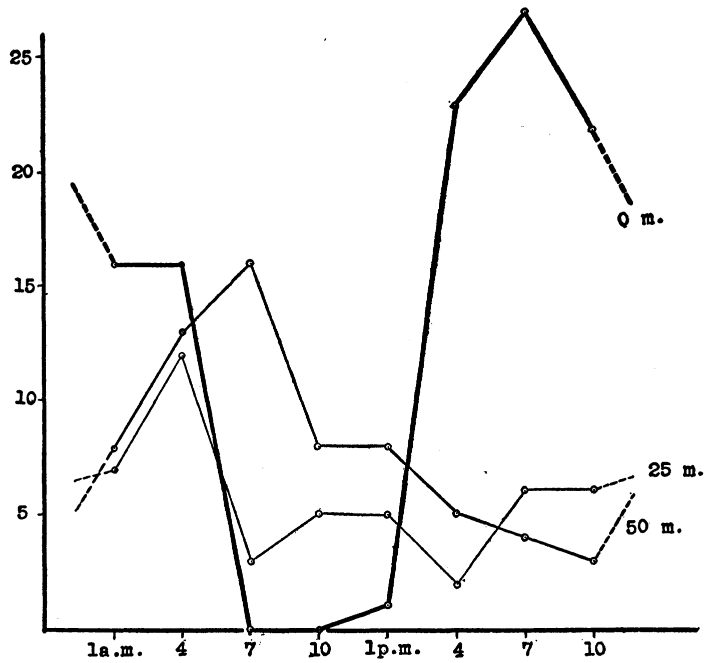


Fig. 1

Curve showing the diurnal change of frequency at the three different depths on July 23–24, 1931.

A glance at the table as well as at the figure shows clear evidence of diurnal change in the vertical distribution of *Diaptomus*. At midnight (1 a. m.) some *Diaptomus* gradually migrate from the surface downwards though majority of them remain on the surface. The frequency of *Diaptomus* increases in the deeper portions toward the dawn. From 4 o'clock a. m. the downwords migration occurs rapidly and finally no *Diaptomus* are found on the surface, shortly after sunrise (7 a. m.). During the same period at the depth of 25 meters the distribution becomes maximum, in the deeper portion being less frequent. It is understood that most of them do not migrate below 25 meters. Next, during the daytime from seven to ten o'clock all *Diaptomus* are still absent from the surface.

In the present observation the upwards migration occurs first in the early afternoon and so a few *Diaptomus* are found migrated toward the surface at 1 p. m. At 4 p. m. the surface distribution of *Diaptomus* increases markedly. The maximum frequency of *Diaptomus* at surface is attained at 7 p. m., that is shortly after sunset and afterwards with the passing of hours they again migrate downwards to have at 11 p. m. almost the same distribution as in the evening (4 p. m.).

It is noted that in the deeper portion of the lake the diurnal change of the distribution occurs less frequently as compared with that of the shallower portion. At 50 meters depth the distribution is almost constant throughout the day except at 4 a. m. when *Diaptomus* becomes, however, more frequent than usual.

From the above one may understand that at this season at least the vertical migration of *Diaptomus* takes place most actively between the surface and the 25 meters depth.

Observation II

In the second series of observations which was carried out on August 23-24, 1931, sample water was collected from 15 meters depth besides from the three above mentioned, and furthermore 100 meters and 150 meters depths were also examined in order to find the maximum depth of the distribution of *Diaptomus*.

During the observation the weather was very fine and there was a bright moon overnight, therefore the condition of illumination differed greatly from that of the previous observation. Table II and Fig. 2 show the result.

Table II. The vertical distribution of *Diaptomus* in Lake Shikotsu on August 23-24, 1931.

Hour	Weather	Depth (m.)	Temperature (°C)	Number
6 a. m.	F., Ca.	0	21.0	2
		15	9.6	8
		25	7.5	2
		50	4.8	3
11 a. m.	F., Ca.	0	21.5	0
		15	9.5	6
		25	7.0	3
		50	4.8	2
3 p. m.	F., Ca.	0	21.5	1
		15	10.0	2
		25	—	—
		50	4.6	0

Hour	Weather	Depth (m.)	Temperature (°C)	Number
7 p. m.	F., Ca.	0	20.8	27
		15	8.4	3
		25	6.5	2
		50	4.6	2
11 p. m.	F., Ca.	0	19.5	15
		15	8.0	45
		25	6.0	2
		50	4.6	6

Ca......Calm, F......Fine

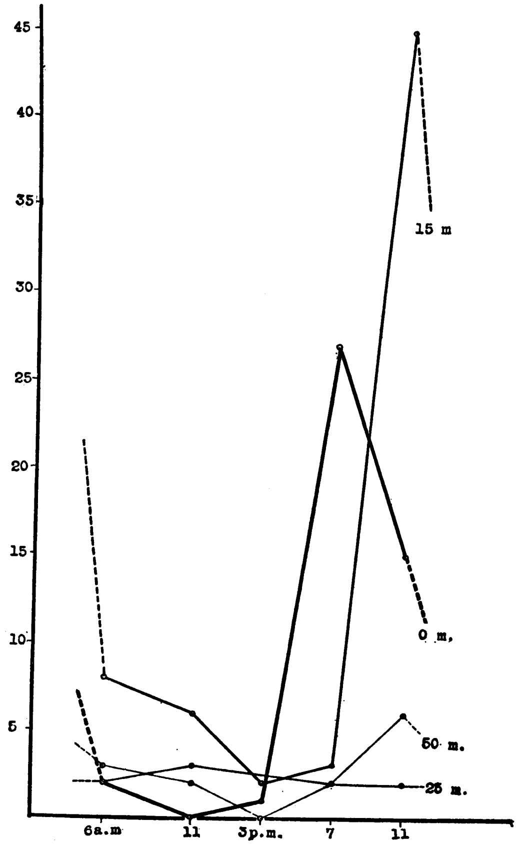


Fig. 2

Curve showing the diurnal change of frequency at four different depths on August 23–24, 1931.

From the above it will be seen that the minimum abundance of *Diaptomus* at surface is found at 11 a. m. In the early afternoon only a few are found near the surface. A remarkable upwards migration takes place during the evening until most of them come to the surface at 7 p. m. Afterwards a part of them migrates downwards and at 11 p. m. the frequency at surface becomes about a half of the maximum number. The most striking diurnal change is found at the level of 15 meters below the surface. In this depth the maximum abundance is observed at 11 p. m. while in the evening it reaches its minimum number. At 25 meters or 50 meters depth we always see only a few *Diaptomus* and the frequency is not so much varied within a day as compared with the superficial part. In the very deep part 100 or 150 meters below the surface no *Diaptomus* is found.

One sees from the above that in Lake Shikotsu *Diaptomus* undergoes in general a diurnal migration showing a striking change in vertical distribution. Apart from the oxygen content of the water in which *Diaptomus* occurs, one can enumerate the enviromental factors which influence the migration such as temperature and illumination. So far as the temperature is concerned it is kept nearly constant in any depth throughout a day. Thus it has little to do with the migration. Here the influence of light upon *Diaptomus* is naturally taken into account. The downwards migration from the surface toward midnight may be a result from the effect of illumination upon the animal. As a matter of fact in the places deeper than 25 meters where the influence of light is very little, the frequency of *Diaptomus* is almost constant day and night. Probably the influence of oxygen which shows apparently no change by time in the lake is not very great.

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摘　　要

支笏湖に於けるディアプトウムスの垂直分布に就て

林　禎　二　郎・名　取　武　光

Diaptomus denticornis WIERZEJSKY var. *yezoensis* KOKUBO は支笏湖に於ける浮游生物中主要なる部位を占め、其の出現は夏期に於て最も多し。同期に於ける之が垂直分布の晝夜變化を見るに表面に於ては、未明より正午に至りて其の分布最も尠く、其後時間の經過と共に漸次表面に浮游し來り薄暮に及んで maxinum に達し、短時間内に於ける變化顯著なり。其後再び深部に移動す。斯かる垂直運動の經過は比較的規則正しく行はるも、天候に依り影響を受くる事も亦大なり。即ち晴天に於ては、午后三時過ぎに於て初めて急激なる上昇運動を認め得たるに對し曇天に於ては、正后過ぎ早くも表面に現はれたるもの若干あり。而して分布の時間的偏差は表面より十五米附近に於て最も多く、二十五米以下に於ては尠く、五十米以下に於ては終日少數の個體のみ分布す。更に垂直運動の範圍は百米以内にして、より深部に於ては *Diaptomus* の發見困難なり。

以上の事實より少くとも斯かる貧營養湖に於ては光りの變化が *Diaptomus* の垂直移動に關し最も重大なる影響を有するものと考察さる。

北海道帝國大學農學部動物學教室

A BIOLOGICAL SURVEY OF LAKE KABA, AN UNCULTIVATED LAKE, COMPARING IT WITH LAKE SHIKOTSU, FOR THE PURPOSE OF CULTIVATION FOR FISHERY

BY

TEIJIRO HAYASHI and BUKÔ NATORI

(With One Text-figure)

Hokkaido is blessed with lakes of various kinds, a few of which have been utilized for fishery while most of them still remain in the natural untouched state. The economical value of the latter, if cultivated, is by no means small. So, the Government Fishery Experimental Station has succeeded in cultivating Lake Shikotsu introducing *Oncorhynchus nerka* (WALBAUM) and *Salmo irideus* GIBBONS and at the same time a kind of freshwater shrimp for the nutrition of the fishes from other lakes. At present the lake has became even famous for the production of those kinds of fishes.

In the hope to ascertain means for the utilization of a lake the present study was undertaken. It is to determine first whether the lake in question has any economical value and next to see subsequent changes, if any, caused by the cultivation. Fortunately Mr. J. TANAKA was very kind to us in offering an uncultivated lake of his own, named Lake Kaba, for our experiment.

Lake Kaba lies to the south of Lake Shikotsu having Mt. Tarumae between them and empties into one of the branches of the River Nishitappu which flows from the eastern foot of the mountain toward the sea. The lake has an area of about 1000 square meters forming two long gulfs, surrounded by bushes to the south-west. The north-eastern side of the lake is bordered with even ground where reeds and reedlings grow thick. The bottom is nearly flat covered mostly with darkbrown saprobel and partly with brown sand or volcanic pebbles in the neck part. It is deepest in the central part measuring 4 meters, other parts being less than 4 meters in depth. At the neck part the depth is about ten centi-meters only.

The water of the lake is not stagnant but always runs out through the narrow mouth of 4 meters width. Recently we have made an artificial float-gate in this part in order to separate the lake from the river part.

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 2, 1932]

The maximum temperature of the lake appears in August showing about 18–19°C. Usually in the summer season the air temperature measures about 5–6°C higher than that of the lake. Toward winter the divergency in the temperatures decreases gradually until at last in late December the condition becomes reversed. In this season the atomospheric temperature falls below 4°C, while the water temperature of the lake shows an almost constant, 4°C. Of course under heavy snowfall the water temperature temporarily declines below 4°C and sometimes a part of the surface of the lake is frozen by the severe cold.

The following table shows the observations on temperature of the water at 1 p. m. at twenty centi-meters depth last year.

Table I. The water temperature of Lake Kaba

Date	July	August	September			October			November					December				Janu-ary
Temp.(°C)	25	26	13	22	30	7	15	22	1	9	15	23	28	2	12	18	21	16
A. T.	17	24	24	22	20	19	18	18	17	14.5	13	11	9.5	8.5	5.5	3	2	-6
W. T.	14	18	17.5	16	15.5	15.5	14.5	14	13	11.5	11	10	9	7.5	5	3.5	3	5

A. T., Atomospheric temperature; W. T., Water temperature.

No doubt, in the lake the water is usually gushing out in a considerable amount all the year round. So far as the physical condition of the lake is concerned, it is quite fitted for salmon-trout farming.

It is a well known fact that the economic value of the lake is determined on the other hand mainly by its plankton life as the method of supplying artificial food has not yet much advanced.

The inhabitants examined in Lake Kaba in the summer season were identified as follows:

Porifera

Spongilla sp. .... in July abounds in the western gulf only.

Nematoda

Lamellibranchia

Anodonta sp. ...... very common in the southern side of the Lake.

Crustacea

Cambaroides japonicus (DE HAAN) ...... at the neck, very common.

Pisces

Leuciscus hakonensis GÜNTHER ...... not so frequent.

Leuciscus sp. (*Yachiugui*) .... very common but species name undetermined; the fish is very voracious but of least value.

PLANKTON

Flagellata

Peridinium sp. .... very frequent.

Glenodinium sp.

Rhizopoda

Nuclearia sp.

Ciliata

Dinobryon sertularia EHRENBERG

Codonella crateva (LEIDY)

Rotifera

Anuraea cochlearis GOSSE

Ploesoma hudsoni IMHOF

Polyarthra platyptera EHRENBERG

Asplanchna priodonta GOSSE

Crustacea

Nauplius

Bosmina longilostris (O. F. MÜLLER)

Bacillariaceae

Fragilaria sp.

Synedra sp.

Surirella sp.

Cocconema sp.

Asterionella sp.

Epithemia sp.

Melosira sp.

Chlorophyceae

Oedogonium sp.

From the above we know that in the lake many fishes have been accustomed to live naturally with the above mentioned plankton which is to be considered sufficient for them. But in consideration of the farming of salmon-trout, it is necessary to compare the life in the lake with that of Lake Shikotsu.

The lives in Lake Shikotsu at summer season were as follows:

Crustacea

Cambaroides japonicus (DE HAAN)

. ***Leander paucidens*** (DE HAAN)

Once Lake Shikotsu was conspicuous in having plenty of the crayfish. However at present hardly any crayfish can be found in the lake except in rivers or rivulets which empty into the lake. The evidence is very interesting as it closely correlates to the introduction of the shrimp. In 1918 and 1919 the shrimp was transplanted from Lake Osatsu about 10 kgr. respectively and since that time the crayfish has become to disappear from the lake gradually with the increase of the shrimp until 1928 when the lake seemed to be completely occupied by the shrimp.

Pisces

Salvelinus pluvius (HILGENDORF)

Cottus pollux GÜNTHER

Oncorhynchus nerka (WALBAUM) ...... the fish was introduced from Lake Akan in three successive years from 1894 with success. At present the fish has become more abundant in this lake than in the original.

Salmo irideus GIBBONS ...... the fish has been artificially cultured since 1920.

Carassius auratus (LINNÉ) ...... the fish was introduced seven years ago (1925) but at present it is rather rare in the lake.

PLANKTON

Flagellata

Ceratium hirundinella O. F. MÜLLER

Peridinium sp.

Ciliata

Dinobryon serturaria EHRENBERG

Rotifera

Anuraea aculeata EHRENBERG

Anuraea cochlearis GOSSE

Crustacea

Diaptomus denticornis WIERZEJSKI var. ***yezoensis*** KOKUBO

Daphnia longispina hyalina (LEYDIG)

Scapholeberis mucronata (O. F. MÜLLER)

Nauplius

Arachnoidea

Hydrachna sp.

Bacillariaceae

Fragilaria sp.
Epithemia sp.
Cocconema sp.
Surirella sp.
Synedra sp.

Chlorophyceae

Oedogonium sp.

As previously stated Lake Shikotsu is one of the lakes which has been successfully utilized for fish culture in Hokkaido, so the study of plankton of any unutilized lake in comparison with that of this lake qualitatively as well as quantitatively is by no means useless. Doing so we may have some suggestion for the cultivation of the new lake, as we have already learned that the physical condition of Lake Kaba is fitted for the fish.

Observation showed that in the summer season the plankton life in Lake Kaba is characterised by the abundant Rotifera while in Lake Shikotsu there are numerous Cladocera and Copepods. In Lake Kaba there is only one species of Cladocera, that is *Bosmina longirostris* (O. F. MÜLLER) which we found a few in the September plankton. UENO (1931) described the same species of Cladocera from Onuma, Konuma and Lake Kuttarush but in Lake Shikotsu other species, *Daphnia longispina hyalina* (LEYDIG) and *Scapholeberis mucronata* (O. F. MÜLLER) were said to be found. *Ceratium hirundinella* O. F. MÜLLER of Flagellata occurs only in Lake Shikotsu and the Nematoda is the particular life of Lake Kaba.

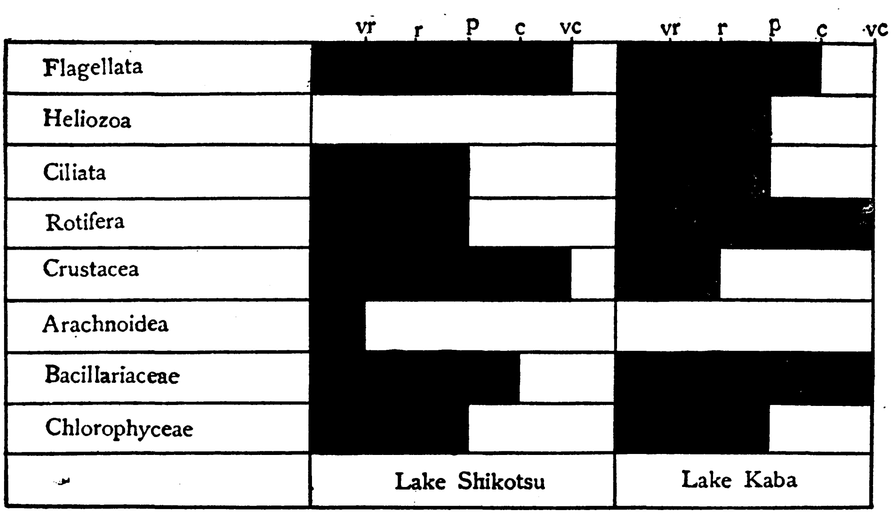

Fig. 1

Showing the quantitative relationship of the two lakes. vr, very rare; r, rare; p, present; c, common; vc, very common.

According to NAUMANN a lake belongs to either oligotrophic or eutrophic type according to the limnological condition. NORDQUIST (1921) differentiated two types according to the plankton life, showing that the oligotrophic lake abounds in Cladocera, with a few Copepods but in summer complete lacking of Rotifera while the eutrophic lake, on the other hand contains abundant Rotifera and Cyclops but only a few Cladocera.

Lake Shikotsu indicates the oligotrophic type as YOSHIMURA (1932) showed by the chemical character of the water. Lake Kaba belongs rather to the eutrophic type though not typical owing to the change of water due to the springs.

At any rate we can see that the oligotrophic type in respect to the plankton is better fitted to the culture of the salmon-trout than is the eutrophic. Under this supposition we are going to introduce *Diaptomus* into Lake Kaba which is for trouts considered to be one of the most important foods.

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摘　　要

未利用湖沼樺沼の生物調査並びに養魚上支笏湖生物相との比較

林　禎二郎・名取武光

北海道は各種の湖沼に富み水産上恵まれたる地方なれども、其の多くは未利用の狀態に在り。之が利用研究の一端さして未利用湖樺沼を見るに其の水温湧水量共に鮭科魚類の養殖に適せり。依つて該湖に於ける生物調査を行ひ其の養殖價値を調べ、且つ魚類移殖後に於ける生物相の變化に資すると共に相隣接せる利用湖支笏に於ける生物相と比較し、以つて該湖に於ける養魚計畫の資料となす。樺沼の生物相は榮養湖に近きを示し、支笏湖は貧榮養湖に屬すべきは其生物相のみならず吉村氏の水理學的調査に依るも明なり。而して支笏湖に於て鮭科魚類の飼料さして最も重要なる位置にある *Diaptomus* は樺沼に於て全く棲息せざる事を知りたれば、鮭科魚類の移殖前提さして同浮游生物の移殖を計畫せり。

此の研究をなすに當り樺沼の使用を許されたる田中重兵衛氏の好意に深く感謝の意を表す。

DESCRIPTIONS OF TWO NEW SPECIES OF ARANEIDA FROM THE NORTHERN KURILE ISLANDS

BY

SABURO SAITO

(With two Text-figures)

Lately through the kindness of Dr. Y. Okada many valuable specimens of spiders collected by the exploring party on the Osaka-Mainich publishing firm in the summer of 1931 from some of the northern Kurile Islands, namely Shumushu, Paramushir and Araito, have been handed to the author for the identification of the species. For this the author wishes here to express his heartiest thanks to Dr. Y. OKADA.

They have been identified with seven known genera covering ten known species and two new species:

Xysticus limbatus KEYSERLING
Clubiona brevipes BLACKWALL
Clubiona frutetorum L. KOCH
Clubiona kurilensis BÖS. et STRAND
Theridion formosum (CLERCK)
Theridion araitense n. sp.
Theridiosoma gemmosum (L. KOCH)
Arctosa cinerea (FABRICIUS)
Pirata montanus EMERTON
Lycosa avida WALCKENAER
Lycosa riparia C. L. KOCH
Lycosa chisimensis n. sp.

Theridion araitense n. sp. (fig. 1)

Jap. name. *Araito-himegumo.*

Cephalothorax glabrous, rather longer than broad, of the same length as the femur of the fourth pair, rounded in sides, narrowing just before the coxae of the first pair; the pars thoracica broading forward, rounded in front, the breadth of the clypeus equaling half that of the pars thoracica. Colour of cephalothorax brownish testaceous with a black longitudinal middle band, the breadth of which in the anterior part is the same as the clypeus; with a black marginal stripe. Anterior eyes nearly equal in size, black, being arranged in a slightly recurved row; the distance of the lateral ones from the central ones greater than that between the latter. The posterior eyes in a straight line, white in colour; the central eyes occur more distantly separated than those of the anterior row. The lateral eyes of both rows contiguous. The width and the length of the sternum nearly equal, representing a heart-shape, truncated before and pointed behind, rusty-brown in colour with a blackish margin. Chelicerae deep brown with long black hairs, small, perpendicular, the length about two times as long as the height of the clypeus; the inner margin of the furrow of the chelicerae armed with three teeth, the outer with two. Labium rather more broad than long, blackish brown at the root with white apex furnished with bristles. Maxillae brown, whitish at the apex, smooth and hairy, the length being twice as long as the breadth at the root. Palpi pale rusty-brown, with blunt bristles. The legs of the same colour as the palpi, coxae slightly darkened at the apex; the underside of the apex of coxae and trochanters provided with some blunt upturned bristles and the tibiae armed with three pairs of long and strong spines; metatarsi with two pairs of such spines on the under side. Each leg furnished with three tarsal claws.

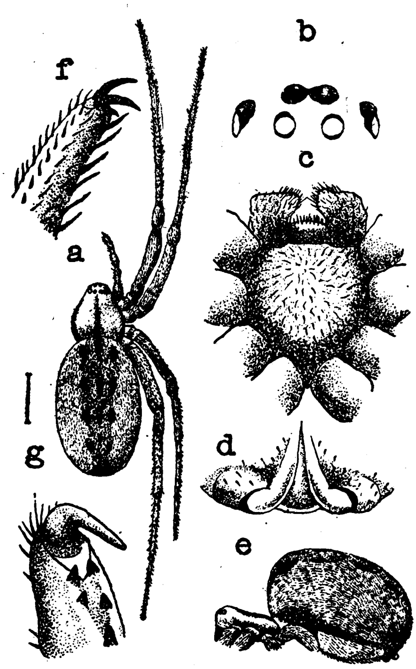

Fig. 1

Theridion araitense n. sp.

a, dorsal view. b, eye. c, sternum. d, epigynum. e, lateral view. f, tarsus of the fourth leg. g, chelicera.

Abdomen very high, truncated in front, gradually dilating backward, posterior pointed; it is thinly spread with short black hairs. The back of the abdomen is yellowish toward the sides, with a median rusty black band, which has three series of large black spots in it, two converging side series and a central one. Belly light sepia with two black stripes which extend from both spiracles to the spinnerets and meet together with the series of black spots of the dorsal side at the anus. The epigynum represents ⊥-shaped depression, blackish brown in colour. Spinnerets of moderate length, an anterior pair brown, contacting with each other, other two pairs arranging transversely on a straight line.

Length of body, 7 mm.; length of cephalothorax, 3 mm., breadth of cephalothorax, 2.5 mm.; length of abdomen, 5.5 mm., breadth of abdomen, 3.5 mm.; height of abdomen, 4.0 mm.; length of legs: I, 8.5 mm., II, 8 mm., III, 7 mm., IV, 9 mm.

Locality: a single female was found in the specimens from Minamiura of Araito Island collected on July 15.

Remarks: the species is akin to *Theridion formosum* (CLERCK) which is a well known form in the world. However, the present species is quite distinct in having the transverse septum in the epigynum which is not to be found in the other known species.

Lycosa chisimensis n. sp. (fig. 2)

Jap. name. *Ao-chishima-dokugumo.*

Cephalothorax as long as patella+tibia of the first pair, its breadth equal to the length of the tibia of the fourth pair; the pars cephalica is moderately high and somewhat rounded. Colour brownish black with deep yellowish middle and submarginal bands tapering forwards and reaching backward to the pars cephalica. Anterior row of eyes nearly straight or more or less recurved; median eyes larger than the lateral and the separation of four eyes equal to $\frac{1}{2}$ the diameter of the lateral eyes. The area occupied by the posterior eyes represents a trapezoid which is shortest on the anterior and longest on the posterior side; the space between the two median eyes a little greater than the eye-diameter, the space between the medians and the laterals double the diameter of the latter. The length of chelicerae about two times as great as the breadth, yellow in colour; the outer margin of the furrow of the chelicerae having two and the inner three teeth. Labium black with a white fleck at the apex, the breadth double the length. Maxillae hairy, yellow in colour. Legs rather long, the fourth pair about four times as long as the cephalothorax, with a metatarsus equalling the length of the patella and tibia; coxae, trochanters and femurs with apicals spines, tibiae with two pairs of spines. Colour of legs brown with deep black markings: four irregular markings on the femurs, four very indistinct ones on the tibiae and metatarsi; a marking at the apex of tarsi, on patellae and on coxae. Sternum brownish black, being strewed with erect black hairs, the space between the second coxae broadest, pointed behind.

Abdomen of the ordinary form, blackish brown above, with a lanceolate pale brownish band at the anterior part; behind this band, which does not reach to the middle of the back, two rows of black spots; belly uniformally

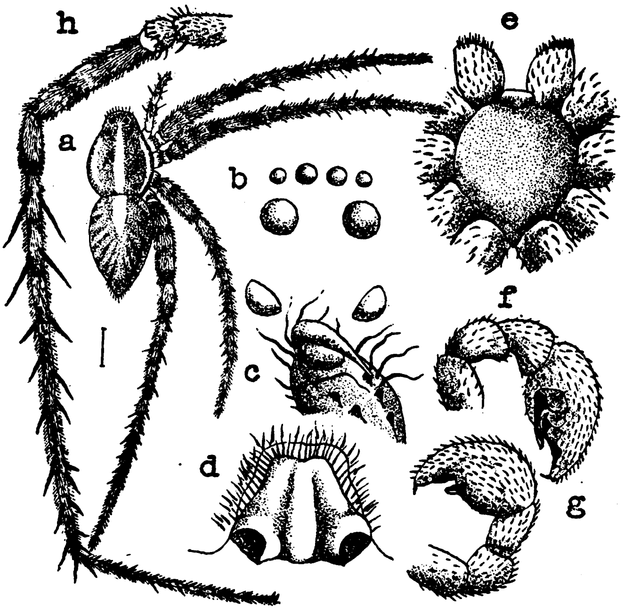

Fig. 2

Lycosa chisimensis n. sp.

a, dolsal view. b, eye. c, chelicera. d, epigynum.
e, sternum. f, palpus of male (inside). g, palpus of male (outside).
h, the fourth leg.

brown. Epigynum has a rather large corneous area for the genus, which gradually narrows forward, not pointed, and posteriorly truncated.

Length of body, 5.5 mm.; length of cephalothorax, 2.5 mm., breadth of cephalothorax, 2.0 mm.; length of abdomen, 3.5 mm., breadth of abdomen, 2.0 mm.; length of legs: I, 9.0 mm., II, 8.0 mm., III, 8.0 mm., IV, 11.5 mm.

Locality: two females were identified in specimens from Ichino-ura (Araito), collected on July 21; four other females were from Mt. Shiriyajiri (Paramushir), obtained on August 3, and four males and two females from Kitaura (Araito) collected on July 17.

Remarks: the present species is near *Lycosa monticola* (CLERCK, 1757) which is common in Europe. Having the semicircular opening of the guide of the epigynum the present form is clearly distinguishable from the above species in which it appears merely as a slit-like opening.

摘　　要

北千島産蜘蛛の二新種に就て

齋　藤　三　郎

1931年の夏大阪毎日新聞社の企圖せる北千島調査隊の採集せる蜘蛛の標本を岡田博士の御厚意に依り査定する機會を得、次の七屬十種、二新種を得茲に新種を報告す。

Xysticus limbatus KEYSERLING
Clubiona brevipes BLACKWALL
Clubiona frutetorum L. KOCH
Clubiona kurilensis BÖS. et STRAND
Theridion formosum (CLERCK)
Theridion araitense n. sp.
（アライトヒメグモ）
Theridiosoma gemmosum (L. KOCH)
Arctosa cinerea (FABRICIUS)
Pirata montanus EMERTON
Lycosa avida WALCKENAER
Lycosa riparia C. L. KOCH
Lycasa chisimensis n. sp.
（チシマアナドクグモ）

本稿を草するに當り岡田博士の御厚意に對し深甚なる謝意を表するものである。

（北海道帝國大學農學部動物學教室）

ON TWO NEW SPECIES OF ANTITHAMNION FROM JAPAN

BY

JUN TOKIDA

(With one Plate and 5 Text-figures)

In the algal collection made by me in southern Saghalien in July and August of the year 1930, I found three species of *Antithamnion*, quite sharply distinct from each other viz., *A. Corallina* (RUPR.) KJELLM. from Robben Island, a well-known fur-seal island in the Ochotsk Sea, *A. corticatum* sp. nov. and *A. sparsum* sp. nov. from Lake Tobuchi, an interesting lagoon in Aniwa Bay. The first one of these species I have described in detail in another paper entitled "*The Marine Algae from Robben Island, Saghalien.*[1]" In the present paper I shall describe the latter two species new to science.

So far as I know there have been only three species of *Antithamnion* reported from Japan. One of these is found in the southern-most part of Hokkaido, and the rest on the Pacific side of Central Honshu. During my study on the algae of Saghalien, I have not found any of these already known species present there.

Here I wish to express my sincere thanks to Professor H. KYLIN of the University of Lund, Sweden, for examining my specimens and writing me his opinions with kind advice. I am much obliged also for the kindness of the gentlemen of the Karafuto Agar-Agar Company, especially to Mr. S. MATSUBARA for his valuable assistance.

Antithamnion sparsum sp. nov.

Plate III, Fig. a; Text-figures 1 & 2

Frons 2–4 cm. alta sparse ramosa; rhizoideis numerosis ab segmentis inferioribus vel cellulis basalibus ramorum et ramulorum superiorum emittentibus, raro in apicibus disciformibus; cellulis ramorum principalium pinnis oppositis, superiore latere pectinatis; nulla pinna ramis opposita; ramulis ultimis apice

1.) *Vid.* Bulletin of the School of Fishery, Hokkaido Imperial University. Vol. 2. 1932.

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 2, 1932]

attenuatis sed non acribus saepe cellulis glandulinis ornatis; cellulis ramorum 40–90 μ raro ad 105 μ crassis, diametro 2–5.5-plo longioribus, cellulis basis ramorum quadratis; chromatophoris numerosis disculiformibus; tetrasporangiis in pinnis pedicellatis vel sessilibus, 37.5–57 μ crassis, 60–73 μ altis, cruciatim divisis. Carpogonia et antheridia ignota.

Habitat: Tobuchi Lake, Saghalien (J. TOKIDA, Aug. 1930, No. 423).

Nom. Jap.: *Kinuito-yotsugasane*.

Fronds 2–4 cm. high, attaching to the substratum by means of long rhizoidal filaments arising from the basal segments of the frond; rhizoidal filaments arise also from the basal cells of lateral branches and branchlets in the middle

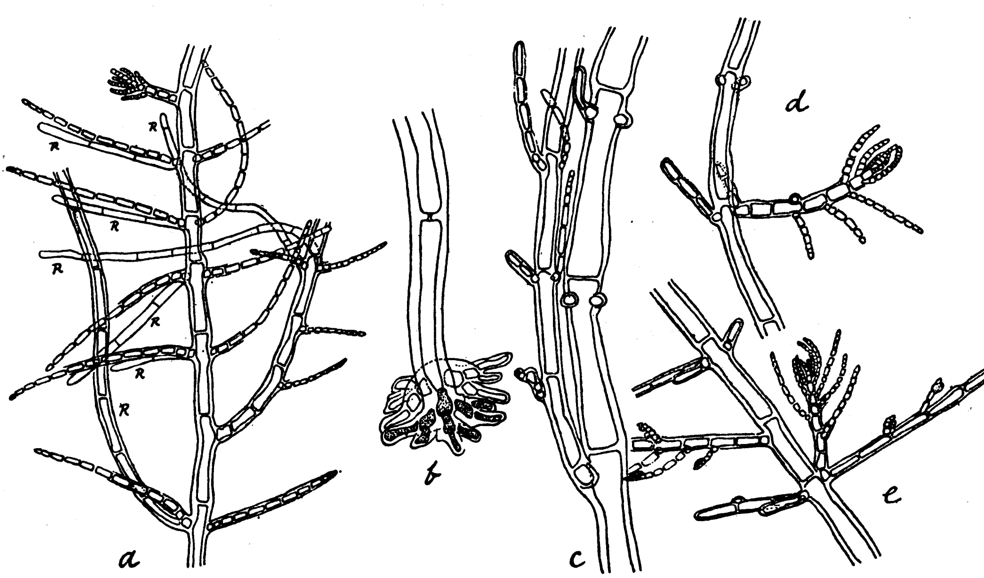

Fig. 1

Antithamnion sparsum sp. nov. *a.* Middle portion of a frond, showing the rhizoids (*R*). *b.* Distal end of a rhizoid with a discoid holdfast. *c.* Lower portion of a frond. *d.* & *e.* Abnormal cases of the position of a branch. a, c, d, & e ×64; b ×159.

as well as the upper part of the frond, a few of them ending with a discoid holdfast; sparingly branched; main branches provided with two opposite branchlets on each cell, these pairs of branchlets not in the same plane but crossing each other at an angle; branchlets pectinate on the upper side; no branchlet opposite a main branch, which terminates with an apical growing point and arises not only on a main branch but in a few cases also on a branchlet; ultimate ramuli with tapering tips but not so sharp, often provided with glandular cells;

in the main branches 45–90 μ rarely up to 150 μ in diam.; basal cells of branches and branchlets quadrate, other cells 2–5.5 times as long as broad; chromatophores numerous, small, disk-shaped; tetrasporangia ovoid, 37.5–57 μ in diam. and 60–78 μ long, pedicellate on branchlets, sometimes sessile on branchlets and ramuli, cruciately divided; sexual reproductive organs unknown.

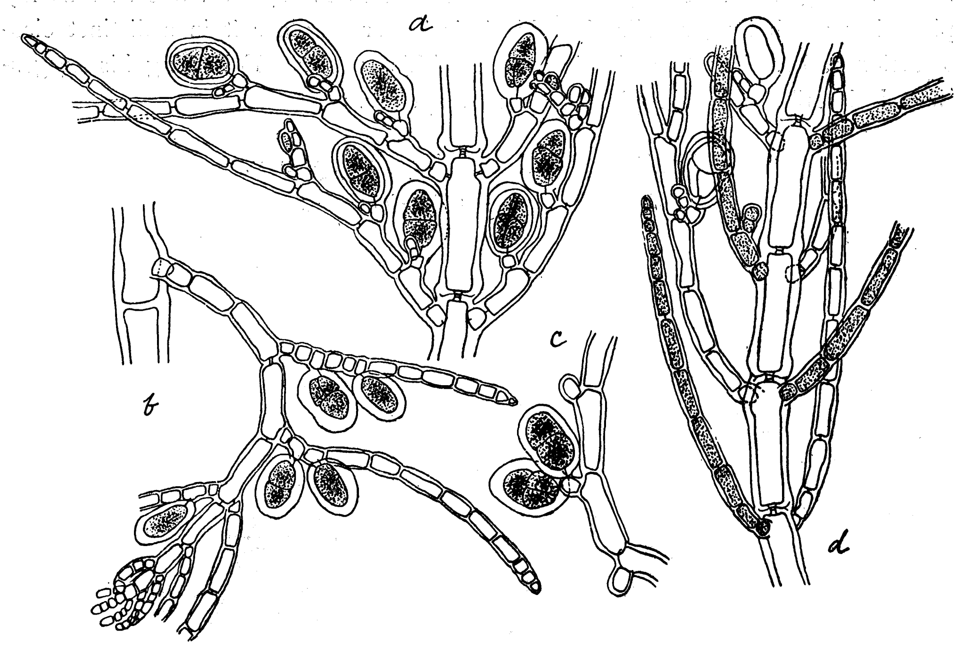

Fig. 2

Antithamnion sparsum sp. nov. *a.* Pedicellate tetrasporangia, and glandular cells. *b.* Sessile tetrasporangia. *c.* Two sporangia on a pedicel. *d.* Upper part of a branch, showing opposite pinnae strictly not distichous. a–d. ×155.

On shells of *Ostrea* brought up from a depth of about three fathoms in Lake Tobuchi, this species was found growing side by side with *A. corticatum* described in this paper. One of the distinct characteristics of our plant is that there is no branchlet opposite a main branch. In 1925 Professor H. KYLIN[2] described a new species which has no branchlet opposite a main branch and named it as *A. defectum*. This curious characteristic was thought to be unique in the last mentioned species, until in 1927 two new species were described by

2.) H. KYLIN, (1925), The Marine Red Algae in the Vicinity of the Biological Station at Friday Harbor, Wash., p. 46, f. 27. Lunds Univ. Årsskr. N. F. Avd. 2. Bd. 21, Nr. 9.

Dr. N. L. GARDNER[3] viz., *A. setaceum* GARDN., and *A. pygmaeum* GARDN., which resemble *A. defectum* KYLIN, especially in the absence of branchlets opposite main branches. Comparing the descriptions and figures of these three with ours, I am inclined to think our Saghalien plant is most closely related to the last mentioned species. Professor H. KYLIN kindly examined my specimens writing me that they are closely related to his species, but that as my plant has much longer cells than his it is better to place it in a distinct classification rather than to make it a form of his species. Following his suggestion, I describe here our plant as a new species.

Antithamnion corticatum sp. nov.

Plate III, Figs. b–d; Text-figures 3–5

Fig. 3

Antithamnion corticatum sp. nov. Apical portion of a frond, showing the branching mode. ×67.5.

Frons erecta, 3 cm. alta, distiche decomposita, inferne corticata, superne

3.) N. L. GARDNER, (1927), New Rhodophyceae from the Pacific Coast of North America. IV. & V. Univ. Calif. Publ. Bot., Vol. 13, p. 373 & 413.

ecorticata; rhizoideis ad basin axium principalium a filamentis corticatis continuis affixa; alterne vel subdichotome ramosa; cellulis ramorum pinnis oppositis; pinnis inferne ramulis oppositis superne secundis ornatis; nulla cellula glandulina; ramulis axillaribus ad cellula basales pinnarum laterale oppositis praeter axes ramorum sursum incurvas, saepe ramosissimis; inferne filamentis corticatis intramembranis opposite vel alterne ramosis, a cellulis basis ramorum et pinnarum nunnumquam etiam ramulorum axillarium deorsum emittentibus corticata; ramulis adventitiis brevibus simplicibus vel raro ramosis super corticem sparsis; ramis principalibus ad basin 300–375 μ crassis, sursum attenuatis inferne e cellulis diametro aequalibus, superne 2–4-plo longioribus constitutis; cellulis superioribus lagunculiformibus; pinnis ad basin 21–24 μ crassis; ramulis ultimis ad basin 12 μ crassis, sursum attenuatis apicibus rotundatis cellulis apicalibus 6–9 μ crassis; chromatophoris in cellulis majoribus e fasciculis tenuibus perpendiculis marginibus irregularibus constitutis; tetrasporangiis in ramulis sessilibus vel breviter pedicellatis cruciatim divisis; antheridiis in apicibus pinnarum et ramulorum; ramulis carpogonatis 4-cellularibus in cellulis subapicalibus ramorum.

Habitat: Tobuchi Lake, Saghalien (J. TOKIDA, Aug. 1930, No. 420; S. MATSUBARA, July 1930).

Nom. Jap.: *Beni-hanemo.*

Fronds erect, 3 cm. high, corticated below, ecorticated above, attached to the substratum by means of rhizoids at the extreme base of the main axis, continuous from the corticating filaments, no rhizoids elsewhere; alternately or subdichotomously branched; each cell in the main branches with two opposite branchlets; branchlets distichous, with ramuli on each cell below, except only a few simple youngest branchlets near the growing apex of a branch, lower ramuli opposite, upper ones secund on the lower (outer) side or sometimes also on the upper (inner); glandular cells absent; ramuli sometimes with ramulets; the lowest or axillary ramuli on the basal cell of a branchlet, rarely also one more couple of ramuli on the succeeding cell, opposite laterally and curved upwards along the branch axis, often repeatedly divided; the basal cell of upper branches, rarely that of branchlets as well, provided with one more ramulus on the lower side beside two axillary ramuli above mentioned; main axes corticated below with intra-membranous, branching rhizoidal filaments, emitted downwards from the lower end of the basal cell of branches and branchlets, sometimes also of the axillary ramuli, branching oppositely and alternately; short simple, rarely divided, adventitious ramuli scattered on the cortication; main axes up to 300–375 μ thick near the base, usually thinner than 300 μ below, gradually attenuate upwards, upper cells of main axes often bottle-shaped; branchlets at the base 21–24 μ in diam.; ultimate ramuli 12 μ thick at the base, slightly tapering toward the apices, with round tips, 6–9 μ thick at the apical cell; lower cells nearly equal in length with the diameter, upper ones 2–4 times as long as the diameter; chromatophores long slender vertical bands with irregular margins in larger cells; tetrasporangia sessile or shortly pedicellate on the upper side of ramuli, cruciately divided; antheridia at the apical portions of branchlets and ramuli; carpogonal branches 4–celled, curved upwards, standing on a supporting cell, which is lateral on the subapical cells of branches.

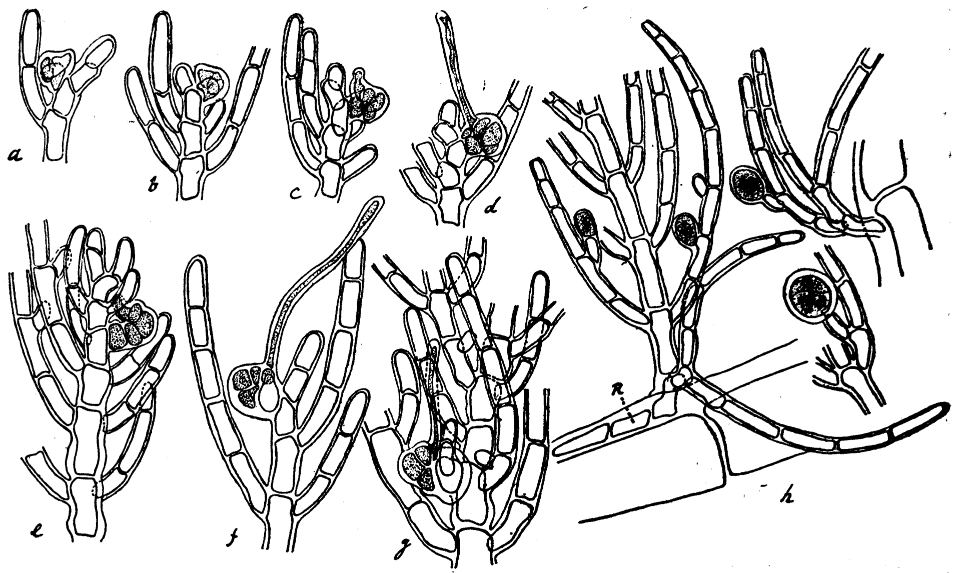

Fig. 4

Antithamnion corticatum sp. nov. *a–g.* Apical portions of branches, showing the carpogonal branches in various stages of development, in *g* the supporting cell is the basal cell of a 3–celled branchlet. *h.* Young tetrasporangia, and a young corticating rhizoidal filament (*R*).
a–g ×261; h ×146.

Our plant was found on a shell of *Ostrea*, growing side by side with *Antithamnion sparsum* TOKIDA as already mentioned above, and on the body of *Styela*, in a depth of about three fathoms in Lake Tobuchi. Because our plant is characterized at first glance by the possession of the cortication such as we see in some species of *Callithamnion*, e. g., *C. tetragonum* AG., I searched for corticated species among the *Antithamnion* hitherto known. As far as I could discover, there were only two species, viz., *Antithamnion ? microptilum* (GRUN.) DE TONI and *A. cladodermum* (ZANARD.) HAUCK. Both seem to me quite different from our plant. I sent my specimens to Professor H. KYLIN who kindly wrote me stating that it was certainly undescribed. The cortication of our plant seems to be unique at present among the *Antithamnion*, while it is perhaps rather common among the *Callithamnion*. A cortical filament appears at first as a single small cell at the lower end of the basal cell of branches and branchlets. These small initials of the filaments are met with even in the upper cells of the main axes; for example, they begin to appear in the 24th cell below the apex. In the specimens collected by myself in August of 1930, there are both female plants with carpogonal branches, and asexual plants with a few small immature tetrasporangia, mostly undivided and 15–27 μ in diam., 24–30 μ long, rarely with a transverse septum and 42 μ in diam., 46.5 μ long. The specimens collected by Mr. S. MATSUBARA in July of the same

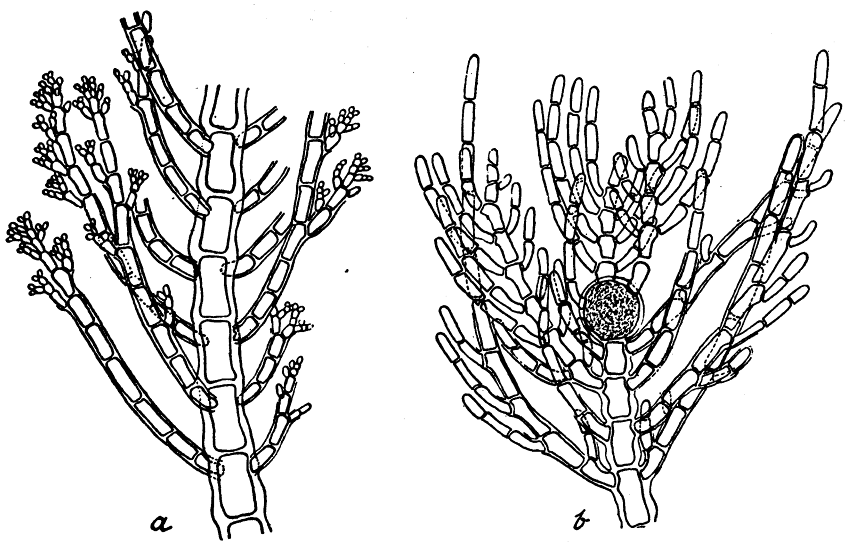

Fig. 5

Antithamnion corticatum sp. nov. *a.* A branch with antheridia. *b.* Apical portion of a branch with a large globular cell probably infected by a parasitic fungus. a–b ×163.

year, are both male and female, the former with mature antheridia. The supporting cell of a carpogonal branch of our female plants is usually a single outgrowth from the subapical axial cell, instead of the basal cell of a branchlet of normal growth as in the case of some other species, for example, *A. plumula* (ELLIS) THUR.,[4)] in other words, the fertile branchlets or "Tragäste"

4.) Cf. H. KYLIN, (1930), Ueber die Entwicklungsgeschichte der Florideen, f. 47, A–D. Lunds Univ. Årsskr. N. F. Avd. 2, Bd. 26, Nr. 6.

after SCHUSSNIG[5] in our female plants are much reduced, mostly represented by only a single supporting cell or the mother cell of the auxiliary cells, but rarely composed of about three cells, the undermost of which is the supporting cell. According to Professor H. KYLIN[6] *A. pacificum* (HARV.) KYLIN has reduced "Tragäste" composed of 2–3 cells. In either case, the carpogonal branch curves upward along not the lateral but the outer side of the supporting cell. This direction of the branch somewhat resembles that of *A. nigricans* GARDN. described by Dr. N. L. GARDNER[7].

In conclusion, it would be well to add that some intercalary cells of the branches are seldom enlarged to become spherical in shape, up to about 60 μ in diameter, with granular and hyaline contents. These bodies seem to me to be due to a parasite, most probably of Chytridinaceous fungus. They are often found empty with a small round opening. The contents are rarely divided into a few zoospore-like masses. Sometimes there occurs a branch, probably attacked by the same parasite, composed of large moniliform cells with hyaline granular contents.

October, 1931.

Botanical Loboratory, School of Fishery,
Hokkaido Imperial University,
Sapporo, Japan.

Explanation of Plate

a. *Antithamnion sparsum* sp. nov. Apical portion of a frond, showing the branching mode. ×67.5

b–d. *Antithamnion corticatum* sp. nov. b. A carpoganal branch on the subapical segment of a branch. ×300

c. Middle portion of a frond, showing axillary ramuli and corticating filaments. ×300

d. Portion of a branch, showing the initials of corticating filaments. ×300

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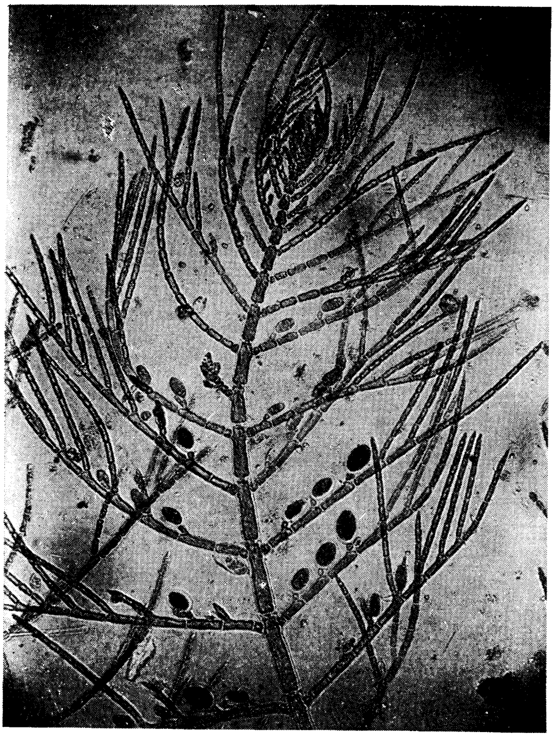
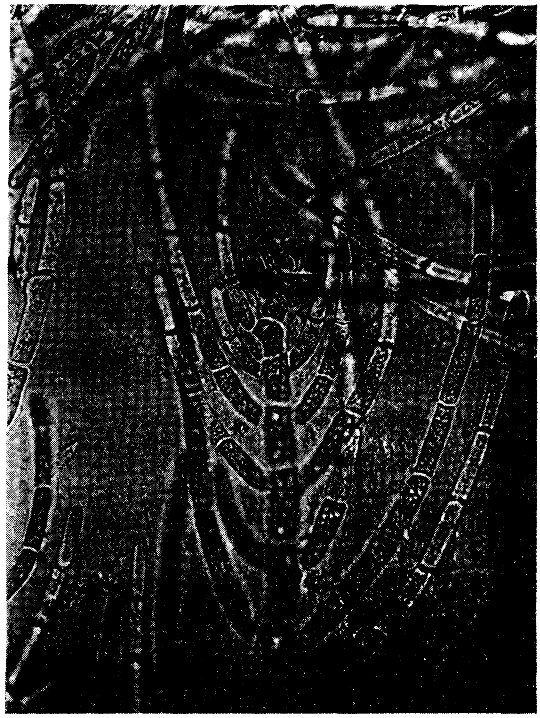
5) Cf. H. KYLIN, (1930), l. c., p. 69.

6.) Cf. H. KYLIN, (1930), l. c., f. 47, H-I.

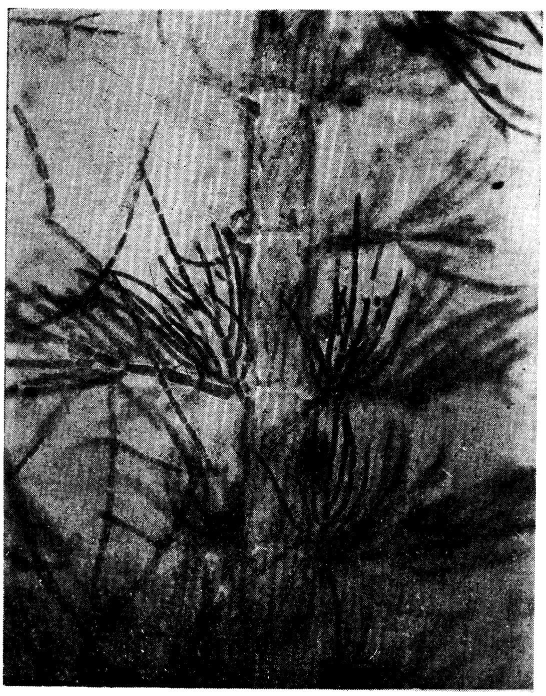
7.) N. L. GARDNER, (1927), New Rhodophyceae from the Pacific Coast of North America. V, p. 409. Univ. Calif. Publ. Bot., Vol. 13, No. 19.



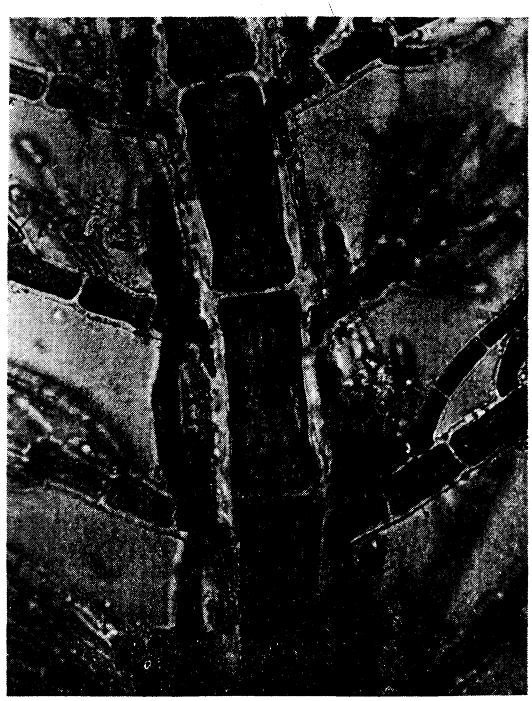
a



b



c



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摘　　　要

紅藻よつがさね屬日本產二新種に就て

時　田　郇

本邦領有南部樺太島沿岸に產する海藻を研究中、昭和五年の夏、予は紅藻類いぎす科 *Ceramiaceae* に屬するヨツガサネ屬 *Antithamnion* 三種を發見せり。即ち、海豹島にて *Antithamnion corallina* (RUPR.) KJELLM. を、遠淵湖(亞庭灣內)にて二新種 *A. corticatum* 及び *A. sparsum* を採集したり。此の中第一種は日本新產にして、予は之を『海豹島の海藻』(水產研究彙報第二卷)と題する別の論文に發表せり。玆には後の二新種を紹介せんとす。

今日まで本邦產として報告されたるヨツガサネ屬は三種あり。何れも樺太にて採集したること無し。

スエーデン國、ルンド大學の教授ハラルド•シリン氏 (Prof. HARALD KYLIN) は、余の送附せる標本を親しく檢し、氏の意見を書送られたり。玆に氏の好意に對して深甚なる感謝の意を表す。余は亦、遠淵湖畔に一工場を有する樺太寒天合資會社の社員諸氏の厚情、殊に松原庄介氏の助力に負ふ所大なり。

Antithamnion sparsum TOKIDA. キヌイトヨツガサネ

第1及2圖、第三圖版a圖、標本番號 423 (時田採集)

本種は主枝に對生する羽枝を缺く性質に於て *A. defectum* KYLIN, *A. setaceum* GARDNER 及び *A. pygmaeum* GARDNER に似たり。而して、此の內 KYLIN の種に最も近し。KYLIN は余の標本を調べ、本種が著く長き細胞を有する點に於て氏の種と異り、多分別種とするを可とすべしとの意見なり。氏の說に從ひて今之を新種とす。即ち枝の基部細胞は短く方形なれど他の細胞は徑の 2-5.5 倍長し。体の高さ 2-4 糎、根樣絲を以て地物に附着し、根樣絲の或ものは先端盤狀となる。約3尋の水底にあるカキの介殼に着生す。主枝の太さは 45-90 μ 稀に 105 μ に達す。僅かに分岐し、主枝は各細胞に對生する二羽枝を有す。羽枝の上側には各節より小枝櫛比す。最末小枝の先端は細くなれども尖らず腺狀細胞を具ふ。色素体は小盤狀にして多數あり。四分胞子囊あり、十字樣に分裂す。有性生殖器官は未詳。

Antithamnion corticatum TOKIDA. ベニハネモ

第3及4圖；第三圖版 b-d 圖、標本番號 420 (時田)、419 (松原採集)

本種は体の下部に *Callithamnion* 屬に見る如き皮層を有することを著しき特徵とす、即ち、枝、羽枝の基部より發して主枝の細胞膜內を分岐しつゝ下向する根樣絲より成り、往々表面より、不定小枝を散在的に生じ、体の基部に於ては根樣絲は下に伸長して根となり、カキの殼或はエボヤの体上に着生す、体の高さ3糎、直立す、屢々互生又は稍叉狀に分岐し、主枝は各節に對生する二羽枝あり、羽枝は二列に生じ、更に小枝を有す、羽枝の基部細胞より生ずる腋生小枝は側方に對生して、枝の軸に沿ふて上方に曲り、屢々分岐す、主軸は下部に於て徑 375μ に達し、上方に次第に細く、上部の細胞は屢々壜形を呈す、最末小枝は基部の徑 12μ, 先端丸し、体の下部細胞は殆ど徑と同長、上部のものは徑の 2-4 倍長し、色素体は多數あり大形細胞內にては、縱に細長き帶狀にしてその緣邊不規則に凹凸あり、四分胞子囊、精子器、胎原列あり別々の個体に生ず、胎原列は4個細胞より成り枝の先端に近き細胞に側生する一個の支持細胞(稀に 2-3 個細胞より成る矮小枝の基部細胞)に立ち、支持細胞の外側に沿つて上方に屈曲す。
稀に枝の一部又は或る細胞が肥大して略々球狀となり、顆粒狀內容を有し、紅色を失へるものあり、往々內容數個に分裂し、又一小孔を以て空虛となれり、之は多分或種菌類の寄生したるものならん。

昭和六年十月　　　　北海道帝國大學附屬水產專門部植物學教室

STUDIES ON THE HYPOCREACEÆ OF JAPAN

I. *Podostroma*

BY

SANSHI IMAI

(With two text-figures)

The genus Podostroma is distinguished from other clavate hypocreaceous fungi by the sphaerical spores which are formed in an ascus to the number of sixteen. Formerly, this genus was included in the genus Hypocrea or Podocrea by TULASNE, SACCARDO, LINDAU and others. In 1905, in his paper on the life history of *Hypocrea alutacea*, ATKINSON, employed the above-mentioned genus name "Podostroma" established by KARSTEN in 1892, and placed LINDAU's Podocrea as its synonym.

In our country, two species of the genus were recorded under the names *Podocrea Cornu-Damae* and *Podocrea xylarioides* by LLOYD who studied on the specimens which were sent from YASUDA to him. The former species was referred by him with some doubt and the latter was newly named on the immature specimens.

During botanical excursions, the writer has himself collceted fungi belonging to this genus and he has also examined YASUDA's specimens deposited in the Herbarium of the Botanical Institute of Tôhoku Imperial University at Sendai. The present short paper is intended to report the result of study on these specimens.

The writer wishes to express his sincere gratitude to Prof. Emeritus KINGO MIYABE and Prof. SEIYA ITO for their valuable suggestions and kind advices, and also to Prof. MASATO TAHARA, of Tôhoku Imperial University, for his kindness in allowing the writer to examine YASUDA's specimens.

1. *Podostroma alutaceum* (FR.) ATKINS.

Sphaeria alutacea PERS. Obs. Myc. II, 66, 1797.
Sph. clavata Sow. Engl. Fungi, pl. 159, 1799.
Sph. alutacea β *albicans* PERS. Syn. Fung. 2, 1801.
Sph. alutacea FR. Syst. Myc. II, 325, 1823.

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 2, 1932]

Sphaeria alutacea β *turgida* FR. ibid. 325, 1823.
Cordyceps alutacea LINK. Handb. IV, 347, 1833.
Hypocrea alutacea TUL. Select. Fung. Carp. I, 62, 1861.
? *Podostroma leucopus* KARST. Hedw. XXXI, 294, 1892.
Podocrea alutacea LINDAU, in ENGL. PR. Nat. Pfl.-fam. I, 1, 364, 1897.
Podostroma alutaceum ATKINS. Bot. Gaz. XL, 416, 1905.

Hab. On the ground among the leaves of various trees, especially among the needles or decaying wood or organic matters on the ground. Hokkaido: Prov. Ishikari, Mt. Soranuma (Sept. 20, 1930, IMAI). Prov. Shiribeshi, Zeni-bako-tôge (Oct. 14, 1928, TOKUNAGA). S. Saghalien: Mt. Kashipo (Sept. 9, 1929, TOKUNAGA).

Jap. name.

The present fungus is variable in the form and color, as well as in its substratum, as ATKINSON noticed already. The specimen from Shiribeshi had grown in association with *Spathularia flavida* among the needles of Larix and it is a tan-colored which corresponds to BERKELEY's figure. The Saghalien specimen had grown together with *Clavaria sachalinensis* IMAI under a' Picea-

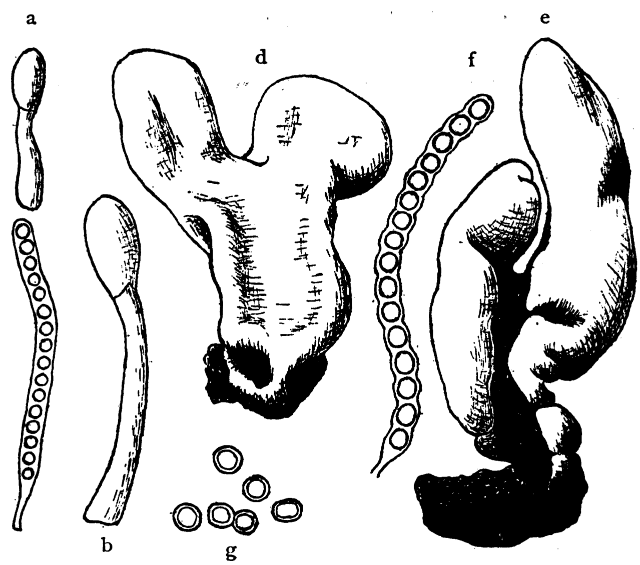

Fig. 1

a. *Podostroma alutaceum*, Shiribeshi-specimen, × 1
b. Ditto, Saghalien-specimen, × 1
c. Ditto, ascus, × ca. 700
d, e. *Pod. giganteum*, × ca. 1/2
f. Ditto, ascus, × ca. 600
g. Ditto, spores, × ca. 700

tree. It is whitish to cream in color somewhat resembling SOWERBY's figure. The Ishikarian specimen was found among the fallen leaves in the mixed woods, without any association of other fungus and its general feature were like the one from Saghalien. Although TULASNE and BROOME considered that the present fungus is parasitic on *Clavaria ligula* and *Spathularia flavida* respectively, it seems better to consider, at least in our cases, that there is only a fortuitous association with them.

In YASUDA's Herbarium, there are two specimens labeled as *Podocrea alutacea*. After a careful examination, the writer recognised that one of them is a new species and named it *Podostroma truncatum*. Another remained as an undetermined species because it is an immature specimen.

2. *Podostroma giganteum* IMAI, sp. nov.

Stromatibus maximis, bi-lobatis, 10–16 cm. altis; lobis alutaceis, compressis vel subcylindraceis, 1–3 cm. latis; stipitibus atratis, usque 5 cm. altis, 2 cm. crassis; peritheciis immersis, subglobosis vel late ellipsoideis; ascis cylindraceis, $75–125 \times 5–6\,\mu$, primo 8- demum 16-sporis; sporidiis globosis vel subglobosis, 5 vel $6 \times 5\,\mu$, hyalinis.

Hab. in lignis putridis. Hokkaido: Prov. Ishikari, Nopporo (Sept. 7, 28, 1930, IMAI); Tsukigatamura (Sept. 1929).

Jap. name.

Among the hitherto recorded species of this genus the writer can not find out such a gigantic one which is provided with the compressed or subcylindrical two lobed stroma as the present fungus.

3. *Podostroma zeylanicum* (PETCH) IMAI, comb. nov.

Podocrea zeylanica PETCH, Ann. Roy. Bot. Gard. Perad. VI, 230, 1917.

Pod. Cornu-Damae LLOYD (nec LINDAU non SACC.) Myc. Notes, No. 56, p. 810, f. 1261, 1918.

Pod. Cornu-Damae YASUDA (non LINDAU) in Sched.

Hab. ? On rotten wood. Honshu: Prov. Iyo, Odo-mura (Oct. 1917, KOMATSUZAKI).

Jap. name.

Three specimens of the present fungus present in the YASUDA Herbarium. Two of them united with each other at the base of stem; one has a two-lobed apex and is 2 cm. high, 0.8 cm. broad and 0.3 cm. thick in its whole size, while the other has a flattened long conical head and short cylindrical stem and is $3.5 \times 0.5 \times 0.4$ cm. in size. The third fungus has a scarcely flattened long conical head and the size is $3.5 \times 0.6 \times 0.6$ cm. The spores are yellowish hyaline, globose or subglobose and about 4 μ in diameter. A part of the specimen was sent from YASUDA to LLOYD who identified it as a young one of *Podocrea Cornu-Damae*, but, as has been described and illustrated by PATOUILLARD, *Podocrea Cornu-Damae* is larger than the present fungus, measuring 5 to 10 cm. in hight and has a corniculate apex in the older stage, though it is simple cylindrical in the younger stage. Considering the fungus in question to be identical with *Podocrea zeylanica* PETCH, the writer treats it here under the name *Podostroma zeylanicum*, changing the genus name of PETCH's fungus.

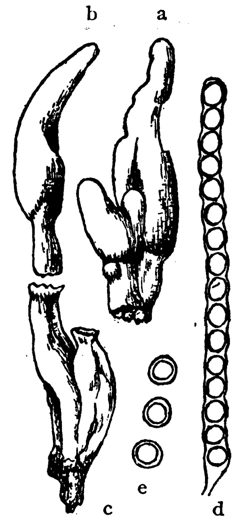

Fig. 2

a, b. *Podostroma zeylanicum*, × 1
c. *Pod. truncatum*, × 1
d. Ditto, ascus, × ca. 600
e. Ditto, spores, × ca. 800

4. *Podostroma truncatum* IMAI, sp. nov.

Podocrea alutacea YASUDA (non SACC.) in Sched.

Stromatibus subcompresso-cylindraceis, apice truncatis et depressis, 1.5–3 cm. altis, ca. 5 mm. crassis, in sicco umbrineis vel fuligineis; stipitibus usque 1.5 cm. altis et 5 mm. crassis, concoloribus; peritheciis immersis, subglobosis; ascis cylindraceis, 75–110 × 5 μ, primo 8-demum 16-sporis; sporidiis subglobosis, hyalinis, 4–5 μ.

Hab. ad ligna. Honshu: Prov. Kôdzuke, Mt. Akagi (Sept. 21, 1919, TSUNODA).

Jap. name.

The present fungus was determined by the writer, basing on the YASUDA specimens which he named *Podocrea alutacea* (PERS.) SACC. The fungus is distinguishable from others of the genus by the truncate and depressed apex of stroma.

As already mentioned in the preceding page, there is another specimen which has been labeled as *Podocrea alutacea* by YASUDA, but the fungus is immature and indeterminable at the present.

5. ? *Podostroma Solmsii* (E. FISCH.) IMAI, comb. nov.

? *Hypocrea Solmsii* E. FISCH. Ann. Jard. Bot. Buitenz. VI, 129, 1887.
? *Podocrea Solmsii* LINDAU, in ENGL. PR. Nat. Pfl. -fam. I, 1, 365, 1897.

Hab. Parasitic on Dictyophora-egg. Hokkaido: Prov. Ishikari, Nopporo (Oct. 25, 1930, IMAI).

Jap. name.

Unfortunately, our specimen is immature, so we can not determine its real systematic position, but provisionally the present name was used, from the habitat parasitic on Dictyophora-egg.

Finally, an analytical key to the species of Japanese Podostroma is given as follows:

I. Stroma 2–5 cm. long, clavate, cylindrical clavate or corniculate
  1. Clavate, not truncate at the apex .... 1. *alutaceum*
  2. Clavate or cylindrical with the truncate and depressed apex .... 4. *truncatum*
  3. Corniculate, irregularly lobed or cylindrical clavate, not truncate at the apex
    a. Growing on Wood .... 3. *zeylanicum*
    b. Parasitic on Dictyophora-egg .... 5. *? Solmsii*

II. Stroma 10–16 cm. long, usually two-lobed and flattened or subcylindrical .... 2. *giganteum*

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摘　　要

日本産肉座菌科の研究

I. ポドストローマ屬

今　井　三　子

本屬 Podostroma は核菌族中、肉質鮮色なる子實体を有する肉座菌科に於て、直上せる有柄の子實体を有し其子嚢内には初め八個の胞子を生じ、後隔膜を生じて夫より分割されたる十六個の胞子を藏するものなり。本屬の日本產種類として從來二種發表されたりと雖も正當なるものに非ず。本研究に於て五種を報ぜり、内二種は新種にして、一種は尙疑問の存するものなり。之等を檢索表に依りて示せば次の如し。

I. 子實体は長さ 2–5 cm. にして棍棒狀、圓筒棍棒狀或は角狀を呈す。
  1. 子實体は棍棒狀にして圓頭を呈す ... ... 1. alutaceum
  2. 子實体は棍棒狀或は圓筒棍棒狀にして、截頭を呈し且つ其頂部陷沒す 4. truncatum
  3. 子實体は角狀或は不規則分岐狀或は圓筒棍棒狀をなし、截頭を呈せず
    a. 腐朽材の上に生ず ... ... 3. zeylanicum
    b. 絹笠茸に寄生す ... ... 5. ? Solmsii

II. 子實体は長さ 10–16 cm. にして、扁平或は類圓筒形二片に分岐す ... ... 2. giganteum

A NEW SPECIES OF PYTHIUM PARASITIC ON *AEGAGROPILA SAUTERI* (NEES) KÜTZING

BY

YOSIO TOKUNAGA

(With Two Text-figures)

A considerable number of fungi have been found to be parasitic on algae, but nothing has been reported of pythiaceous fungus parasitic on *Aegagropila* up to the present time. *Aegagropila Sauteri* (NEES) KÜTZING, a ball-shaped green alga, which attracts popular attention on account of its remarkable form and of the limited distribution, is often affected by some parasitic fungi. The writer found a species of *Pythium* parasitic in the filaments of this alga collected in Lake Akan, Hokkaido. The present paper is written to report the Aegagropila-disease together with the taxonomy of the fungus.

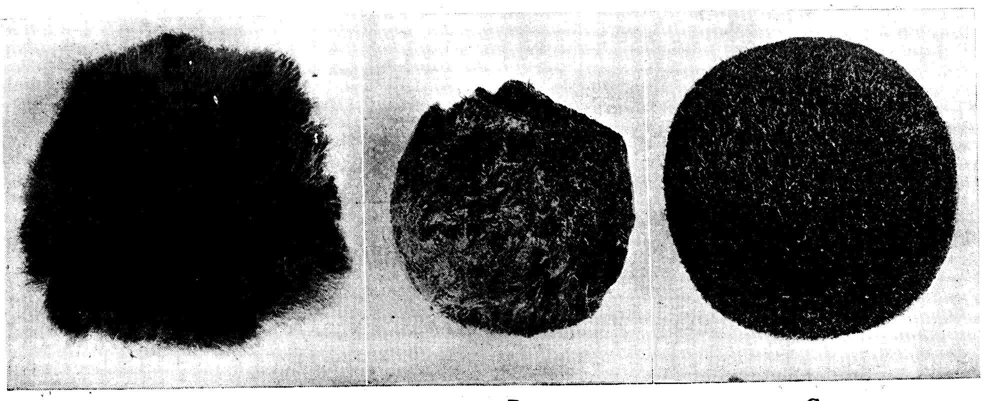
The writer wishes to express here his sincere thanks to Prof. Emer. K. MIYABE for his valuable suggestions and to Profs. S. ITO and Y. TOCHINAI for their kind directions. He is also indebted to Mr. Y. ABE, a forest ranger in Akan district, for his kindness in collecting the materials and giving them to the writer.

The affected plants become soft and hairy in appearance and their surface filaments etiolate to clayish yellow in color. The filaments are brittle and fragile, and fall off from the algal ball. The rotting progresses gradually into the centre, then the ball decreases in size, and breaks up into pieces finally. Under the microscope it is revealed that the affected filaments contain fine hyphae and yellowish oogonia. Sometimes it is observable that the vesicles develop at the tip of exit tubes which penetrate the cell wall of the host and that the zoospores differentiate in the vesicle. The zoospores swim actively in water surrounding the alga and settle on the wall of the filament. The cytoplasm and chloroplasts in the algal cells are killed. The hyphae penetrate the cross walls and spread from cell to cell towards the basal part of the filaments.

The fungus was purely isolated on artificial media for the sake of detailed observations. A small piece of the filament in which the fungus was growing actively was cut off with a scalpel and washed several times in sterile water.

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 3, 1932]

Then it was placed on the surface of rice-grain decoction agar in a PETRI-dish. The dish was laid in a cool place and inclined to some degree to let water



A B C

Fig. 1

Aegagropila Sauteri, infected (A & B) and healthy (C). ca. $\times \frac{2}{3}$
A. Photographed in water. B & C. Photographed in air.

flow down. When the fungus grew on the medium, a bit of hyphae was cut off from the margin of the mycelial mass and transferred to another dish.

The fungus grew well on the various media, plant-decoction agars and synthetic agars, except the strongly acidic media as apricot-juice agar. In the plate culture, the colonies were entire in the margin and sometimes formed concentric rings. The aerial hyphae developed vigorously in cottony appearance on several media and completely filled up the cavity of the test-tube in the case of the cultures on onion decoction agar slant. Although no reproductive organs were borne on the agar media, when a bit of hyphae was transferred into fresh water the sporangia and zoospores were formed abundantly.

The pathogenicity of the fungus to various algae was tested. The experiments were carried out in two series. In the first series a piece of the algal filament bearing actively living hyphae was used as the inoculum, while in the second series a bit of hyphal mass cultured on rice-grain decoction agar was used. In each series, two PETRI-dishes of four inches diameter containing about 20 c.c. of sterile water were prepared for each alga, and a small mass of algae was put in the water. One of two dishes was infested by the fungus and the other dish being non-infested was used as the control. Each dish was examined under microscope every day for a fortnight after the inoculation.

The present experiments were carried out from September to October in the year of 1931. The species of algae inoculated in these experiments and their habitat are as follows:—

1. *Oscillatoria* sp. (Maruyama, near Sapporo)
2. *Spirogyra* sp. A (Sapporo)
3. *Spirogyra* sp. B (Lake Shikotsu)
4. *Zygnema* sp. (Lake Shikotsu)
5. *Hydrodictyon reticulatum* (L.) LAGERH. (Lake Shikotsu)
6. *Draparnaldia* sp. (Maruyama, near Sapporo)
7. *Oedogonium* sp. A (Maruyama, near Sapporo)
8. *Oedogonium* sp. B (Lake Shikotsu)
9. *Cladophora* sp. (Lake Akan)
10. *Aegagropila Sauteri* (NEES) KÜTZING (Lake Akan)
11. *Sphaeroplea annulina* (ROTH.) AG. (Lake Shikotsu)
12. *Vaucheria sessilis* (VAUCH.) DC. (Maruyama, near Sapporo)

Among these algae, *Aegagropila Sauteri* was growing healthily in the laboratory for about two years. The other were collected in August to September of 1931 and were growing actively in the laboratory.

As the results of the experiments, no infection took place on the algae except two species, *Cladophora* sp. and *Aegagropila Sauteri*, in both series. *Cladophora* sp. was infected by the inoculation of affected algal filaments, while it was nonsusceptible to the isolated fungus. In the infected filaments, the hyphae grew in the cells and spread from cell to cell, but no oogonium formation was observed until the alga was completely destroyed. *Aegagropila Sauteri* was infected by the fungus in both series of the experiments. The infected alga showed apparently similar symptoms to those in nature. Though the alga had been destroyed before the oogonia matured, they were easily observed in the affected cells. In the present experiments, there was failure to infect the algae other than the two species mentioned above, but it is necessary to study further to determine the pathogenicity of the fungus to other algae. As an appendix to the present inoculation experiments, rice-seedlings were inoculated by the fungus, but the result was quite negative.

Finally, the fungus was examined from the taxonomic standpoint. There are many species of *Pythium* parasitic on green algae. *Pythium angustatum* SPARROW parasitic on *Vaucheria* sp. is most closely related to our fungus but it differs from the present species in the characters of oospore and in the number of antheridium. In our fungus the oospore is usually larger than that of *Pythium angustatum* and it is formed completely occupying the oogonium, and only one antheridium attaches to one oogonium. Moreover, our fungus differs in the cultural characters from SPARROW's fungus which forms oogonia abundantly on corn-meal agar. After a thorough literature study the writer came to the conclusion that the fungus under consideration has been hitherto undescribed and is a new species of *Pythium*. He proposes a new name *Pythium akanense* for the fungus. The technical description of the species is given here.

Pythium akanense TOKUNAGA, sp. nov.

Mycelio entophyto; hyphis incoloratis, ramosissimis, plerumque ex cellula non exeuntibus, 0.8–2.4 μ crassis. Sporangiis filiformibus, simulate hyphae similibus; tubulis exitus longis, membranam cellulae hospitis penetrantibus, infra membranam valde turgescentibus; vesiculis sphaeroideis vel ellipsoideis, 2–40 zoosporas gignentibus; zoosporis reniformibus, in parte concava binis ciliis praeditis; oogoniis semper in cellulis hospitis evolutis, 14.4–18.4 μ diam., membrana levi, tenuissima; antheridiis originis dubiae singulis, clavatis vel oblongatis, minutis; oosporis solitariis, sphaericis, 14–18 μ diam., in medio globulum grandem continentibus, perfecte oogonium implentibus, episporio levi, flavo, usque ad 0.8 μ crasso; germinatione nondum observata.

Hab. parasitice in cellulis *Aegagropilae Sauteri* (NEES) KÜTZING.

Hokkaido: Prov. Kushiro; Lake Akan (Y. ABE, Aug. 1931).

Fig. 2

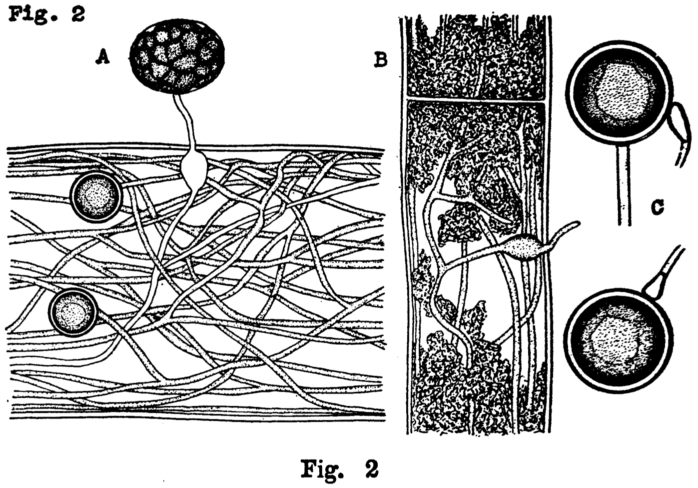


Fig. 2

Pythium akanense sp. nov.

A and B. Showing the fungus development in host cells. × 430

C. Oogonia with an antheridium. × 850

Mycelium well developed in the filaments of the host alga passing from cell to cell through the cross walls; hyphae colorless, richly branched, 0.8–2.4 μ in breadth. Sporangia filamentous in shape, not differing in any way from the vegetative hyphae; exit tubes extending into the surrounding water penetrating the cell wall, but not going further from the substrata, similar to the hyphae but swollen very much just under the cell wall; vesicles spheroidal or ellipsoidal, irregular in size, producing 2–40 zoospores. Zoospores kidney-shaped, with two cilia near the hilum. Oogonia always formed in the host cells, usually terminal, spherical, 14.4–18.4 μ in diameter; their wall smooth, very thin. Antheridia coming from the doubtful origin, single to an oogonium, clavate or oblong, small in size. Oospores single, completely filling the oogonium, spherical, 14–18 μ in diameter, containing a central reserve globule which is irregular in shape; epispore smooth, yellowish in color, not very thick, up to 0.8 μ in thickness; germination not yet observed.

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摘　　要

毬藻に寄生せるピシウム屬の一新種

德　永　芳　雄

淡水産藻類に寄生せるピシウムは、從來屢々報告せられたるも毬藻に寄生せるものは未だ發見せられざるが如し。著者は北海道阿寒湖に於て採集せられたる毬藻に寄生せる一種を得たるを以て此處に報告せんとす。

菌に冒されたる毬藻は柔軟にして毳狀を呈しその表面は黄白色に變ず。變色部は容易に脫落し腐蝕は漸次中心に進み、球は次第に小となる。被害部を檢鏡せば細き菌絲及び黄色なる藏卵器を細胞中に認め得べし。本菌を分離培養せしに酸度中性に近き寒天培養基上には極めて良好なる發育を成せり。寒天培養基上には如何なる繁殖器管をも生ぜざりしも、菌絲の一部を取りて水中に置くときは游走子を多數生ぜり。尙自然狀態に於ける菌及び分離せる菌絲を接種源とし、本菌の種々なる藻類及び稻に對する病原性を調査せしに *Cladophora* sp. 及び毬藻を除きては全く陰生に終れり。本菌を從來發表せられたる同屬の各菌と比較するに、之と一致せる種類無きを以て著者は之を新種と認め *Pythium akanense* TOKUNAGA と命名し記載文を揭げたり。

終に臨み材料の蒐集に援助を與へられたる安部與市氏に感謝の意を表す。

NOTES ON THE CULTURAL STUDY OF A NEW SPECIES OF HYALOPSORA

BY

SENJI KAMEI

(With 3 Text-figures)

Hyalopsora Aspidiotus MAGN. is the only species in the genus that has ever been proved to be heteroecious between Abies and fern. Comparing with the most species of white-spored rusts of Abies, this species is rather complicated in the process of its life-cycle. With the teleutosporic material BUBÁK (2), KLEBAHN (3, 4) and MAYOR (5) have already engaged in the inoculation experiments. According to the results of works done by MAYOR who was successful in the proof of the entire life-cycle, the sporidia gained from a fern host infected young needles of *Abies pectinata* D C. producing spermogonia in the next spring and aecidia in the following next spring requiring 4 years for the completion of the whole life-history. BELL (1) on the other hand, found in Timagami Forest, Ontario, Canada, a new species of the Peridermium on the three-year-old needles of *Abies balsamea* (L.) MILL. to which he named as *Peridermium pycnoconspicuum* BELL. He inoculated with the aecidiospores thus obtained onto the frond of *Phegopteris Dryopteris* FÉE and succeeded in producing the characteristic uredospores of *Hyalopsora Aspidiotus* MAGN. So the peridermial stage of this species is at present proved to be parasitic on two species of Abies both American and European.

While continuing the life-history studies of the fern-rusts of our country the writer happened to find an interesting new species of Hyalopsora parasitic on *Blechnum Spicant* WITHER. var. *nipponicum* (KUNZE) MIYABE et KUDO. This fern is found common in the vicinity of Sapporo, for instance, in the Nopporo Forest about 10 miles east from our city, where the primeval forest vegetation is still preserved. It grows luxuriantly by the way side or underneath the bushes composed of numerous small trees of *Abies Mayriana* MIYABE et KUDO and various species of deciduous trees. In the early summer, especially on the overwintered fronds we find abundant conspicuous uredosori. The pustules are mostly restricted on the upper surface, and are easily attracted by the powdery,

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golden-colored mass of uredospores pushing out from each sorus (Fig. 1). These spores are thin-walled, sparsely but strongly echinulated, very char-

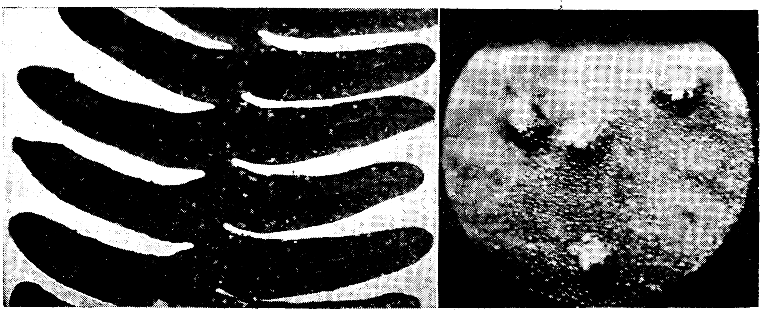
a  b

Fig. 1

Uredosori of *Hyalopsora aculeata* n. sp. on the overwintered frond of *Blechnum Spicant* W. var. *nipponicum* (K.) M. et. K. collected at Nopporo, on June 15 1931 a, ×1; b, ×10

acteristic compared with those of the other species (Fig. 2, b). The pseudoperidia are stoutly developed, which are dehiscent by apical rupture (Fig. 1. b). The thick walled uredospores, which are commonly found in the case of the other related species, are not found in this species. Teleutospores are produced inside the lower epidermal cells of overwintered fronds (Fig. 2, d). These portions are slightly discolored when the spores are matured. From the beginning to the middle of June, after the spores begin to germinate, the undersurface of the frond is covered by light grayish to whitish colored films except two longitudinal sterile portions. These films when seen under the microscope reveal to be the aggregation of abundant sporidia and basidia, which have emerged through the minute holes penetrated on the upper wall of the epidermis (Fig. 2, d). With those sporidia inoculation experiments were repeatedly conducted on the young seedlings of *Abies Mayriana* M. et K. Out of 7 pots, 4 ($XIII_6$, XIV_6, VII_7, and $XXVII_{11}$) have shown spermogonia on the needles of current season about 20 to 28 days after inoculations. These spermogonia a few in number, 5 to 15 per leaf, mostly on two stomatiferous surfaces, are slightly raised on the surface and are almost elliptic in upper view (Fig. 3, a). In sections they are subepidermal and flattened conoidal to lense form (Fig. 3, b, d). Comparing with the size of those in *Peridermium pycnoconspicuum* B. which was given by BELL, the spermogonia in our case are longer in the vertical direction, though almost nearly equal in breadth. The

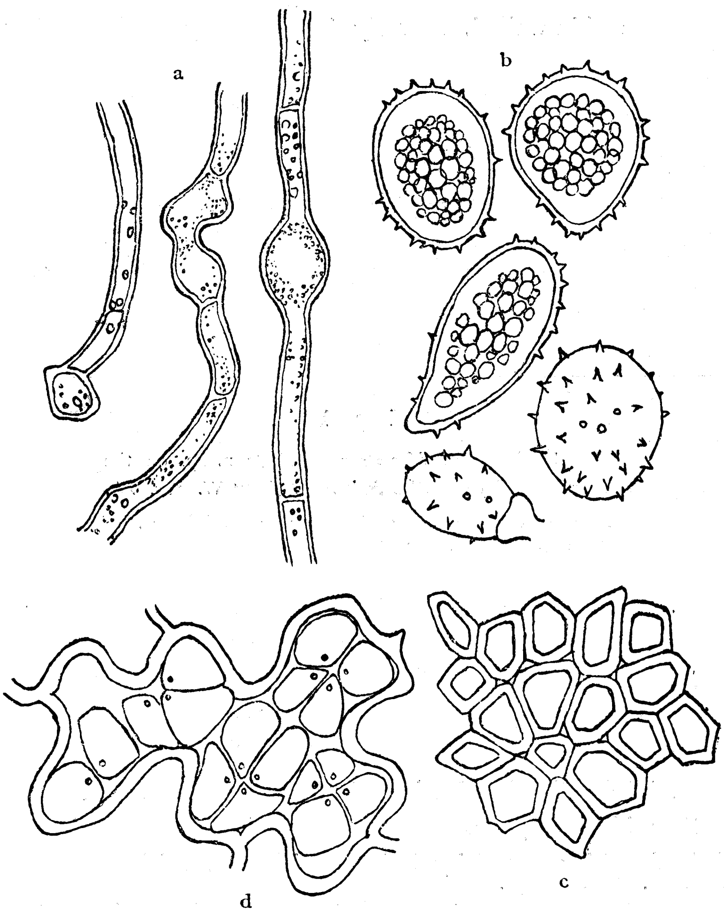


Fig. 2

Hyphae (a), uredospores (b), middle part of pseudoperidium of a uredosorus (c) and teleutospores (d) of *Hyalopsora aculeata* n. sp. ×480

peridermia on the contrary, did not well develope in every pot experimented. In one affected leaf of the current season in pot $XIII_6$, however, an imperfectly grown peridermium sorus was observed, just beside a matured spermogonium. It was already differentiated into the pseuoperidium and the orange colored aecidiospores (Fig. 3, c). Beside this case the writer did not find any trace of peridermium sorus in spite of his careful observation on the inoculated seedlings throughout the season. Considering from the process of the life-cycle this species is not similar to *Hyalopsora Aspidiotus* MAGN. But the question, whether the peridermial sori habitually mature on the needles of the current

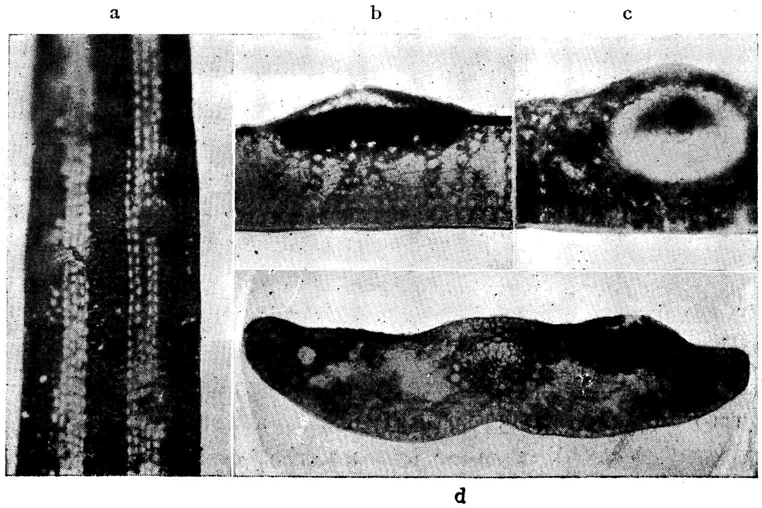


Fig. 3

Spermogonia and a peridermium of *Hyalopsora aculeata* n. sp. gained from cultural experiments. a. Face view of mature spermogonia on a 1-year-old leaf of *Abies Mayriana* M. et K. ×7; b, c. Median vertical sections of spermogonia (b, from longitudinal section; d, from transversal section of leaf) ×52; c, Median vertical section of an immature peridermium (from longitudinal section of leaf) ×52

season or otherwise behave, is remained for the further investigation to prove. Now, though not proved by the back inoculations, the constant appearance of the spermogonia through 4 pots and a case of the imperfect peridermium sorus producing the aecidiospores of colored contents common to the species of Hyalopsora made the writer to convince him that these stages on *Abies Mayriana* M. et K. are connected to the present rust species on Blechnum. The characters of uredo and teleuto stages are different from those of the related species, especially in the greater size, and stronger echinulations of the uredospores and in the stout pseudoperidia. So the writer wishes to admit it as a new species and to call it by the name of *Hyalopsora aculeata*. According to Professor HIRATSUKA of the Tottori Agricultural College this species is also found parasitic on *Blechnum amabile* MAKINO which is distributed in the higher mountains of Honshû. Though the writer is not yet seen the specimen but the occurrence is highly probable because the two host plants are so closely related that one can hardly discriminate when two are grown together. The diagnosis of the new species is as follows:—

Hyalopsora aculeata KAMEI, nov. sp.

O. Spermogoniis hypophyllis, maculis dilute flavidis insidentibus, in duas series utrimque ad nervum dispositis, inconspicuis, secto folio conspicuis, subepidermicis, subconoideis vel lenticularibus, magnis, 300–500 μ longis, 100–200 μ latis; Spermatophoris obclavatis, 30–50 μ longis, 3–5 μ latis, hyalinis; spermatiis oblongo-ellipsoideis, 6.5–8.0 μ longis, 3.2–3.6 μ latis, levibus. hyalinis.

I. Aecidiis imperfectis; peridio exstanti; aecidiosporis flavo-brunneis.

II. Soris uredosporiferis plerumque epiphyllis, sparsis vel aggregatis, saepius ad marginem vel nervum dispositis, rotundatis, minutis, 0.3–0.7 mm. diam., flavis vel brunneis, apice apertis et pulverulentis; peridio firmo, in parte superiori cellulis polygonalibus composito; uredosporis obovatis, ovato-oblongis vel subglobosis, raro angulatis, 20–34 × 30–48 μ, intus aurantiacis; episporio hyalino, 1–2 μ crasso, distincte disperse aculeato; poris germinationis obscuris; paraphysibus paucis.

III. Teleutosporis plerumque hypophyllis, in maculis dilute brunneis insidentibus, intracellularibus, globosis vel ellipsoideis, plerumque 1–5 cellulis, hyalinis, 16.5–29.5 × 29.5–52 μ; episporio ca. 1 μ crasso, levi; sporidiis subglobosis, ca. 10 μ dimetientibus, hyalinis, levibus.

Hab. O and I on *Abies Mayriana* MIYABE et KUDO. Mature spermogonia and imperfectly developed peridermium on the current year needles formed by the inoculation of sporidia obtained by the germination of the new species concerned. II on the overwintered fronds as well as on those of the current season appearing from June to November, III on the overwintered fronds of *Blechnum Spicant* WITHER. var. *nipponicum* (KUNZE) MIYABE et KUDO collected at Nopporo, Prov. Ishikari in June.

In conclusion, the writer wishes to express his heartiest thanks to Prof. Emerit. KINGO MIYABE and Prof. SEIYA ITO for their kind directions and Prof. NAOHIDE HIRATSUKA for his kind advice.

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摘　　要

ヒアロプソラ屬一新種の生活史に關する研究報告

龜井專次

羊齒類に寄生する銹菌中ヒアロプソラ屬の種類にして、今日迄に其異株寄生性に關し實驗的に證明されたるものは單に *Hyalopsora Aspidiotus* MAGN. のみなり。乃ち之れに就ては早くより BUBÁK, KLEBAHN 等の報告あるも、完全なる解決をなしたるは佛國の MAYOR なり。同氏に據れば本菌の成熟冬胞子より得たる小生子は歐洲樅の嫩葉に侵入し、翌春に至りて雄精器を生じ、翌々春に至りて銹子腔を生じ斯くて足掛四年にして其生活史を完了するなりと云ふ。又加奈太國 BELL はオンタリチ地方チマガミ森林内バルサム樅の三年目の針葉に生ずる獨特なるペリダーミユムを採集並に命名し、其銹胞子を以て接種試驗を果せる後氏は上菌の一時代なる事を公表せり。由りて上菌は歐米二種の樅屬種類に關係を有し、長期に亘る生活徑路を辿る事明かとなれり。著者は年來、野幌國有林内アヲトドマツ林下に生ずるシシガシラに寄生するヒアロプソラ屬の一種に興味を引かれ、其冬胞子を發芽せしめて得たる小生子をアヲトドマツ幼苗嫩葉に接種すること數回に及びしが、被接種根苗合計七本中四本は接種後二十日乃至二十八日にして嫩葉裏面に雄精器を發生したるも、銹子腔は只一回成熟雄精器に近接して未だ十分發達せざるものを見たるのみなり。但し之にありては已に擬護膜を生じ、且つ其銹胞子はヒアロプソラ屬に通有なる橙黃色の內容を有せり。而して斯かるペリダーミユムを BELL 記載のものに比較するに、其雄精器はやゝ大形にして又其發生針葉の年數が同一ならざるを見る。著者は未だ銹胞子による接種試驗を行ひ得ざるも、上記の小生子接種試驗に於て供試苗四本迄孰れも雄精器を見たる事、並びに假令一回なるも銹子腔を得而も鮮明なる着色あることを確かめたる以上、之をシシガシラ寄生銹菌の一時代なりと認むべき十分の理由ありと信ず。尙ほ之が夏胞子、冬胞子時代の性質を近緣諸種に比較するとき夏胞子層擬護膜の强壯なること、夏胞子の大形なること、其膜面に强き刺狀突起を有する點等に於て明かに異るものにして、玆に之を新種と認め其種名及記載文を公表せり。尙ほ平塚直秀氏に據れば本種はシシガシラの他に本州地方の深山に產するオサシダにも寄生する由なるが、著者は未だ標本を鏡見せざるも其寄主植物が甚だ近緣なる事實より恐らく然るべきことを憶測する次第なり。

終りに臨み終始懇篤なる御指導を賜はれる宮部名譽教授、伊藤教授並に有益なる助言を垂れられし平塚直秀氏に對し深謝の意を表す。

A CONTRIBUTION TO OUR KNOWLEDGE OF VIRUS DISEASES OF PLANTS IN JAPAN

BY

TEIKICHI FUKUSHI

Introduction

During recent years it has been recognized that virus diseases constitute one of the most important groups of plant disease in Japan. Although some of these diseases must have existed for a number of years, they have attracted little attention until recent years, except the mosaic disease of tobacco and the dwarf disease of rice plant. There is some evidence to indicate that the mosaic disease of tobacco has been known in Japan since 1857. The dwarf disease of rice plant also has been known for many years although its origin is uncertain. This is the first virus disease of plant shown to be transmitted by an insect as pointed out by KUNKEL* (1926)[19] based upon the writer's information and also by HINO (1927)[5].

The dwarf disease of mulberry tree has long been recognized as one of the most serious plant diseases in Japan. It is exclusively confined to this country and has been ascribed to some cultural practices, particularly to excessive cutting back the trees in order to stimulate a new growth of branches and tender leaves for the silkworm. During recent years, however, certain investigators have claimed to have obtained evidence that this disease is infectious and belongs to the virus disease group.

With the exception of these diseases most of the virus diseases of plants are considered to have been imported from foreign countries in recent years. The list presented in this paper, while far from complete, will give some indication as to the virus diseases of plants in Japan.

On certain aspects of the virus diseases of plants

Our knowledge of the existence of the virus disease of plant dates from 1888, when E. F. SMITH[32], working with the peach yellows destructive in the

* It should be stated here that TAKATA's paper was erroneously cited by KUNKEL.

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Eastern United States of America, ascertained that this disease was communicable to healthy trees by budding, pointing to "some contagium vivum" as the causative agent, though no organisms could be found in association with the disease. A few years later, SMITH (1891[33], 93[34]) found that peach rosette was also transmitted to healthy trees by diseased buds in which no causal organisms could be demonstrated.

Almost at the same time, IWANOWSKI (1892)[13] in Russia demonstrated that the juice from the mosaic diseased tobacco leaves remained infectious after passing through the Chamberland filter. Indeed he was the first to discover the filterable virus. He himself, however, did not realize it and ascribed the infectiousness of the filtrate to the toxin which he assumed to have been produced by the causal bacteria. In 1898 BEIJERINCK[2], evidently in ignorance of IWANOWSKI's work, arrived at a similar conclusion indicating that the causative agent of the tobacco mosaic disease is filterable.

In the same year, LOEFFLER and FROSCH[24] published an epoch-making paper on the etiology of the foot and mouth disease of cattle coming to the conclusion that the causal agency of the disease is a filter-passing organism and the causative agents of small pox, cow pox, measles, scarlet fever and other infectious diseases of unknown cause are in all probability caused by organisms of this order. Thus the term filterable virus was introduced to denote these causative agents capable of passing through a Berkefeld or Chamberland filter, both of which were considered at that time as bacteria proof filters. Since that time the study of the filterable viruses has developed in increasing importance and in 1913, LIPSCHÜTZ[23] could present in his collective survey of the subject, a list of forty-one virus diseases affecting man and animals in which the filterable nature of the causative agent had been established with more or less certainty. Recently, MC KINLEY (1929)[28], in his extensive survey of the entire subject of virus diseases, described about seventy virus diseases which affect man and various animals including fowls, insects and fishes.

In spite of the earlier discovery of their representative, the virus diseases of plants have attracted less attention of pathologists than the virus diseases of animals. However, the study of the virus diseases has within recent years became a specialized field in plant pathology and at present about sixty viruses are known to induce plant diseases.

The term "virus" is originally derived from the Latin word which means poison. BEIJERINCK (1898)[2] was the first plant pathologist, as far as the writer is aware, to introduce the term virus, denoting the causative agent of the mosaic disease of tobacco. At present, however, the concept involved in the term virus is by far more complicated as compared with what BEIJERINCK introduced and it is most difficult to formulate a definition of a virus because its essential characteristics are not definitely known.

Because the virus is exceedingly small, lying beyond the limits of microscopic visibility, and it seems to multiply in the infected plant, some pathologists incline to the view that the virus is an ultramicro-organism capable of causing an infectious disease. If the term ultramicroorganism means a cellular organism of ultramicroscopic dimension the above mentioned definition cannot be applied to all the viruses, since it is almost impossible to conceive that certain viruses represent an organism in the ordinarily accepted sense, owing to their extraordinarily small size and to their remarkable tolerance to heat, ageing and toxic substances which destroy the ordinary microorganisms. This phase of the problem will be discussed more in detail in another publication.

It appears that the virus is defined by most pathologists as a filter-passing agent capable of causing an infectious disease. Such definition holds valid for the viruses affecting man and animals, a majority of them being filterable or even ultrafilterable. However, it cannot be upheld for the viruses affecting plants which have not been definitely demonstrated to be filter passers except the filterable viruses of the tobacco mosaic, tobacco yellow mosic, cucumber mosaic etc. Furthermore, filterability through a Berkefeld or Chamberland filter is not regarded so significant as it was in the past when these filters were considered to retain all bacteria, protozoa and other microorganisms. Since it is well recognized that some bacteria, protozoa and yeasts under certain conditions will pass through various types of filters, filterability cannot always be recognized as a criterion to distinguish the virus from the filterable forms of bacteria and other microorganisms. Filterability does not depend merely upon the size of the particle to be filtered and the diameter of the pores of the filter but a variety of factors—pressure employed, time of filtration, the electric charge possessed by the particles to be filtered and the wall of filter, the H-ion concentration of the fluid, the dilution of the material to be filtered, the amount of solid matter present, etc.—exert a profound effect upon filtration.

Finally we are led to the belief that the virus may be defined as an ultramicroscopic corpuscular agent capable of inducing disease. Such definition may be open to criticism, being rather ambiguous.

At any rate it cannot be denied that the virus group in all probability is not a homogeneous one.

Under such cricumstance it may be profitless to attempt to demonstrate the cansative agent first of all in order to recognize a virus disease of plant. In this respect the virus diseases differ from the diseases caused by parasitic microorganisms. For practical purposes then by what means is a virus disease of plant recognizable?. There are two criteria to be relied upon, viz., symptoms of the disease and the mode of transmission.

The manifestations of the virus diseases of plants are generally alike. In the first place, the most common symptom is chlorosis, which manifests itself in two types, the mosaic and yellows. The mosaic is characterized by the mottled appearance of the foliage showing a mosaic-like pattern of alternating dark green and yellowish green spots or blotches of varying sizes and shapes on the leaves as shown in the mosaic diseases and "infectious chloroses" (in BAUR's sense[1]). In the yellows, chlorosis is general throughout the affected parts as in the aster yellows, peach yellows etc. In the second place, the dwarfing of a part or the entire plant is a common symptom among virus diseases of plants. (dwarf disease of rice plant, strawberry dwarf etc.) In the third place, rosetting, an excessive tillering or branching is also one of manifestations of the disease. (peach rosette, wheat mosaic etc.) In the forth place, necrosis of certain types develops in several virus diseases of plants, particularly in the potato leaf roll, stipple streak etc. Besides these, it is not unusual that curling, rolling and other deformities of leaves, and discoloration and malformation of flowers occur in association with the virus diseases of plants. These different types of symptoms may appear either alone or in a variety of combinations.

These manifestations, however, are by no means specific for virus diseases because mottling of the foliage appears in the variegation of non-infectious nature; the yellowing of leaves is induced by an excess of lime in the soil as well as by the lack of potassium and by some other factors; and stunting of plant, overgrowth of branches and necrotic conditions are caused by certain parastic microorganisms. Consequently a virus disease of plant cannot always be recognized merely on the basis of its manifestations.

The intracellular bodies associated with certain virus diseases of plants are regarded to be of diagnostic significance to some extent but such intracellular inclusions are not present in association with all the virus diseases.

Compared with the symptoms, the mode of transmission should be regarded of much practical importance in order to recognize a virus disease of plant. Virus diseases of plants are transmitted (a) by grafting and budding, (b) by insects, (c) by inoculating the juice from the diseased plant, (d) through the seed, and (e) through the soil. The virus diseases of plants can be classified into three groups based upon the mode of transmission. The diseases of the first group can be transmitted by the organic union or grafting and budding only, peach yellows, peach rosette and little peach being the representatives. The second group includes the diseases which are transmitted principally by the insect vectors as represented by the dwarf disease of rice plant, streak disease of sugar cane and maize, aster yellows and likewise by the rosette of peanuts and broad bean mosaic. In this group the transmission may be effected by grafting as already verified by KUNKEL (1926)[19] and STOREY and BOTTOMLEY (1928)[25] in the aster yellows and the rosette of peanuts respectively, but there is no evidence that these diseases are communicated by inoculating the juice from the affected plants into healthy plants. To the third group belong the diseases which are transmitted through the juice from the diseased plant, a majority of mosaic diseases and other virus diseases being included in this group. The transmission by grafting and by insects are usual in this group. Certain diseases of this group have been recognized as seed-borne while some others as transmitted through the soil.

If a disease of plant is demonstrated to be transmitted by any one of the above mentioned means, in conjunction with the absence of any causal organisms, in all probability it belongs to the virus disease group. Furthermore, if the disease is characterized by the manifestations mentioned before, it is no doubt a virus disease.

Virus diseases of plants in Japan

A list of the virus diseases of plants in Japan will be given below in a tabulated form, based upon a recent survey conducted by the writer.

Name of disease	Plant name	Family name	Locality
yellows	*Callistephus chinensis* NEES.	Compositae	Sapporo (FUKUSHI[8], 1929)
"	*Calendula officinalis* L.	"	" (" 1930)
"	*Erigeron annuus* PERS.	"	" (KANEGAE, 1929)
"	*Taraxacum platycarpum* DAHLST.	"	" (FUKUSHI[8], 1929)
mosaic	*Lactuca sativa* L.	"	Tottori (FUKUSHI, 1928)
"	*Zinnia elegans* JACQ.	"	" (" 1927)
mosaic	*Cucumis Melo* L.	Cucurbitaceae	*Tottori (FUKUSHI, 1928) *Sapporo (" 1929)
"	*C. Melo* var. *Conomon* MAK.	"	Hiroshima (HORI[9], 1922) Tottori (HORI[9], 1922; FUKUSHI, 1928)
"	*C. sativus* L.	"	Shizuoka (HORI[9], 1922) Okayama (KASAI[16], 1923)
"	*Cucurbita moschata* DUCH. var. *melonaeformis* MAK.	"	Tottori (FUKUSHI, 1928) Korea (NAKATA et al.,[20] 1928)

* In the green house.

Name of disease	Plant name	Family name	Locality
mosaic	*Lagenaria vulgaris* SER. var. *elavata* SER.	Cucurbitaceae	Tottori (HORI[9], 1922; FUKUSHI, 1927) Okayama (KASAI[10], 1923)
"	*Trichosanthes cucumeroides* MAXIM.	"	Kanagawa (KASAI[17], 1924)
"	*Capsicum annuum* L.	Solanaceae	throughout Japan (HORI[8], 1920, etc.)
"	*Cyphomandra betacea* SENDT.	"	*Sapporo (FUKUSHI, 1929)
"	*Lycopersicum esculentum* MILL.	"	throughout Japan (HORI[8], 1920, etc.)
"	*Nicotiana tabacum* L.	"	throughout Japan
"	*Petunia violacea* LINDL.	"	throughout Japan [Tottori (FUKUSHI, 1927) etc.]
"	*Physalis pubescens* L.	"	Tottori (FUKUSHI, 1928)
yellow mosaic	*Lycopersicum esculentum* MILL.	"	Tottori (FUKUSHI, 1928)
"	*Nicotiana tabacum* L.	"	*Sapporo (FUKUSHI, 1929)
"	*Petunia violacea* LINDL.	"	*Sapporo (KAWAI, 1932)
mosaics	*Solanum tuberosum* L.	"	throughout Japan [Hokkaido (Hokkaido Agr.. Exp. Stat.[6], 1915; TSUJI[38], 1919) etc.]
mild mosaic	"	"	Tottori (FUKUSHI, 1928) Sapporo (FUKUSHI, 1929)
crinkle mosaic	"	"	" (FUKUSHI, 1929)
leaf roll	"	"	throughout Japan [Okayama (Okayama Agr. Exp. Sta.[30], 1915; KASAI[15], 1919) etc.]
stipple streak	"	"	Sapporo (TSUJI[38], 1919; FUKUSHI, 1929)
unmottled curly dwarf	"	"	Tottori (FUKUSHI, 1928) Sapporo (" 1929)
mosaic	*Primula obconica* HANCE	Primulaceae	*Sapporo (HAYASHI, 1928) *Tokyo (FUKUSHI & KAWAI, 1932)
"	*P. denticulata* SMITH	"	" "
"infectious chlorosis"	*Euonymus japonicus* THUNB.	Celastraceae	throughout Japan
mosaic	*Crotalaria juncea* L.	Leguminosae	Tottori (FUKUSHI, 1927)
"	*Glycine Soja* BENTH.	"	Sapparo (FUKUSHI, 1929)
"	*Phaseolus angularis* WIGHT	"	throughout Japan [Morioka (MATSUMOTO[25], 1922) Korea (NAKATA et al.[29], 1928) etc.]

* In the greenhouse

Name of disease	Plant name	Family name	Locality
mosaic	*Phaseolus vulgaris* L.	Leguminosae	Sapporo (S. ITO[7], 1920; KURIBAYASHI[29], 1926) Okayama (KASAI[16], 1923) Tottori (FUKUSHI,[4] 1928)
"	*Trifolium hybridnm* L.	"	Sapporo (KAWAI, 1931)
"	*T. pratense* L.	"	Tottori (FUKUSHI[4], 1928) Sapporo (" 1929)
"	*T. repens* L.	"	Tottori (FUKUSHI[4], 1927) Sapporo (" 1929)
"	*Vicia Faba* L.	"	Tottori (FUKUSHI[4], 1928) Tokyo (" 1930) Chiba (HORI)
"	*Vigna sinensis* ENDL.	"	Morioka (MATSUMOTO[27], 1922) Okayama (KASAI[17], 1924) Tottori (FUKUSHI[4], 1928)
mosaic	*Brassica campestris* L. subsp. *Rapa* HOOK. f et ANDS.	Cruciferae	Fukuoka (TAKIMOTO[37], 1927)
"	*B. japonica* SIEB.	"	" (" ")
"	*B. Pe-tsai* BAILEY	"	" (" ")
"	*Raphanus macropoda* LEV. var.	"	" (" ")
"	*Sinapsis* sp.	"	" (" ")
"infectious chlorosis"	*Paeonia albiflora* PALL. var. *hortensis* MAK.	Ranunculaceae	Sapporo (TOGASHI, 1930)
mosaic	*Aquilegia flabellata* S. et Z.	"	Yoshida in Niigata-Ken (S. ITO, 1931) Sapporo (Y. IMAI, 1932)
"	*Diantuus Caryophyllus* L.	Caryophyllaceae	*Tokyo (FUKUSHI & KAWAI, 1932)
"	*Rumex obtusifolius* L.	Polygonaceae	Zenibako near Sapporo (FUKUSHI, 1929)
"	*Canna indica* L.	Cannaceae	Kagoshima (FUKUSHI, 1928) Sapporo (FUKUSHI, 1931)
"	*Crocus vernus* ALL.	Iridaceae	Sapporo (FUKUSHI, 1931)
"	*Iris pumila* L.	"	" (" ")
"	*I. tectorum* MAXIM.	"	" (" ")
"	*Gladiolus gandavensis* VAN. HOUTTE	"	" (" ")
"	*Hippeastrum equestre* HERB	Amaryllidaceae	* " (KAWAI, 1931)
"	*Narcissus Pseudo-Narcissus* L.	"	Morioka (TOGASHI, 1931) Sapporo (KAWAI, 1931)
"	*N. incomparabilis* MILL.	"	Morioka (TOGASHI, 1931) Sapporo (FUKUSHI, 1931)

* In the greenhouse

Name of disease	Plant name	Family name	Locality
mosaic	*N. Tazetta* L, var. *chinensis* M. ROEM.	Amaryl-lidaceae	Sapporo (FUKUSHI, 1931)
"	*Allium fistulosum* L.	Liliaceae	Miyazaki (HORI[8], 1920) Gumma (HORI[10] 1929)
"	*A. Cepa* L.	"	Shizuoka (HORI[10], 1929)
"	*Fritillaria camtschatensis* KER-GAWL.	"	Sapporo (FUKUSHI, 1929)
"	*Hyacinthus orientalis* L.	"	" (TOCHINAI, FUKUSHI, 1931)
"	*Lilium auratum* LINDL.	"	" (FUKUSHI, 1929) Kamakura (SHIMAMURA, 1931)
"	*L. dauricum* KER.	"	Sapporo (FUKUSHI, 1930)
"	*L. longiflorum* THUNB.	"	" (" 1929)
"	*L. maculatum* THUNB. var. *elegans* KOIDZ.	"	" (KAWAI, 1931)
"	*L. Makinoi* KOIDZ.	"	" (FUKUSHI, 1931)
"	*L. Maximowiczii* REGEL.	"	" (" 1929)
"	*L. philippinense* BAK. var. *formosanum* WILS.	"	*Tokyo (FUKUSHI & KAWAI 1932)
"	*L. platyphyllum* MAXIM.	"	Sapporo (FUKUSHI, 1931)
"	*L. speciosum* THUNB. var. *Tametomo* S. et Z.	"	" (" ")
"	*L. tigrinum* KER-GAWL.	"	" (" 1929)
"	*Muscari botryoides* MILL.	"	" (" 1931)
"	*Tulipa Gesneriana* L.	"	throughout Japan
"	*Saccharum officinalum* L.	Graminae	Formosa *Sapporo (FUKUSHI, 1929)
sereh	"	"	Formosa (HORI[8], 1920)
dwarf	*Oryza sativa* L.	"	Middle and Southern Japan (TAKATA[36], 1895; etc.)
stripe	"	"	Honshu and Shikoku (Imp. Agr. Exp. Sta.[11] 1917, KURIBAYASHI[21], 1931)
"	*Zoysia japonica* STEUD.	"	Nagano (KURIBAYASHI[22], 1931)
dwarf	*Avena sativa* L.	"	Hokkaido (KURIBAYASHI, 1920 See HORI[8])
"	*Hordeum sativnm* JESS, var. *hexastichon* L.	"	throughout Japan [Shizuoka (Shizuoka Agr. Exp. Sta.[31], 1916) etc.]
"	*H. sativum* var. *vulgare* HACK. f. *coeleste* MAK.	"	"
"	*Triticum sativum* LAM. var. *vulgare* HACK.	"	"
"	*Secale cereale* L.	"	Hokkaido [14]

* In the greenhouse

As shown above, 71 species of plants in 51 genera distributed through 15 families are subject to virus diseases in Japan. The total of the figures, however, will not give the number of viruses involved because some virus affects a variety of plants. It is probable that more than 25 viruses affecting plants are present. A majority of the viruses cause mosaic diseases. Among the listed plants the following 15 species appear to be new hosts:

Cyphomandra betacea SENDT. (mosaic)
Primula obconica HANCE. (")
P. denticulata SMITH (")
Crotalaria juncea L. (")
Aquilegia flabellata S. et Z. (")
Dianthus Caryophyllus L. (")
Iris pumila L. (")
I. tectorum MAXIM. (")
Lilium dauricum KER. (")
L. maculatum THUNB. var. *elegans* KOIDZ. (")
L. Maximowiczii REGEL (")
L. tigrinum KER-GAWL (")
L. Makinoi KOIDZ. (")
L. platyphyllum MAXIM. (")
Fritillaria camtschatensis KER-GAWL. (")

The mosaic of Primula is a hitherto-unrecorded disease, as far as the writer is aware. This mosaic was first noticed in 1928 by Mr. G. HAYASHI of this Institute on *Primula obconica* grown in the greenhouse of the Botanic Garden in Sapporo. Quite recently a similar disease was found by the writer and his collaborator on *Primula obconica* and *P. denticulata* cultivated in a greenhouse located in a suburb of Tokyo.

It may be also worthy of note that both the dwarf and stripe diseases of rice plant are exclusively confined to Japan.

The tomato mosaic was artificially transferred by the writer to *Solanum nigrum* L. and likewise the dwarf disease of rice plant to both *Panicum miliaceum* L. and *P. Crus-galli* L. var. *frumentaceum* HOOK. f. These plants, however. were not enumerated in the list because they have never been found showing the mosaic or dwarf disease in the field.

Summary

It is difficult to formulate the definition of a virus because its essential characteristics are not definitely known. In the present paper the writer critically reviewed the definitions which have been given for the virus and discussed certain aspects of the virus diseases of plants.

71 species of plants in 51 genera distributed through 15 families are subject

to virus diseases in Japan. A majority of the viruses involved cause mosaic diseases while the others are the causative agents of the yellows, leafroll, dwarf diseases and stripe diseases. Among these diseases both the dwarf and stripe disease of rice plant are confined exclusively to Japan and the Primula mosaic is a hitherto-undescribed disease. 15 species of plants were reported to be new hosts which are subject to mosaic diseases.

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摘 要

本邦產植物の傳染性萎縮病に關する知見

福 士 貞 吉

茲に植物の傳染性萎縮病と名づくるものは ウイルス病 (Viruskrankheit) 或は ヴアイラス病 (virus disease) の事である。其病原たる virus は其本体が十分闡明せられてゐない爲に之に適切な定義を與へる事が困難である。私は本文に於て virus に與へられたる定義を批判し、如何にして virus disease を判定すべきかを說いた。それに基づいて我國の植物の病害を吟味すると十五科五十一屬七十一種の植物が virus disease 即ち傳染性萎縮病に犯されることが知れる。その內最も多いのはモザイク病で約五十種の植物を犯し、外に萎黃病、萎縮病、葉捲病、縞葉枯病等がある。その中で稻の萎縮病及縞葉枯病は我國特有の病害であり、Primula のモザイク病は未だ記錄のない病害である。又新に傳染性萎縮病の罹病植物の目錄に書き加ふべき植物が十五種ある。

ON A NEW SPECIES OF SPHACELARIA

BY

MASAJI NAGAI

(With one Text Figure)

In the middle of April of the present year, Mr. H. OTANI collected for me certain species of sea-weeds at the Rumoe harbour on the coast of the Japan Sea in Hokkaido. Among these specimens, an interesting brown alga belonging to the genus Sphacelaria was found on a frond of *Iridaea laminarioides* BORY. As far as I know, six species of this genus have been recorded within our boundary until now, four from the warmer southern seas and two from the northern waters. Of the four species of the former, two of them have been reported by the foreign algologists (3) and the others by Dr. K. YENDO (9), and also by Dr. K. OKAMURA (3). Of the latter two, the one is *Sphacelaria variabilis* SAUV. which was enumerated by Dr. OKAMURA in the 2nd Edition of his Nippon Sorui Mei-i and afterwards found also by Dr. Y. YAMADA (8) in the Mutsu Bay near the Tsugaru Strait between Honshu and Hokkaido, and the another is *S. plumigera* HOLMES which was found by Prof. J. TOKIDA (7) in the Southern Saghalien. Now the present alga considered as a new species will be added to the above six.

The present alga grows epiphytic on the frond of *Iridaea laminarioides*, fixing the thallus by small disks. The thallus consists of more or less dense tufts of erect filaments forming the felt-like turf.

The erect filaments are sparingly branched, more or less cylindrical and gradually attenuate at the base. The old filaments probably broken at the tips are sometimes found developing further into one to three new ones by dichotomous or trichotomous branching at the apex. (fig. B) In this case, the membranes of the terminal segments are found remaining at the base of the new filaments. (fig. B) The main filaments are measured 36 to 45 μ in diameter and 1.8 to 3 mm. in height. The branches are 25.5 to 33 μ in diameter. They are olive brown in color. The segments of the filaments are divided into two or more small cells by the longitudinal sections, but not generally by

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the transverse ones. (fig. B and filaments in figs. D–I) In a rare case, I came across the filament in which a few segments are secondarily divided more or less transversely. (fig. A) The apical segments are usually larger than the other segments on the same filaments, always unicellular, clavate and rounded at the apex. (figs. A and B) They are measured 27 to 51 μ in diameter, and 54 to 135 μ in length.

The unilocular sporangia are produced on short, 1-celled pedicels, turning upwards, and arranged unilaterally on the main or branched filaments. (figs. D and E) The pedicels are often tapering gradually towards the base. The sporangia are mostly globular, rarely unequally obovoid when young, usually with thickened wall, measuring 51 to 75 μ in diameter.

The plurilocular sporangia are produced on 1–4 celled pedicels turning upward and arranged unilaterally on the main or branched filaments or rarely terminating on the branchlets. (figs. F–I) The cells of the pedicels are observed rarely divided lengthwise, and frequently swollen on one side in the uppermost ones. These sporangia are oblong to ellipsoidal oblong in shape, often once or twice constricted slightly in the middle portions, and plurilocular. The locules are cylindrical and long at first (the upper two sporangia in figs. G and I), and then divided into small cells of square-shape and of about 3 μ diameter when matured. (figs. F–I) These sporangia are olive yellow in color at full maturity. They are measured 36 to 66 μ in length and 14 to 30 μ in breadth.

The propagula and hairs, either subterminal or rhizoidal, are not found.

According to the key for the determination of the species given in SAUVAGEAU's 'Remarques sur les Sphacélariacées', the species in question is related to the following species, *S. ceylanica*, *S. intermedia*, *S. Hystrix* and *S. Harveyana* by the fact that the secondary transverse partitions are not found generally in the segments of the axes, and also by the absence of the propagula and hairs, and by the epiphytic habit.

For comparison with the related species, the essential characters are shown in the following table.

Table 1. Essential characters of the alga in question and the related species

Algae	*S. ceylanica*	*S. intermedia*	*S. Hystrix*	*S. Harveyana*	The species in question
Substrata	Parasitic and epiphytic on *Turbinaria vulgaris*; when parasitic, penetrated into frond deeply with a bundle of thin filaments	Parasitic and then epiphytic on *Turbinaria triquetra* with a shallow disk of a bundle of short and thick filaments	Parasitic and epiphytic on *Cystoseira ericoides* with entangled mass of filaments	Parasitic on *Cystophora*	Epiphytic on *Iridaea laminarioides* with a shallow disk, not penetrating into frond
Filaments	Simple or ramified, indistinguishable between axes and branched filaments, 3 mm. high, 12–20 μ in diam.	2–4 mm. high, variable in diameter-range, 20–80 μ in diam.	1–10 mm. (2–4 mm. after REINKE) high; 2 kinds: primary (short and thin, soon degenerating, 35–45 μ in diam.) and secondary filaments (long and thick, remaining longer, 60–100 μ in diam.) sometimes intermediate form present	1–3 mm. high, 40–60 μ in diam.	Sparingly branched, 1.8–3 mm. high, 36–45 μ in diam. in main filaments, 25.5–33 μ in branched ones
Unilocular sporangia	Unknown	Globular, 60–90 μ in diam.	Globular	Globular, 60–70 μ in diam.	Globular, 51–75 μ in diam.
Plurilocular sporangia	Long, cylindrical, 50–60 × 15–20 μ Pedicels 1-celled	Long, 50–60 × 30–45 μ Pedicels 1-celled	Cylindrical, brown colored, with larger locules, 55–85 × 45–65 μ Pedicels 1–2 celled	40–50 × 32–36 μ	Oblong, ellipsoidal oblong, constricted slightly once or twice in the middle portion, olive yellow at maturity, 36–66 × 14–30 μ Pedicels 1–4 celled
Antheridia	Unknown	Unknown	Shaped as in Plurilocular sporangia, orange colored, with smaller locules than those of pl. sporangia, 55–90 × 45–52 μ	Present	Unknown
Propagula	Unknown	Unknown	Consist of 3 fusiform rays	Unknown	Unknown
Hairs	Sessile	Soon degenerating; sessile	Present or absent		Unknown
Rhizoids			Present	Absent	Unknown

Comparing with *S. ceylanica*, the present alga is separable from it in the thicker filaments and the many celled pedicels of the plurilocular sporangia. In the next species, *S. intermedia*, the filaments are said to be very variable and widely ranged in diameter according to SAUVAGEAU (6). But in the present species, the thickness of the filament is not so variable and less wide as in the case of *S. intermedia*. In the smaller size of the unilocular sporangia and in the many celled pedicels of the plurilocular sporangia, the present alga is also distinguishable from the latter.

S. Hystrix is one of the well studied species in the genus. According to SAUVAGEAU, the filaments of *S. Hystrix* is said to consist of two kinds, the one short, thin and soon degenerating, and the another long, thicker and persistent. Such two kinds of the filament are not found in our alga. There are some further differences between them in the other characters mentioned below. In *S. Hystrix* two kinds of the plurilocular organs, the plurilocular sporangia and the antheridia are found, while the plurilocular sporangia only are known to exist in our alga. The plurilocular sporangia of *S. Hystrix* are much larger than those of the present species. In regard to the propagula and hairs, they are known to be present in the former, while not found in our alga, as far as I have studied.

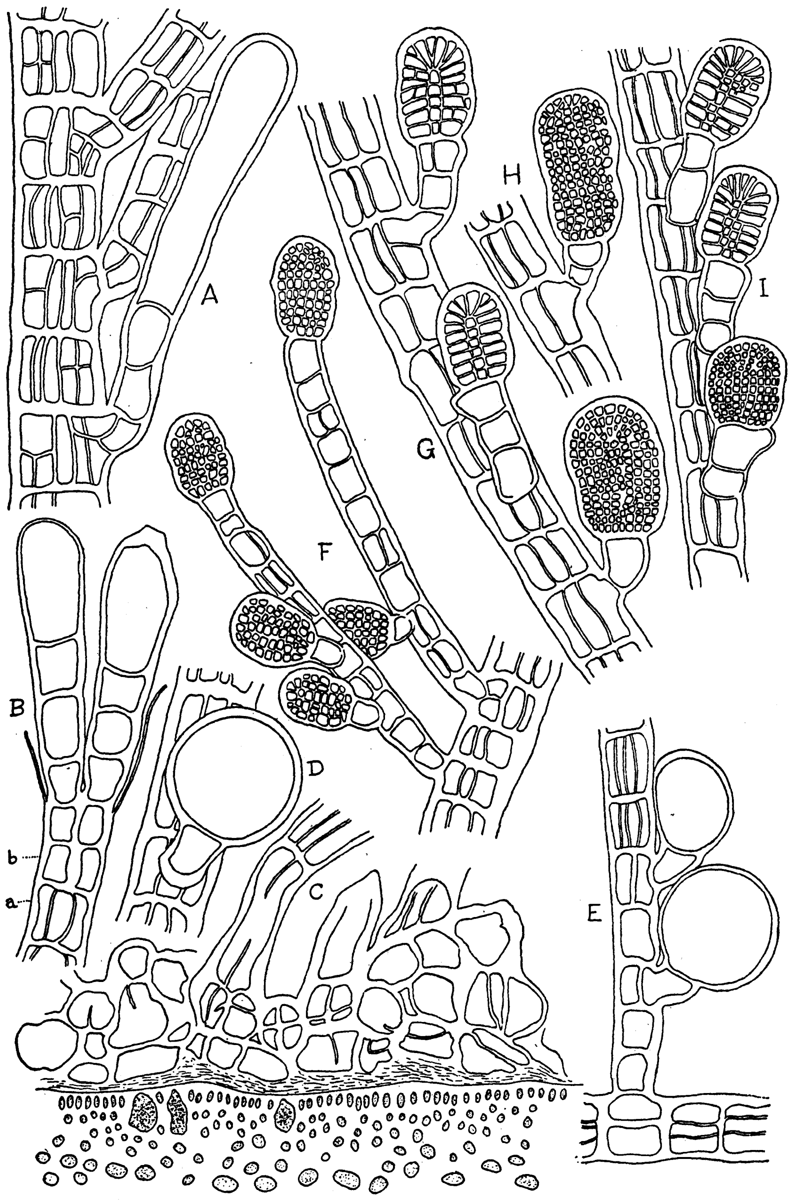
Finally, the species in question is apparently different from *S. Harveyana* in having the more delicate filaments and the thinner plurilocular sporangia.

Consequently I came to the conclusion that the species in question is not referrable to any known species in the genus.

The diagnosis is given as follows:—

Sphacelaria Iridaeophytica NAGAI, sp. nov.

Thallo pusillo, filamentis erectis caespitosis, discis basilaribus matrici adfixis; filamentis plus minusve cylindraceis, ad basim gradatim attenuatis, non multum lateraliter ramosis, olivaceo-brunneis, in axibus principalibus 36–45 μ, in axibus ramosis 25.5–33 μ diametris, 1.8–3 mm. altis; cellis terminalibus filamentorum clavatis vel cylindraceis, apud apices rotundatis, 27–51 μ diametris, 54–135 μ longis; cellis aliis longitudinaliter atque rarissime secundario transverse divisis; sporangiis unilocularibus globosis vel in juventute raro obovoideis, 51–75 μ diametris, pedicellis unilocularibus; sporangiis plurilocularibus oblongis vel oblongo-ellipsoideis, in partibus mediis semel vel bis sensim constrictis, 14–30 μ latis, 36–66 μ longis, maturescentibus olivaceo-flavis coloratis, pedicellis 1–4 locularibus; pilis et propagulis ignotis.



A. A part of main filament bearing three branches, in which the segments are divided lengthwise and secondarily transversely into smaller cells.

B. Terminal portion of the old filament developing further into two new ones by dichotomous branching, indicating *a* the segment belonging to the old filament and *b* the basal cells of the newly formed branched filaments.

C. Basal portion of the thallus epiphytic on *Iridaea laminarioides*.

D. E. Unilocular sporangia on the main and branched filaments.

F–I. Plurilocular sporangia on branched filaments (F) and main axes. (×320)

Hab. Ad frondem *Iridaeae laminarioidis*, in litore prope Rumoe ad oram maris Japoniae in Yesso.

Finally, I wish to express here my heartiest thanks to Prof. Emer. K. MIYABE and Prof. S. ITO for their valuable directions and constant encouragement. My gratitude is due to Prof. Y. YAMADA of the Faculty of Science who gave me valuable suggestions and allowance to use the books in the library under his management. My thanks are also due to Prof. J. TOKIDA in the School of Fishery for his good advices and critisisms in the present study, and to Mr. H. OTANI for his kind help in obtaining the material.

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摘　要

褐藻くろがしら屬の一新種に就きて

永　井　政　次

今春四月大谷廣直君留萠地方に遊び歸學後其の採集せる若干の海藻標本を余に示せり。大部分は北海道近海に普通なる種類なりしが、唯一種ギンナンサウ (*Iridaea laminarioides* BORY) の体上に着生せる矮小にして珍奇なる褐藻の一種を見出せり。種々調査の結果之れは先に時田教授が本誌にて發表せられしクロガシラ屬 (*Sphacelaria*) の一種にして SAUVAGEAU 氏の研究せる *S. ceylanica* SAUV., *S. intermedia* SAUV., *S. Hystrix* SUHR., 及 *S. Harveyana* SAUV. の四種に最も近き種類なる事判明せり。依つて以上の四種と夫々其の形態特徴を比較研究せる結果全く其の何れにも該當せざる事を知れり。故に是れに對して *Sphacelaria Iridaeophytica* NAGAI なる種名を與へ其の形態を記せり。

ON STROPHARIA CAERULESCENS, A NEW SPECIES OF POISONOUS TOADSTOOL

BY

SANSHI IMAI

(With One Text Figure)

According to the statistics published by the Japanese Sanitary Bureau, 344 cases of intoxication caused by toadstools have been reported in the year of 1929. Among them, 10 patients had resulted in death. In the same year, the writer had an opportunity to study on an undescribed fungus which causes a special intoxication. In 1931, he met again with a case of poisoning by the same fungus near Asahigawa, in the province of Ishikari, Hokkaido.

In the present short paper, the writer intends to describe this new species of toadstool and the symptoms caused by it.

The writer wishes to express his sincere thanks to Prof. Emer. KINGO MIYABE and Prof. SEIYA ITO for their kind advices and also to Mr. Y. KANNO, doctor of the Japanese Red-Cross Hospital at Asahigawa, for his kind information.

I. Causal Fungus

Stropharia caerulescens IMAI, spec. nov.

Fungi gregarii vel caespitosi. Pileo carnoso, convexo-plano vel subumbonato, hygrophano vel vix viscidulo, glabro, luteolo vel isabellino raro albido, margine pallido, 1.5–6 cm. lato; lamellis adnatis, e pallido violaceo-fuscis; stipite subcavo, aequali, albido, sicco, infra annulum fibrilloso, 3.5–9 cm. longo, 5–9 mm. crasso; annulo subsuperiori, tenuissimo-membranaceo, rarius fibrilloso, saepe evanescente; carne albida vel pallida, caerulescente; sporis fuscis vel violaceo-fuscis, ellipsoideis, $7–10.5 \times 4.25–7\ \mu$; cystidiis nullis.

Hab. ad terram et stercus. Hokkaido: Prov. Ishikari. Junius, Julius et October.

Nom. Jap. *Shibire-take* (n. n.)

The specimen of the present fungus which has turned blue in color some-

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 3, 1932]

what resembles *Stropharia aeruginosa* FR., from which it is easily distinguished by the hygrophanous and glabrous pileus and nongelatinous stem, as well as

Stropharia caerulescens IMAI, about half natural size

by the discoloring character of the context which changes from whitish color to azure-blue when it was bruised or wounded.

II. Symptoms of Intoxication

1. *Case of poisoning at Sapporo*:—From the reports of the chief of Sapporo Police-Station and of the doctor who had attended the patients, and also by the direct narrative of the patients, the writer summarizes here the intoxication-process. The symptoms in this case are as follows:—

In the afternoon of the 21st of June, 1929, Mrs. S. (43 years old and healthy) collected in a private garden about 375 grams of the toadstool which he had erroneously recognized as *Armillaria mellea*. In the next morning she cooked the fungus with turnip in the miso-soup and all the members of her family, the husband (46 years old and healthy) and a son (14 years old and healthy) ate it. Soon after the breakfast their body became abnormal. Mr. S. felt so feverish at his stomach as if he had drunk alcoholic liquor at hungry time and the limbs became somewhat paralyzed. Mrs. S. became giddy and her face turned pale. Then, they hurried to the nearest hospital about 500 meters apart.

Mrs. S. was most serious. She was in a slightly comatose condition during her walking and felt several times the sensation of falling forward. The doctor immediately drugged an emetic and washed the stomach and then administered a laxative. After these treatment she was calmly laid down on bed. While she was in bed, she felt intermittently the constriction or trembling of muscles and finally she came into hallucinosis then coma.

Since the laxative resulted with success, she gradually recovered from the above written symptoms. For a few days after this accident she was obliged to care for the stomach which was badly affected by the toadstool.

Their son who did not eat flesh of the toadstool but drank only the soup, felt a chill and paralysis of the limbs, followed by hallucination.

Mr. S. felt also a paralysis of the limbs, but he escaped from other agonies owing to his artificialy induced vomiting immediately after he had felt the poisoning.

Mr. and son were also drugged an emetic and laxative, and they recovered completely the next day.

2. *Case of poisoning at Asahigawa*:—After the report of the chief of Asahigawa Police-Station and the information kindly sent by the doctor at the writer's request, the intoxication-process and symptoms of this case are described as follows:

In the morning (about 6 o'clock) of the 11th of October, 1931, Mrs. M. (22 years old and well nourished woman), who is addicted to the mushroom-eating, collected about 375 grams of the toadstool which had grown on horse-dung in her backyard and cooked the fungus with raddish in the miso-soup and then ate them all at about 7 o'clock. About 10 minutes later she felt a chill and paralysis of the limbs. Her face turned pale and after about 30 minutes she lost her sight and fell down into a comatose condition. Then, she was carried to an hospital far way about 6 kilometers and consulted at 11 o'clock A. M.

At this time she had utterly fallen down into coma, losing her consciousness and talking in delirium. The pupils had opened to a medium size and not reacted to light. The cardiac sound was pure, the pulse was moderate, regular and tight, the breast and abdomen were normal, cyanosis appeared on the lips, the patellar-reflex was sensitive; and no trismus, no diarrhea, no vomiting, no perspiration and no drivel had occurred.

The doctor immediately injected camphor and 800 grams of the RINGER's solution, then washed her stomach and obtained about 500 grams of food-dregs in which are contained a large amount of the toadstool. After this treatment the patient was calmly laid down on bed. At 4 o'clock P. M. she regained somewhat her consciousness and in the next morning restored her health. In the afternoon of the 14th, when the doctor consulted the patient he did not recognize any abnormal symptom except the patellar-reflex was sensitive.

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摘　　要

一新毒菌シビレタケに就きて

今　井　三　子

昭和四年六月、札幌市苗穂に於て、又昭和六年十月、旭川市近郊神居村に於て一種の茸による中毒者を出せり。之れを調査するにモエギタケ (*Stropharia aeruginosa*) に類似せる一新種なるを以て和名を其中毒症狀よりシビレタケ (*Stropharia caerulescens* IMAI) と命名し、記相文と共に其中毒症狀の大要を報告せり。

本菌は地上或は馬糞上等に多數群生し、中高の平蓋を有し、表面淡黃色或は白色にして、肉は初め白色なるも負傷せる時は空青色に變色す。莖は白色。襉は莖に直生し初め白色なるも後ち紫褐色となる。(挿圖は實物大の約半分)

モエギタケとは蓋及び莖が粘質ならざる點と、肉が變色する點に於て容易に區別さる。

中毒症狀は食後數分にして既に体に麻痺を感じ、顏面蒼白となり、次第に視力を減じ、30分位にして意識を失ひ、痛覺を欠き譫語を發するに至る。然れ共下痢、嘔吐、發汗等の症狀なし。

吐劑、下劑等により手當をなせるに數時間にして意識を次第に回復し來たり、翌日に於て殆ど全快するに至る。

要するに從來知られたる多數の毒菌による症狀に比して、本菌による中毒は其症狀の發現迅速なる事、知覺神經の障碍さるゝ事、体の麻痺を起す事、下痢、嘔吐、發汗等の症狀なき事、及び致命的ならざるものゝ如き點に於て特異の症狀となすを得べし。

DIE *MORDELLIDEN* JAPANS (*COL.*) (DRITTER NACHTRAG)

VON

HIROMICHI KÔNO

(Mit Tafel IV)

Im Jahre 1928 veröffentlichte ich „Die *Mordelliden* Japans", in „Trans. Sapporo Nat. Hist. Soc., X". Der erste Nachtrag dieser Arbeit erschien im folgenden Jahre, in „Insecta Matsumurana III"; der zweite Nachtrag dazu im Jahre 1930 in gleicher Zeitschrift, IV". Ich behandelte in diesen 3 Arbeiten 36 *Mordelliden*-Arten aus unsrem faunistischen Gebiet.

Seit jener Zeit wurden von Herrn T. KANO 2 Arten aus der Insel Kôtôsho enumeriert; nun möchte ich in der vorliegenden Arbeit noch 11 andere Arten behandeln, so dass die *Mordelliden* Japans nun 49 Arten zählen.

Das Material dieser Arbeit lieferte mir die umfangreiche Sammlung des Entomologischen Museums der Kaiserlichen Hokkaido Universität in Sapporo.

Glipa ishigakiana n. sp.

♀. Körper gestreckt, hinten etwas verschmälert. Grundfarbe schwarz mit metallischem Schimmer; Fühler an der Basis braun, Kiefertaster dunkelbraun. Kopf gelblich grau behaart, Scheitel mit einem grossen dunklen Mittelmakel. Halsschild quer; die Punktierung ziemlich dicht; die Behaarung gelblichgrau, 4 grosse Makel, von denen 1 vor der Mitte und 3 in einer Querreihe vor der Basis, schwarz. Schildchen grau behaart. Flügeldecken gestreckt, an den Schultern am breitesten, nach hinten zu allmählich verengt; die Punktierung dicht; die Behaarung schwarz, je 1 halbkreisförmiger Makel an der Basis und je 1 Schrägbinde im vorderen Viertel gelblichgrau, je 1 angelhakenförmiger Makel in der Mitte und je 1 sichelförmiger Makel vor der Spitze grau. Unterseite grösstenteils und Beine dicht grau behaart. Hinterbrust zwischen den Hüften an der Hinterseitenecke stumpfwinklig nach hinten gerichtet. Pygidium schlank, in der hinteren Hälfte schwarz behaart. Hinterschiene an der Spitze mit 2 Endspornen, der innere Dorn etwas länger als der äussere. Das erste Hinter tarsenglied fast so lang wie die 2 folgenden Glieder zusammen.

Körperlänge: 8 mm (ohne Pygidium).

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 3, 1932]

Das Männchen noch unbekannt.

G. malaccana PIC sehr ähnlich, aber Fühler vorwiegend schwarz und Flügeldecken an der Basis nicht braun behaart.

Fundort: Ishigakishima (1 ♀, V. 1926, T. KANO).

Japanischer Name: *Ishigaki-obihananomi.*

Glipa malaccana PIC

Glipa malaccana PIC, L'Echange, XXVII, p. 90 (1911); KANO, Konchû, Tokyo, IV, p. 51 (1930).

Fundort: Formosa (Ranrun, 1 Ex., 8/VII. 1925, H. KÔNO); Ins. Kotosho (nach KANO).

Sonstiger Fundort: Malacca.

J. N.: *Koto-obihananomi.*

Mordella composita WALKER

Mordella composita WALKER, Ann. Mag. Nat. Hist., (3), II, p. 286 (1858); KANO, Konchû, Tokyo, IV, p. 52 (1930).

Fundort: Formosa (Botansha, nach KANO).

S. F.: Ceylon.

J. N.: *Koshun-hananomi.*

Mordella kanoi n. sp.

♀. Körper gestreckt. Grundfarbe schwarz; Fühler an der Basis, Kiefertaster und Vorderbeine grösstenteils dunkelbraun. Flügeldecken mit je 2 roten Schrägmakeln, von denen 1 hinter der Schulter und 1 anderer dicht hinter der Mitte, die Endsporne der Hinterschiene braun. Kopf, Halsschild und Schildchen gelblichgrau behaart, Halsschild mit 3 grossen dunklen Längsmakeln. Schildchen, nicht quer. Flügeldecken mit dunkler, purpur schimmernder Behaarung, auf den roten Makeln goldgelb behaart. Unterseite grösstenteils und Beine ganz gelblichgrau behaart. Vorderschiene fast gerade. Das erste Hintertarsenglied fast so lang wie die 3 folgenden Glieder zusammen.

Körperlänge: 4 mm (ohne Pygidium).

Diese Art der *M. aurata* KÔNO nahe verwandt, aber Halsschild ein wenig länger, Schildchen nicht quer und die Zeichnung der Flügeldecken anders.

Fundort: Formosa (Rahara, 1 ♀, 23/IV. 1926, T. KANO).

J. N.: *Kano-hananomi.*

Mordella mixta FABRICIUS

Mordella mixta FABRICIUS, Syst. Eleuth. II, p. 122 (1801); KANO, Bull.

Biologeograph. Soc. Jap., II, p. 181 (1931).

Fundort: Kotosho (nach KANO).

S. F.: Molukken.

Anaspis frontalis LINNÉ

Mordella frontalis LINNÉ, Syst. Nat. ed. X, p. 420 (1758).

Diese bis jetzt in unsrem faunistischen Gebiet nur aus Sachalin und Hokkaido bekannte Art wurde kürzlich von Herrn Prof. M. L. PEELE in den Kurilen erbeutet.

Fundort: Sachalin; Kurilen (Ins. Shikotan, 1 ♀, 9/VIII. 1931, M. L. PEELE); Hokkaido.

S. F.: Europe, Sibirien.

J. N.: *O-kuro-funagatahananomi.*

Mordellistena matsumurai n. sp.

♂. Färbung kastanienbraun. Behaarung gelb, glänzend. Fühler lang, den Hinterrand des Halsschildes weit überragend; das 4te Glied klein, nur so lang wie das 3te, das 5te doppelt so lang wie das 4te, die folgenden ein wenig kürzer als das 5te. Halsschild deutlich breiter als lang, an den Seiten ein weinig abgerundet, die breiteste Stelle liegt hinter der Mitte, die Hinterecken rechtwinklig. Schildchen quer. Flügeldecken an der Basis etwas schmäler als das Halsschild. Pygidium schlank. Analsegment länger als breit, fast halb so lang wie das Pygidium. Vorderschiene etwas gebogen, an der Basis ein wenig verdickt. Hinterschiene etwas länger als das erste Hintertarsenglied, mit 5 Einkerbungen; das erste Hintertarsenglied mit 3, das 2te und 3te je mit 3 Einkerbungen. Der innere Endsporn der Hinterschiene kräftig, mehr als doppelt so lang wie der äussere.

Körperlänge: 4 mm (ohne Pygidium).

In Fühlerbau und Körperform *M. rosseola* MARSEUL ähnlich, aber Färbung heller, der äussere Endsporn der Hinterschiene kräftiger und die Zahl der Einkerbungen der Hinterschiene verschieden.

Fundort: Formosa (Kusukusu-Shijukei, 1 ♂, 20–21/IV. 1928, Prof. Dr. S. MATSUMURA).

J. N.: *Matsumura-himehananomi.*

Mordellistena takaosana n. sp.

Färbung kastanienbraun. Behaarung braun, seidenglänzend. Körper gestreckt. Fühler schlank, das 4te Glied am längsten, so lang wie die 2 vorhergehenden Glieder zusammen, das 5te etwas kürzer als das 4te. Halsschild quer, an den Seiten nach vorn im Bogen verschmälert, die Hinterecken stumpfwinklig nach hinten gerichtet; die Punktierung fein. Schildchen dreieckig, breiter als lang. Flügeldecken an der Basis etwas schmäler als das Halsschild, an den Seiten fast parallel. Pygidium schlank, doppelt so lang wie das Analsegment. Vorderschiene beim Männchen schwach gebogen, an der Basis deutlich verdickt. Hinterschenkel mit 3 stark schrägen Einkerbungen, von denen die oberste am kleinsten ist. Das erste Hintertarsenglied mit 4, das 2te und 3te je mit 2 Einkerbungen. Die Endsporne der Hinterschiene ungleich lang, der innere Sporn fast doppelt so lang wie der äussere.

Körperlänge: 4–4,5 mm (ohne Pygidium).

In Färbung und Körperform *M. rosseola* MARSEUL ähnlich, aber Fühler schlanker, der äussere Endsporn der Hinterschiene fast halb so lang wie die innere (bei *M. rosseola* der innere Endsporn 3 mal so lang wie der äussere) und die Zahl der Einkerbungen der Hinterschiene und- A Tarsen verschieden.

Fundort: Honshu (Takao, 1 Ex., 14/V. 1912, H. TAKABAYASHI, 1 Ex., 10/V. 1913, E. GALLOIS).

J. N.: *Takao-himehananomi.*

Mir liegt noch ein Männchen aus Hokkaido (Sapporo) vor, dessen Hinterschiene 6 Einkerbungen zeigt, im übrigen stimmt es ganz mit dem typischen *M. takaosana* aus Honshu überein.

Mordellistena luteora n. sp.

Färbung rotbraun bis kastanienbraun; Kopf, Fühler, Halsschild, Vorder- und Mittelbeine heller. Behaarung gelb, seidenglänzend. Fühler lang, alle Glieder länger als breit, die 3 basalen fast gleich lang, das 4te Glied am längsten. Halsschild breiter als lang, etwas vor der Basis am breitesten, nach vorn allmählig verschmälert, die Hinterecken stumpf. Schildchen dreieckig. Flügeldecken an der Basis ein wenig schmäler als das Halsschild, parallelseitig, hinten schwach verengt. Pygidium fast zweimal so lang wie das Analsegment. Vorderschiene des Männchens schwach gebogen, an der Basis deutlich verdickt. Hinterschiene etwas länger als das erste Hintertarsenglied, mit 4 schrägen Einkerbungen, von denen die mittleren 2 länger als die anderen sind. Das erste Hintertarsenglied mit 3, das 2te so wie auch das 3te mit je 2 Einkerbungen. Der innere Endsporn der Hinterschiene fast doppelt so lang wie der äussere.

Körperlänge: 3–4 mm.

M. takaosana ähnlich, aber Körper etwas kleiner, Färbung heller und die Zahl der Einkerbungen der Hinterbeine verschieden.

Fundorte: Honshu (Misaki, 1 Ex., 21/VII. 1911, Prof. Dr. S. MATSUMURA, Tokyo, 2 Ex., Prof. S. MATSUMURA, Iwawakisan in der Prov. Kii, 1 Ex., 16/VII. 1613, Prof. S. ISSIKI, Gifu, 1 Ex., 15/VII. 1902, Prof. S. MATSUMURA); Kiushu (Beppu, 4 Ex., 10/VII. 1916, Prof. S. MATSUMURA, Kagoshima, 2 Ex.).

J. N.: *Nami-aka-himehananomi.*

Mordellistena palliata n. sp.

Färbung rotgelb bis rotbraun; Fühler schwarz, an der Basis gelb. Behaarung gelb, glänzend, unter gewissem Licht dunkel. Fühler mässig kräftig; die 3 basalen Glieder fast gleich lang, die folgenden etwas länger (♀) oder viel länger (♂) als das 3te. Halsschild in der Mitte am breitesten, die Hinterecken nachh inten gerichtet. Schildchen dreieckig, kurz. Flügeldecken parallelseitig, hinten ein wenig verschmälert. Pygidium schlank, in eine lange Spitze ausgezogen, fast 3 mal so lang wie das Analsegment. Vorderschiene des Männchens schwach gebogen, an der Basis ein wenig verdickt. Hiterschiene fast so lang wie das erste Hintertarsenglied, mit 3 schrägen Einkerbungen, von denen die oberste am längsten ist; das erste Hintertarsenglied mit 3, das 2te mit 2 Einkerbungen, das 4te ohne solche. Der innere Endsporn 2 1/2 mal so lang wie der äussere.

Körperlänge: 3,5–4 mm (ohne Pygidium).

Von der vorhergehenden Art durch die folgenden Punkte verschieden:

1. Fühler grösstenteils schwarz.
2. Pygidium viel länger.
3. Vorderschiene des Männchens schlanker.
4. Die Zahl der Einkerbungen der Hinterbeine geringer.

Fundort: Honshu (Shuzenji in der Prov. Izu, 1 ♀, 30/VII. 1913, E. GALLOIS, Chuzenji, 2 ♂, 26–28/VII. 1915, E. GALLOIS, Tokyo, 1 ♀, 16/VII. 1914, 1 ♀, 17/VII. 1915, E. GALLOIS, 1 ♀, VII. 1903, Prof. S. MATSUMURA; 1 ♂, Iwate, T. OGASAWARA).

J. N.: *Usuiro-himehananomi.*

Mordellistena chibi n. sp.

♂. Färbung hell rotgelb; Fühler grösstenteils, Scheitel, Flügeldecken an den Seiten, Unterseite, Pygidium und Hinterschenkel verdunkelt. Behaarung gelb. Fühler mässig lang, deutlich den Hinterrand des Halsschildes überragend; das 3te Glied klein, die folgenden Glieder deutlich länger und breiter als das 3te. Halsschild an den Seiten schwach abgerundet, die breiteste Stelle liegt hinter der Mitte, die Hinterecken winklig nach hinten gerichtet. Schildchen dreieckig. Flügeldecken gestreckt, nach hinten allmählich verschmälert. Pygidium lang, in eine dünne Spitze ausgezogen, fast 3 mal so lang wie das Analsegment. Hinterschiene kaum länger als das erste Hintertarsenglied, mit 3 schrägen Einkerbungen, von denen die oberste am längsten ist; das erste Tarsenglied mit 2 Einkerbungen, das 2te auch mit 2 kleinen. Der innere Endsporn der Hinterschiene 3 mal so lang wie der äussere.

Körperlänge: 3 mm (ohne Pygidium).

Diese Art an die kleinere Form von *M. luteola* erinnernd, aber Körper viel kleiner, Färbung der Unterseite dunkler Fühler grösstenteils schwarz und die Zahl der Einkerbungen der Hinterschiene verschieden.

Fundort: Honshu (Iwate, 2 ♂, VII. 1905, Prof. S. MATSUMURA).

J. N.: *Chibi-himehananomi.*

Mordellistena takizawai n. sp.

♂. Färbung schwarz; Fühler an der Basis, Mundteile, Flügeldecken grösstenteils (an der Naht und an den Seiten verdunkelt), Vorder- und Mitterbeine (Schienen an der Spitze schwarz) rotgelb. Behaarung dunkel, unter normalem Licht gelb glänzend. Fühler mässig kräftig; die 3 basalen Glieder fast gleich lang, die folgenden Glieder ein wenig breiter, das 4te deutlich länger als das 4te, quadratisch. Halsschild an den Seiten schwach abgerundet, hinter der Mitte am breitesten, die Hinterecken stumpf. Flügeldecken an den Schultern so breit wie das Halsschild, nach hinten zu allmählich verjüngt. Pygidium mehr als 3 mal so lang wie breit. Vorderschiene schwach gebogen, an der Basis ein wenig verdickt. Hinterschiene kaum länger als das erste Hintertarsenglied, mit 3 schrägen Einkerbungen; das erste Hintertarsenglied mit 3 stark schrägen Einkerbungen, von denen die oberste klein und undeutlich ist, das 2te Glied nur mit einer einzigen. Der innere Endsporn der Hinterschiene kräftig, 3 mal so lang wie der äussere.

Körperlänge: 3,8 mm (ohne Pygidium).

M. chibi etwas ähnlich, aber Körper grösser, Färbung dunkler und die Zahl der Einkerbungen der Hinterschiene verschieden.

Fundort: Hokkaido (Jozankei, 1 ♂, 9/VIII. 1931, M. TAKIZAWA).

J. N.: *Takizawa-himehananomi.*

Mordellistena awana n. sp.

Färbung rotbraun. Behaarung dunkel, Flügeldecken unter normalem Licht an den Schultern seidenartig gelb glänzend, Unterseite und Beine gelb behaart. Fühler von 5ten Glied an etwas verdickt; das 4te Glied klein, ein wenig länger als breit, nicht länger als das 3te, das 4te deutlich länger als das 4te. Halsschild quer, etwas hinter der Mitte am breitesten. Schildchen quer. Flügeldecken an der Basis ein wenig schmäler als das Halsschild. Pygidium in eine dünne Spitze ausgezogen, fast 3½ mal so lang wie das Analsegment. Hinterschiene kaum länger als das erste Hintertarsenglied, mit 4 schrägen Einkerbungen; das erste Hintertarsenglied mit 3, das 2te mit 2 Einkerbungen, das 3te nur mit einer einzigen. Der äussere Endsporn der Hinterschiene nur halb so lang wie der innere.

Körperlänge: 3,5 mm (ohne Pygidium).

M. rosseola MARSEUL ähnlich, aber Färbung heller, Fühler schlanker, Pygidium länger, der innere Endsporn der Hinterschiene schwächer und das 3te Hintertarsenglied nur mit einer Einkerbung.

Fundort: Shikoku (Awa, 1 Ex., 5/VIII. 1913, E. GALLOIS).

J. N.: *Awa-himehananomi.*

Mordellistena menoko n. sp.

♂. Färbung rotgelb; Unterseite, Fühler und Beine heller, Flügeldecken an den Schultern und an der Naht gelb. Behaarung der Oberseite dunkel, unter normalem Licht auf den Flügeldecken an den Schultern und an der Naht gelb glänzend, Unterseite gelb behaart. Fühler an der Innenseite ein wenig gesägt; das 2te Glied so lang wie breit, etwas kürzer als das erste, das 3te länger als breit, das 4te so lang wie das 3te, die folgenden Glieder noch etwas länger. Halsschild breiter als lang, die Hinterecken rechteckig. Schildchen dreieckig, breiter als lang. Flügeldecken an der Basis kaum schmäler als das Halsschild, an den Seiten fast parallel. Pygidium schlank, fast 3½ mal so lang wie das Analsegment. Vorderschiene gebogen. Hinterschiene kaum kürzer als die 2 basalen Hintertarsenglieder zusammen, mit 4 schrägen Einkerbungen, von denen die 2te am längsten ist; das erste Hintertarsenglied mit 4, das 2te mit 2 Kerbungen, das 3te nur mit einer einzigen. Der Endsporn der Hinterschiene ungleich lang, der innere Sporn fast doppelt so lang wie der äussere.

Körperlänge: 3,5 mm (ohne Pygidium).

Der vorgehenden Art am nächsten verwandt, aber Fühler etwas schlanker und das erste Hintertarsenglied mit 4 Einkerbungen.

Fundort: Hokkaido (Jozankei, 1 ♂, 17/VIII. 1925, H. KÔNO).

J. N.: *Menoko-himehananomi.*

Mordellistena galloisi n. sp.

Färbung dunkel; Flügeldecken und Beine kastanienbraun, Fühler an der Basis bräunlichgelb. Behaarung dunkel. Fühler mässig kräftig, an der Innenseite gesägt; das erste und 2te Glied so lang wie breit, das 3te klein, verkehrt konisch, die folgenden kräftiger und breiter, fast gleich lang, das 4te fast so lang wie das 3te, kaum länger als breit. Halsschild quer, die Hinterecken abgestumpft. Schildchen dreieckig. Flügeldecken parallelseitig, an der Spitze den Hinterrand des 4ten Bauchsegmentes überragend. Pygidium mässig plump, kaum doppelt so lang wie das Analsegment. Hinterschiene mit 4 stark schrägen Einkerbungen, von denen die 2te am längsten ist; das erste Hitertarsenglied mit 3 Einkerbungen, das 2te und 3te mit je 2. Hinterschiene mit 2 Endspornen, von denen der innere lang und schlank und 3-4 mal so lang wie der äussere.

Körperlänge: 4,5 mm (ohne Pygidium).

Auf den ersten Blick an *M. takaosana* erinnernd, aber Färbung dunkler, Fühler kürzer und kräftiger, der äussere Endsporn der Hinterschiene viel kürzer und die Zahl der Einkerbungen der Hinterschiene geringer.

Fundort: Honshu (Chuzenji, 1 Ex., 21/VII. 1926, 1 Ex., 28/VII. 1917, E. GALLOIS).

J. N.: *Gallois-himehananomi.*

Aus dem Entomologischen Institut
der Kaiserlichen Hokkaido Universität.

摘　　要

本邦産花蚤科の研究

（第三追補）

河　野　廣　道

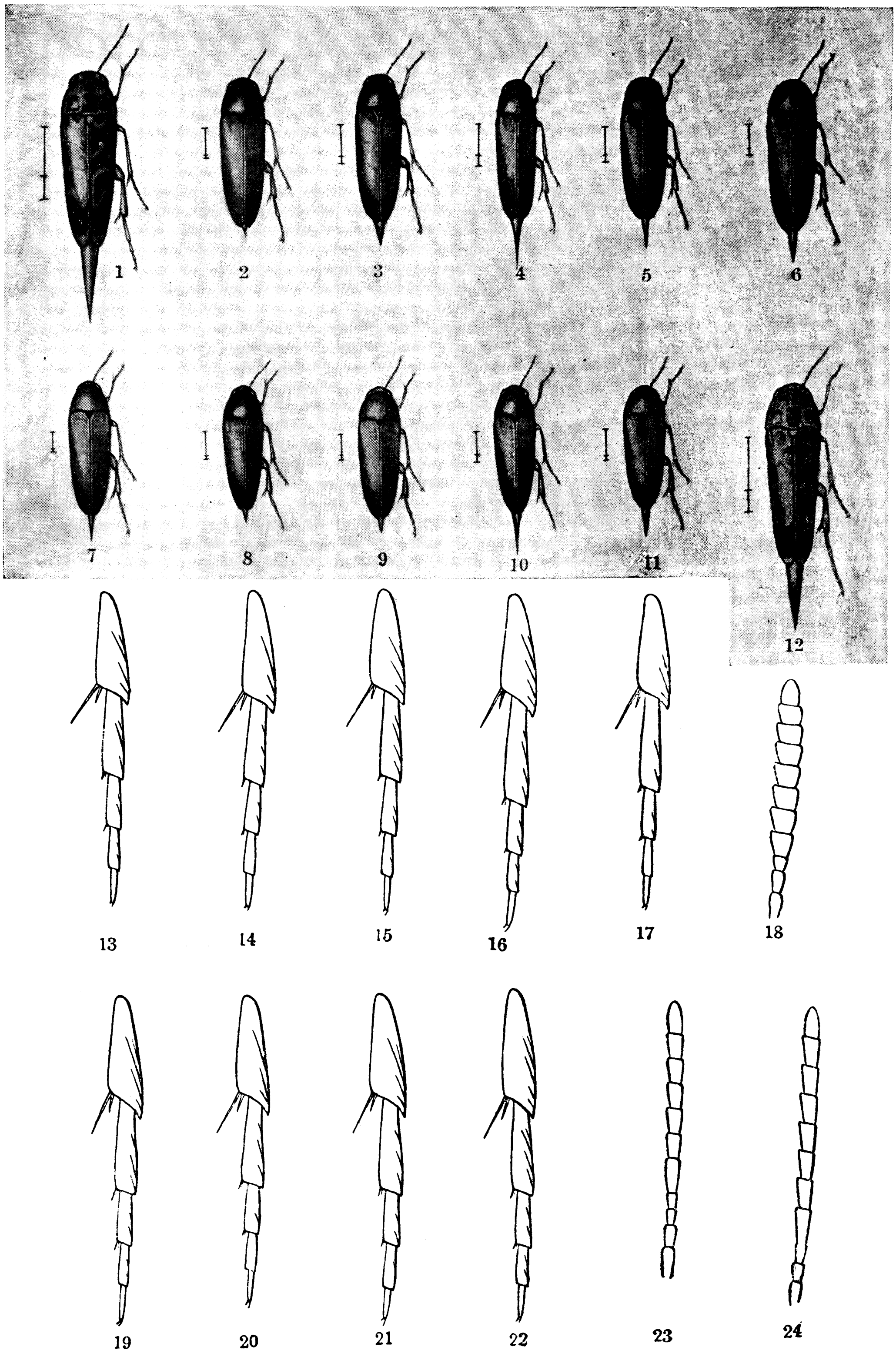
本文は私が曩に札幌博物學會報第十巻に發表した「本邦産花蚤科の研究」の第三追補である。第一追補及び第二追補は „Insecta Matsumurana, III 及び IV“ に發表した。第二追補迄に知られた本邦産の花蚤は總計 36 種であつた。その後鹿野氏が臺灣、紅頭嶼から二未記錄種を發表し、又私が本文に十一新種を記載したから、今日迄に知られたる本邦領土の花蚤科甲蟲は合計49種となつた。

本文に記載した新種の和名及び學名は次の如くである。

Glipa ishigakiana KÔNO (n. sp.)	イシガキオビハナノミ（新種新稱）
Mordella kanoi KÔNO (n. sp.)	カノハナノミ（　”　）
Mordellistena matsumurai KÔNO (n. sp.)	マツムラヒメハナノミ（　”　）
M. takaosana KÔNO (n. sp.)	タカチヒメハナノミ（　”　）
M. luteola KÔNO (n. sp.)	ナミアカヒメハナノミ（　”　）
M. palliata KÔNO (n. sp.)	ウスイロヒメハナノミ（　”　）
M. chibi KÔNO (n. sp.)	チビヒメハナノミ（　”　）
M. takizawai KÔNO (n. sp.)	タキザハヒメハナノミ（　”　）
M. awana KÔNO (n. sp.)	アハヒメハナノミ（　”　）
M. menoko KÔNO (n. sp.)	メノコヒメハナノミ（　”　）
M. galloisi KÔNO (n. sp.)	ガロアヒメハナノミ（　”　）

Erklärung der Tafel IV

1. *Glipa ishigakiana* n. sp. ♀
2. *Mordellistena galloisi* n. sp.
3. *Mardella kanoi* n. sp. ♀
4. *Mordellistena palliata* n. sp. ♂
5. *M, takaosana* n. sp. ♀
6. *M. awana* n. sp.
7. *M. chibi* n. sp. ♂
8. *M. rosseola* MARSESL ♂
9. *M. luteola* n. sp ♂
10. *M. takizawai* n. sp. ♂
11. *M. matsumurai* n. sp. ♂
12. *Glipa malaccana* PIC
13. Hinterschiene und -tarsus von *Mordellistena galloisi* n. sp.
14. " " " " *M. palliata* n. sp. ♀
15. " " " " *M. menoko* n. sp. ♂
16. " " " " *M. matsumurai* n. sp. ♂
17. " " " " *M. chibi* n. sp. ♂
18. Fühler von *Mordellistena galloisi* n. sp.
19. Hinterschiene und -tarsus von *Mordellistena luteola* n. sp. ♂
20. " " " " *M. takizawai* n. sp. ♂
21. " " " " *M. awana* n. sp.
22. " " " " *M. takaosana* n. sp. ♂
23. Fühler von *Mordellistena matsumurai* n. sp. ♂
24. " " *M. palliata* n. sp. ♂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ON NEW SPECIES OF HETEROECIOUS FERN RUSTS

BY

SENJI KAMEI

From the antiquity of the host plants, fern rusts are now generally considered to be the most ancient and primitive group. Among some forty described species most of them belong to three genera of Pucciniastreae, namely Uredinopsis MAGN., Milesina MAGN. and Hyalopsora MAGN. So far concerned with the species hitherto investigated, their aecidial phaces are invariably found on Abies. So it is very natural that one is apt to imagine the heteroecism in the rust fungi must have originated from these fern rusts and consequently to call forth the inquiries about this group from various sides of the mycological point of view.

Up to this day, since FRASER (3, 4, 5) had succeeded in the verification of the life cycle of Uredinopsis connecting the five species of fern rusts to *Peridermium balsameum* PECK, thirteen species of three genera above mentioned were proved to be heteroecious between Abies especially by FAULL and his students (1, 2), partly also by KLEBAHN (12), MAYOR (13, 14), WEIR and HUBERT (16) and the writer (9, 10, 11).

In our country, while eight species of fern rusts were already mentioned by NAOHIDE HIRATSUKA (6, 7), no records of any cultural experiments except three species with which the writer (9, 10, 11) is concerned have been published.

In Hokkaido, *Abies Mayriana* MIYABE et KUDO and *Abies sachalinensis* FR. SCHM. are widely distributed all over the island constituting the most important forest trees. Needles of both adult trees and seedlings are commonly attacked by peridermial stages which weaken the vigor of the trees and frequently inducing them to death. These peridermia are divided into two groups at a glance, white and orange yellow. The former group is more abundant and more widely distributed, and are connected with fern rusts.

In the course of his life-history studies of fern rusts of our country carried on for the past several seasons, the writer has succeeded in the proof of heteroecious relationship of fifteen species, containing nine new species, every one of which issues its aecidial phace on the needles of *Abies Mayriana* MIYABE et KUDO and

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 3, 1932]

other related species. In the present paper the writer intends to record only the diagnoses of seven new species, each of which is accompanied by the corresponding peridermial stage (except one imperfect case) which was obtained by cultural experiments.

The writer wishes to express his sincere thanks to Prof. Emer. KINGO MIYABE and Prof. SEIYA ITO for their kind directions and he is also indebted to Dr. GUBLER for the courtesy of translating of my descriptions into Latin.

1. *Uredinopsis Woodsiae* KAMEI, sp. nov.

O. Spermogoniis amphigenis, praecipue hypophyllis, minutis, abundantibus, irregulariter densiusque in areis decoloratis et deformibus dispositis, subcuticularibus, solitariis vel subinde confluentibus, paulum supra folii superficiem elatis, lenticularibus vel applanato-conoideis, 37–66.5 μ altis, 92–137 μ latis; spermatophoris simplicibus, obclavatis, septatis, hyalinis; spermatiis oblongis, 1.6–2.4 × 4.0–5.6 μ, hyalinis, levibus.

I. Peridermiis ex mycelio limitato, amphigenis, plerumque hypophyllis, irregulariter in series duas, ab utroque latere nervi meridiani dispositis, albis, cylindricis, apice ruptis, saepius 1 mm. longis, 0.15 mm. dimetientibus; cellulis peridii polygonalibus vel ellipsoideis, 15–26 × 22–37 μ, leniter imbricatim positis, parietibus interioribus grossiuscule verrucosis, ca. 4 μ crassis, parietibus exterioribus levibus, tenuibus, ca. 1 μ. Aecidiosporis globosis vel ellipsoideis, minime verrucosis, 14–22 × 15–28 μ, saepius 18.5 × 22 μ, contentibus hyalinis.

II. Soris uredosporiferis hypophyllis, in areis discoloribus sparsis, minutis, subrotundatis, 0.5–1.0 mm. dimetientibus, flavidis vel brunneolis; pseudoperidiis hemisphaericis. Uredosporis biformibus, sporis primis ex fisso peridii fere in massam albidam evolutis, ovato-oblongis vel ovato-fusiformibus, 13–19.5 × 27.5–47 μ, ad apicem subinde in mucronem breviorem abeuntibus, saepe nudis; episporio tenui, 1–2 μ, serie una longitudinali verrucarum minutarum laxe positarum obsito, utrobique laxiusque et minute verrucoso; contentibus hyalinis; sporis secundariis (amphisporis) in peridio firmo posterius evolutis, angulatioribus, plerumque pedicellatis; episporio crassiore, minutissime verrucoso; contentibus hyalinis; poris germinationis indistinctis.

III. Teleutosporis amphigenis, subepidermicis, saepe in profundo mesophyllo insidentibus, intercellulalibus, globosis vel subglobosis, fere 2–4, raro pluri- vel unicellularibus, 16.5–24 × 18.5–29.5 μ, hyalinis; episporis tenuibus, levibus; sporidiis subglobosis, ca. 8 μ latis hyalinis, levibus.

Habitat. O and I on one-year-old needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*) formed by the inoculation of sporidia gained by the germination of overwintered teleutospores collected in the previous autumn.

II, II^x and III on the fronds of *Woodsia polystichoides* EAT. var. *nudiuscula* HOOK. (*Yezo-iwadenda*). The specimens examined are as follows:—

II, II^x, III. Hokkaido: Prov. Ishikari: Mt. Teine, Sept. 28 1924; Oct. 22 1924, S. KAMEI; Jōzankei, Oct. 19 1924, S. KAMEI.

This is a striking species of Uredinopsis. So far as the writer is aware, any species of Uredinopsis which attacks a fern belonging to the genus Woodsia is yet unknown. The uredospores are of two forms just as in the case of *Uredinopsis Struthiopteridis* STROEMER, *Uredinopsis filicina* MAGN. and others. But the difference in shape between two spore forms is not so distinct as in the case of *Uredinopsis Struthiopteridis* STROEMER. Primary uredospores have very short beak or sometimes quite lacking, which is an another characteristic.

2. *Uredinopsis Athyrii* KAMEI, sp. nov.

O. Spermogoniis amphigenis, praecipue hypophyllis, minutis, numerosis, dense aggregatis, in areis decoloratis et deformibus, solitariis vel confluentibus paulum supra folii superficiem elatis vel epidermide depressis, inconspicuis; in sectione subcuticularibus, applanato-conoideis vel hemisphaericis, 37–77 μ altis, 74–137 μ latis; spermatophoris simplicibus, obclavatis, septatis; spermatiis oblongis, 1.6–2.4 × 4.8–6.4 μ, hyalinis, levibus.

I. Peridermiis e mycelio limitato, solitariis vel adhaerentibus, in duas series utrimque ad nervum positis, in areis plus minus decoloratis, partem vel totum folii occupantibus, 0.7–1.3 mm. altis, 0.2–0.7 mm. dimetientibus, cylindricis, profundo immersis; peridiis hyalinis, apice ruptis; cellulis peridii adjacentibus, polygonalibus et ellipticis, 15–29.5 × 26–44.5 μ, parietibus interioribus asperioribus et fortiter verrucosis, 2–4 μ crassis, parietibus exterioribus levibus, tenuibus 1–2 μ; aecidiosporis plerumque obovatis vel ellipsoideis, 12–23.5 × 13–27.5 μ, saepissime 19.5 × 21 μ; episporio hyalinio, ca. 1 μ, minute verrucoso; contentibus hyalinis.

II. Soris uredosporiferis hypophyllis, in areis discoloribus, subinde in nervis et petiolis, minutis, rotundatis, 0.1–0.5 mm. in diam., in sectione plus minus hemisphaericis; peridiis delicatis, apice dehiscentibus; sporis in molem album filiformem exeuntibus; uredosporis fusiformibus vel ovato-oblongis, 11.5–17.5 × 21–42 μ, saepissime 13 × 32 μ, episporio 1 μ, hyalino, serie una longitudinali verrucarum minutarum dense positarum obsitis, ceterum disperse verruculosis, ad apicem subinde in mucronem brevem, fortem, 2.5–5 μ longum abeuntibus; contentibus hyalinis.

III. Teleutosporis sub epidermide superiore et inferiore foliorum sitis, infra

The sign II^x means the sorus of secondary uredospores or amphispores plurioribus, plerumque 2–5 cellulis, globosis vel subglobosis, 13–25 × 15–37 μ; episporio tenui, ca 1 μ, hyalino, levi, contentibus hyalinis; sporidiis subglobosis, 7–11 μ latis, hyalinis, levibus.

Habitat. O and I on the current year needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*) formed by the inoculation of the sporidia gained by the germination of the overwintered teleutospores collected in the previous autumn.

II and III on the fronds of *Athyrium Filix-foemina* ROTH. var. *melanolepis* MAKINO (*Meshida*). The specimens examined are as follows:—

II. Hokkaido: Prov. Ishikari: Nopporo, Oct. 22 1922, S. KAMEI; Mt. Teine, Sept. 27 1925, S. KAMEI. Prov. Iburi: Mt. Makkarinupuri, Aug. 27 1922; Aug. 24 1924, S. KAMEI; Tôasa, Sept. 12 1923, S. KAMEI; Chitose, Sept. 18 1931, S. KAMEI.

II and III, Prov. Ishikari: Sapporo, Botanic Garden, Sept. 30 1922, S. KAMEI; Kotoni near Sapporo, Oct. 25 1922, S. KAMEI. Prov. Iburi: Mt. Makkarinupuri, Aug. 27 1923, Nov. 12 1924, Sept. 9 1925, S. KAMEI.

This is also a striking species of Uredinopsis nearly related to *Urediuopsis Copelandi* SYDOW found in California on *Athyrium cyclosorum* RUPR. The beak of the uredospore of this species, however, is shorter and the amphispores that are described in the Californian species are not yet found in this species. The writer has an another form parasitic on *Athyrium Vidalii* NAKAI (*Yama-inu-warabi*) which is commonly found in the vicinity of Sapporo. The primary uredospores are scarcely different from those of the species concerned. Further observations are needed before the determination, whether this form is to be included in this species or not is made.

3. *Uredinopsis hirosakiensis* KAMEI et HIRATSUKA, f. sp. nov.

O. Spermogoniis amphigenis, plerumque hypophyllis, minutis, abundantibus, irregulariter in partibus affectis follii flavidis decoloratis et deformibus sparsis, solitariis vel confluentibus, subcuticularibus, parum supra superficiem elatis vel non multum depressis, in sectione conoideis vel fere hemisphaericis, 74–137 μ latis, 37–92.5 μ altis, melleis; spermatiis oblongis vel oblongo-ellipsoideis, 1.6–2.7 × 4.8–6.4 μ, hyalinis, levibus.

I. Peridermiis ex mycelio limitato, raro amphigenis, plerumque hypophyllis, in areis decoloratis in series duas utrimque ad nervum medianum disperse dispositis, profundo immersis, cylindricis, apice ruptis, 0.2–0.3 mm. dimetientibus, 0.6–1.2 mm. altis. Peridiis hyalinis; cellulis peridii ovoideis vel obovoideis, fragilibus, vix imbricatim positis, 13–22 μ latis, 20–37 μ longis, parietibus interioribus crassis, 3–7 μ, asperius verrucosis, parietibus exterioribus tenuibus, 1 μ; aecidiosporis globosis vel obovoideis, 11–17.5 × 15–26.5 μ, saepissime 18.5 × 20.5 μ; episporio hyalino, tenui, 1.0–1.5 μ, parte minuta levi excepta, minutissime verrucoso; contentibus hyalinis.

II. Soris uredosporiferis hypophyllis in areis discoloribus sparsis, plerumque ad nervum et marginem saepe in petiolis dispositis, rotundatis, minutis, 0.1–0.3 mm. dimetientibus, dilute flavidis; pseudoperidiis delicatioribus, depresso-hemisphaericis vel subconoideis, apice dehiscentibus, pulverem album sporarum protrudentibus. Uredosporis ovoideis vel ellipsoideis, 11–24.5 × 15.5–33 μ, saepissime 19 × 24 μ; episporio tenui, ca. 1 μ, hyalino; disperse sed distincte verrucoso-echinulatis; contentibus hyalinis.

III. Teleutosporis amphigenis in mesophyllo sub epidermibus inferioribus et superioribus dense raro sparse positis, globosis, vel ellipsoideis, 15.5–24 × 17.5–40 μ, plerumque 2–4 cellulis, subinde pluri- vel unicellularibus, hyalinis; episporio tenui, ca. 1 μ, hyalino levi. Sporidiis subglobosis, 7.5–11 μ longis, 7.5 μ latis, levibus, hyalinis.

Habitat. O and I on the current year needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*) formed by the inoculation of sporidia which were gained by the germination of the overwintered teleutospores collected in the previous autumn.

II and III on the fronds of *Dryopteris Thelypteris* (L.) A. GRAY (*Himeshida*). The specimens examined are as follows:

II and III. Honshu: Prov. Mutsu: Hirosaki, Sept. 8 1897; Sept. 12 1897, NAOHARU HIRATSUKA. Hokkaido: Prov. Ishikari: Bibai, Sept. 12 1920, K. TOGASHI; Sapporo, Sept. 20 1920, T. FUKUSHI; Sept. 30 1922, S. KAMEI; Nopporo, Sept. 7 1924, S. KAMEI. Prov. Iburi: Tôasa, Sept. 12 1923, S. KAMEI.

This species was named after Hirosaki where Dr. NAOHARU HIRATSUKA collected this fungus for the first time in Japan. The characters of the uredospores as well as the teleutospores are similar to those of a species of Pucciniastrum except the color of their contents. However, according to the writer's repeated inoculation experiments the spermogonia and peridermia which had issued on the leaves of *Abies Mayriana* M. et K. are always colorless, by which characters the present species is distinguished from the species of Pucciniastrum heteroecious on Abies, such as in the case of *Pucciniastrum Tiliae* MIYABE, *Pucciniastrum Styracinum* HIRATSUKA and *Pucciniastrum Epilobii* OTTH., every one of which is also proved by the writer to be parasitic on *Abies Mayriana* M. et K. Moreover, the spermogonia which were gained from the inoculation experiments were seen to be nearly of the same type with those typical species of Uredinopsis. So, the writer admits that it is a species of Uredinopsis deviating toward a species of Pucciniastrum.

4. *Uredinopsis intermedia* KAMEI, sp. nov.

O. Spermogoniis hypophyllis, minutis, paucis, sparsis, inconspicuis, in sectione conspicuis, subepidermicis, in profundo insidentibus, globosis vel subglobosis, 120–187 μ altis, 130–209 μ latis; spermatiis oblongis, 1.9–2.4 μ latis, 5.6–6.7 μ longis, hyalinis, levibus.

I. Peridermiis ex mycelio limitato, hypophyllis, in duas ordines in areis flavo-decoloratis dispositis, partem vel totum folii occupantibus, 0.2–0.4 mm. dimetientibus, 0.6–1.2 mm. altis, cylindricis; peridiis hyalinis, apice irregulariter ruptis; cellulis peridii rhomboideis vel ovoideis, 15–26 × 22–37 μ, parietibus exterioribus levibus, tenuibus, 1 μ; parietibus interioribus crassioribus, cum tuberculis 3–7 μ, fere striatis, asperioribus verruculosis, vix vel paulum imbricatim positis. Aecidiosporis plus minusve globosis, 11.5–23.5 × 16–29 μ, saepissime 19.5 × 21 μ, pariete tenui verruculoso parte minuta levi eximia; contentibus hyalinis.

II. Soris uredosporiferis hypophyllis, flavidis vel fulvis, in area discolorata sparsis, parvis, 0.2–0.3 mm. dimetientibus, poro medio ruptis. Pseudoperidiis hemisphaericis tenuibus. Uredosporis biformibus, sporis primis maturius evolutis fere in cirrhos albidos protrusis, forma valde discrepantibus, rhomboideis, cuneatis vel flavellatis raro triangulis, 13–30 × 14.5–32 μ, saepissime 16 × 24 μ, episporio 1 μ, ad angulos crassiore, hyalino levi; sporis secundariis (amphisporis) posterius evolutis in peridio firmo, fere vere rupturis in pulverem flavo-sordidum protrudescentibus, formis aequalibus, ovoideis vel oblongis saepissime pedicellatis, 7.5–37 μ longis, episporio crassiore, 13–19.5 × 17.5–24 μ, minutissime verrucoso; contentibus hyalinis.

III. Teleutosporis subepidermicis, amphigenis, infra abundantibus, intercellularibus, globosis vel ellipsoideis, plerumque 2–6 cellulis, 15–22 × 18.5–33.5 μ, hyalinis; episporio gracili 1 μ, levi; sporidiis subglobosis, 5.5–9.0 × 7.5–11 μ, hyalinis, levibus.

Habitat. O and I on the current year needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*) formed by the inoculation of sporidia obtained by the germination of overwintered teleutospores collected at the previous autumn.

II and III on the fronds of *Athyrium acrostichoides* DIELS (*Miyamashikeshida*) and of *Athyrium pterorachis* H. CHRIST. (*O-meshida*) The specimens examined are as follows:—

On *Athyrinm acrostichoides* DIELS.

II, II^x, III. Hokkaido: Prov. Ishikari: Mt. Teine, Sept. 28 1924, S. KAMEI;

Prov. Iburi: Chitose, Sept. 17 1931, S. KAMEI.

II^x, III. Hokkaido: Prov. Ishikari: Nopporo, Nov. 12 1922: Nov. 8 1923, S. KAMEI.

On *Athyrium pterorachis* H. CHRIST.

II, II^x, III. Hokkaido; Prov. Ishikari: Sapporo Botanical Garden, Sept. 30 1922, S. KAMEI; Mt. Teine, Sept. 28 1924, S. KAMEI.

II^x, III. Hokkaido: Prov. Ishikari: Nopporo, Nov. 12 1922; Oct. 23 1923; Nov. 8 1923, S. KAMEI; Prov. Iburi: Morap, Sept. 18 1931, S. KAMEI.

II, III. Hokkaido: Prov. Iburi: Mt. Makkarinupuri, Aug. 27 1922, S. KAMEI.

That the hibernating intercellular teleutospores germinate in the spring and infect the young needles of Abies is essentially the same as the other species of Uredinopsis. Moreover, besides the primary uredospores slightly thick-walled pedicellate uredospores (amphispores) are secondarily formed in the firmer pseudoperidium. With these secondary uredospores it was proved that they infect the young fronds of the same fern, indicating that this species can also pass the autoecious life, just as in the case of *Uredinopsis Struthiopteridis* STROEMER and *Uredinopsis filicina* MAGN. But the spermogonia formed on the young needles of *Abies Mayriana* M. et K. are invariably large sized and subepidermal, which characters are nearly related to the case of *Uredinopsis ossaeiformis* n. sp. Besides, the primary uredospores are peculiar shaped and the epispores are quite smooth having neither any markings nor ridges. Such smoothness of the uredospores are seen also in the case of *Uredinopsis ossaeiformis* n. sp. In short, considering from the characters of uredospores and the spermogonia this species is with *Uredinopsis ossaeiformis* deviated from the usual species of Uredinopsis toward Milesina, especially nearing to *Milesina Miyabei* n. sp. and *Milesina polypodophila* FAULL. The specific name is based on the intermediate natures between Uredinopsis and Milesina.

5. *Uredinopsis ossaeiformis* KAMEI, sp. nov.

O. Spermogoniis hypophyllis, minutis, paucis, primo inconspicuis, posterius brunneis, in areis flavidis decoloratis, plerumque in superficie stomatifera irregulariter disperse dispositis, secto folio conspicuis, subepidermicis, profundo insidentibus, subsphaericis, in sectione transversali 192.5–270 μ latis, in sectione longitudinali 154–259 μ latis, 110–241 μ altis; spermatophoris simplicibus vel ramosis, obclavatis, septatis. Spermatiis ellipticis vel oblongis, $1.2–2.3 \times 3.6–6.6\ \mu$, hyalinis, levibus.

I. Peridermiis ex mycelio limitato, amphigenis, praecipue hypophyllis, in series duas juxta nervum medianum dispositis, in areis plus minus flavis decoloratis sparsis, ca. 30 pro folio, profundo insidentibus, cylindricis, apice apertis, 0.2–0.5 mm. dimetientibus, 0.5–1.1 mm. altis; peridiis hyalinis, cellulis peridii paulum imbricatim positis, fortiter conjunctis, quadri- vel sexangulis, saepe cuneatis vel oblongis, 14.5–24.5 μ latis, 24.5–44.5 μ longis, parietibus interioribus dense et minute verrucosis, cum tuberculosis 3–5 μ crassis; parietibus exterioribus levibus, tenuibus, ca. 1 μ. Aecidiosporis ellipsoideis vel subglobosis, 16–25 × 21–30.5 μ, saepius 24 × 25.5 μ; episporio hyalino, 1.0–3.2 μ crasso, minute verrucoso parte minuta levi excepta; contentibus hyalinis; poris germinationis obscuris.

II. Soris uredosporiferis hypophyllis, in areis discoloribus sparsis, saepius ad nervum et marginem abundantibus, interdum in petiolis et nervis positis, dilute flavis, rotundatis, minutis, 0.2–0.3 mm. dimetientibus; sporis ex poro centrali in cirrhos albidos protrudentibus; pseudoperidiis subepidermicis, hemisphaericis, vel applanato-conoideis; cellulis peridii apice polygonalibus in lateribus elongatis. Uredosporis saepissime ossaeiformibus, subangulatis, apice truncatis vel vix rotundatis, raro subglobosis vel polygonalibus, 13–22.5 × 22.5–43 μ, saepissime 16 × 35.5 μ; episporio hyalino, 1.5 μ, ad angulos ca. 3 μ, levi; contentibus hyalinis; poris germinationis obscuris.

III. Teleutosporis numerosis, dense aggregatis, sub epidermide superiore et inferiore foliorum sitis, infra pluribus, saepissime circum sorum uredosporiferum positis, subinde profundo mesophyllo insidentibus, intercellularibus, globosis, ellipsoideis vel piriformibus, longitudinaliter et transverse septatis, 2–7 cellulis, plerumque 4 cellulis, raro nonseptatis, 15.5–26.5 × 17.5–31 μ, episporio hyalino, levi tenui, ca. 1 μ; contentibus hyalinis; sporidiis subglobosis, 5.5–7.4 × 7.7–9.2 μ, hyalinis, levibus.

Habitat. O and I on the current year needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*), *Abies sachalinensis* FR. SCHMIDT (*Akatodomatsu*) and *Abies firma* SIEB. et ZUCC. (*Momi*) formed by the inoculation of sporida which were obtained by the germination of the overwintered teleutospores collected at the previous autumn.

II and III on the fronds, sometimes also on the stipes of *Dryopteris dilatata* A. GRAY (*Shirane-warabi*) and *Dryopteris monticola* C. CHR. (*Miyama-benishida*). The specimens examined are as follows:—

On *Dryopteris dilatata* A. GRAY

II. Hokkaido: Prov. Ishikari: Utashinai, Sept. 24 1892, E. TOKUBUCHI; Mt. Teine, Sept. 18 1927, S. KAMEI; Nopporo, Oct. 15 1920; Nov. 23 1921; Oct. 13 1929, S. KAMEI. Prov. Tokachi: Shikaribetsu, Sept. 30 1929, S. KAMEI. Prov. Iburi: Mt. Makkarinupuri, Aug. 21 1921; Aug. 23 1924; Sept. 27 1925; Oct. 6 1930, S. KAMEI. Prov. Teshio: Mt. Rishirifuji, Aug. 5 1922,

K. TOGASHI. Island Kunashiri: Furukamappu, Aug. 11 1929, M. NAGAI and M. SHIMAMURA.

III. Hokkaido: Prov. Ishikari: Mt. Teine, Oct. 10 1926, I. TANAKA; Nopporo, Oct. 20 1922; Nov. 17 1923, S. KAMEI.

II, III. Hokkaido: Prov. Ishikari: Nopporo, Nov. 20 1920; Oct. 14 1923, S. KAMEI. Prov. Iburi: Mt. Makkarinupuri, Aug. 27 1923, S. KAMEI; Lake Shikotsu, Sept. 18 1931, S. KAMEI.

On *Dryopteris monticola* C. CHR.

II. Hokkaido: Prov. Ishikari: Nopporo, Oct. 20 1922; Sept. 9 1925; Oct. 13 1929, S. KAMEI.

III. Hokkaido: Prov. Iburi: Mt. Makkarinupuri, Nov. 17 1925, S. KAMEI.

II, III. Hokkaido: Prov. Ishikari: Nopporo, Sept. 29 1923; Oct. 24 1925, S. KAMEI. Prov. Iburi: Aug. 24 1924, S. KAMEI.

The uredospores are typically bone shaped and the specific name is given from this character. In spite of this peculiar characters of the uredospores, the teleutospores are apparently the same as those of the usual species of Uredinopsis. They are subepidermal, intercellular and sometimes also immersed deeply into the mesophyll. These teleutospores complete their development before winter and hibernate, germinating in the late spring during May to infect young needles of Abies just as in the case of the usual species of Uredinopsis. But the spermogonia which issue after the inoculation of the sporidia are always subepidermal and deeply seated inside the mesophyll tissue and very large sized. These characters are clearly distinct from the subcuticular and smaller type formed in the case of the usual species of this genus such as *Uredinopsis Struthiopteridis* STROEMER, *Uredinopsis filicina* MAGN., *Uredinopsis Pteridis* DIET. et HOLW., *Uredinopsis Adianti* KOMAROV, *Uredinopsis Athyrii* n. sp. and *Uredinopsis Woodsiae* n. sp. Such difference in the uredospores and spermogonia of this species from the usual species of Uredinopsis are also seen in *Uredinopsis intermedia* n. sp. which makes one remind that these two species are closely related and deviate together toward some species of Milesina such as *Milesina Miyabei* n. sp. and *Milesina polypodophila* FAULL. But compared with *Uredinopsis intermedia* n. sp. the present species lacks the secondary uredospores. If the absence of the secondary uredospores is one of the common characters of Milesina this species is more closely related toward Milesina than *Uredinopsis intermedia* n. sp. The uredospores of this species are similar to those of *Milesina Miyabei* n. sp. but easily distinguished by the shorter and broader shape.

6. *Milesina Miyabei* KAMEI, sp. nov.

O. Spermogoniis hypophyllis, paucis, minutis, in areis flavidis decoloratis sparsis, fere inconspicuis, subepidermicis, profundo immersis, fere sphaericis, in sectione longitudinali 160–280 μ latis, in sectione transversali 200–250 μ latis, 190–240 μ altis. Spermatophoris simplicibus vel ramosis, septatis. Spermatiis oblongo-ovatis vel oblongo-ellipsoideis, 1.6–2 μ latis, 4.8–7.6 μ longis, hyalinis, levibus.

I. Peridermiis ex mycelio limitato, hypophyllis, paucis, in duas series utrimque ad nervum disperse dispositis, albis, cylindricis, usque ad 2 mm. longis, 0.5 mm. latis, apice ruptis, profundo immersis; Peridiis hyalinis; cellulis peridii plerumque quadri- vel sexangulis, saepe margine rotundatis, imbricatis, 17.5–26 × 23–41 μ, parietibus interioribus crassioribus, 2–4 μ, verrucosis, parietibus exterioribus tenuibus, levibus. Aecidiosporis globosis vel ellipsoideis, 14–24 × 15–29.5 μ, saepissime 18.5 × 22 μ, episporio ca. 2 μ, in parte majore densius verrucoso; contentibus hyalinis.

II. Soris uredosporiferis hypophyllis, inconspicuis, in areis posterius brunneolis discoloribus sparsis, plerumque ad nervum et marginem folii positis, rotundatis, minutis, dilute flavidis vel fuscis, 0.15–0.35 mm. dimetientibus, poro centrali dehiscentibus; peridiis subepidermicis, applanato-hemisphaericis, delicatioribus. Sporis plerumque in molem albam filiformem exeuntibus; uredosporis ossaeiformibus, angustioribus, plerumque apice truncatis, subinde vix rotundatis sed nunquam acutis, 11–20 × 26–55.5 μ; episporio tenui, ca. 1 μ, ad angulos parum crassiore; poris germinationis indistinctis; contentibus hyalinis.

III. Teleutosporis amphigenis, intra cellulas epidermidis evolutis, globosis vel oblongis, longitudinaliter vel oblique septatis, plerumque 3–5 cellularibus, subinde non septatis, 11–26 × 22–52 μ; episporio tenui, levi; contentibus hyalinis; sporidiis ovoideis vel subellipsoideis, 7–10 × 11–13 μ, hyalinis, levibus.

Habitat. O and I on the current year needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*) formed by the inoculation of sporidia obtained by the germination of the teleutospores in the overwintered fronds of the fern host collected in the early summer.

II and III on the fronds, sometimes also on the stipes of *Dryopteris crassirhizoma* NAKAI (*Yezo-memma*). The specimens examined are as follows:—

II. Hokkaido: Prov. Ishikari: Mt. Moiwa, Oct. 20 1923, S. KAMEI; Noppro, Nov. 3 1921; Oct. 20 1922; Sept. 9 1924; Oct. 26 1925; Oct. 22 1927; Oct. 13 1929; Oct. 24 1929; Apr. 20 1930, S. KAMEI. Prov. Iburi: Tomakomai, Oct. 24 1910. K. MIYABE; Chitose, Sept. 18 1931, S. KAMEI; Mt. Makkarinupuri, Aug. 27 1922; Aug. 27 1923; Aug. 24 1925; Sept. 9 1925; Nov. 1926; Nov. 2 1928; Oct. 6 1930; S. KAMEI. Prov. Tokachi: Shikaribetsu, Sept. 30 1929, S. KAMEI.

II and III. Hokkaido: Prov. Ishikari: Nopporo, Nov. 12 1922; June

12 1926; May 24 1931, S. KAMEI; Prov. Iburi: Mt. Makkarinupuri, Nov. 12 1924; Nov. 17 1925; Nov. 2 1928, S. KAMEI.

The species was named after Prof. Emer. K. MIYABE, who had collected the fungus for the first time in Japan.

The shape of the uredospores of this species is very characteristic, being more or less bone-shaped. They are apparently related to *Uredinopsis ossaeiformis* n. sp. So the observer may be apt to think these two species as belonging to one and the same genus until he sees each corresponding teleutospores. The writer once saw very immature teleutospores formed inside the epidermal cells of a frond collected in November 12 in Mt. Makkarinupuri. But the matured spores were always seen in the affected part of overwintered fronds collected usually in the first part of June.

The spermogonia gained from the inoculation experiments are invariably subepidermal and very large sized. Among those species of Milesina which were heretofore described *Milesina polypodophila* FAULL from Canada is the only one species having the subepidermal spermogonia. Comparing with the description of spermogonia of this Canadian species made by HUNTER (8) our species is almost similar in height though slightly wider in breadth. On the other hand, in the description of the uredostage Moss (15) said that *Milesina polypodophila* FAULL and *Milesina marginalis* FAULL et WATSON "exibit rather striking morphological difference and so will be considered separately". Moreover, according to HUNTER (8) the spermogonia of *Milesina marginalis* FAULL et WATSON are subcuticular and smaller, differing clearly from those of *Milesina polypodophila* FAULL.

In our locality, there are some seven species of Milesina found mostly in the vicinity of Sapporo. Of these, *Milesina Miyabei* n. sp. is quite different from other species. The uredospores of the species under consideration are quite smooth and peculiar shaped unlike those of *Milesina Kriegeriana* MAGN., *Milesina vogesiaca* SYDOW, *Milesina Scolopendri* JAAP, *Milesina jezoensis* KAMEI et HIRATSUKA and others. The spermogonia of the last mentioned three species are observed to be subcuticular and smaller sized, in which characters they are distinctly different from the case of *Milesina Miyabei.* Considering those common characters exibited between *Milesina Miyabei* and *Milesina polypodophila* FAULL, these two species are rather nearly related and unusually deviate from the typical species of Milesina.

7. *Milesina Dryopteridis* KAMEI, sp. nov.

O. Spermogoniis hypophyllis, in superficie stomatifera sparsis, minutis, inconspicuis.

I. Peridermiis adhuc ignotis.

II. Soris uredosporiferis hypophyllis, in partibus matricis restrictis decoloratis brunneolis insidentibus, subinde in petiolis, sparsis, minutis, rotundatis, 0.1–0.25 mm. dimetientibus; pseudoperidiis hemisphaericis, subepidermicis, delicatis, apice ruptis, cellulis polygonalibus, 8–15 μ dimetientibus. Uredosporis ex poro centrali saepissime in cirrhos albidos protrusis, obovatis vel ovato-oblongis vel late-clavatis, 12–14.5 × 17.5–27.5 μ, saepissime 13 × 22 μ, pariete tenui 1.5–2.5 μ, disperse echinulato; contentibus hyalinis.

III. Teleutosporis intra cellulas epidermidis evolutis, 1–4 (vel pluri-) cellularibus, 26–37 μ latis, ca 20 μ altis, hyalinis, levibus.

Habitat. O (probably also I) on the current year needles of *Abies Mayriana* MIYABE et KUDO (*Aotodomatsu*) formed by the inoculation of sporidia obtained by the germination of the teleutospores in the overwintered fronds of the host fern collected in the early summer.

II and III on the fronds, sometimes also on the stipes of *Dryopteris viridescens* O. KUNTZE (*Kogane-warabi*).

The specimens examined are as follows:—

II. Hokkaido: Prov. Ishikari: Maruyama, near Sapporo, May 7 1890, K. MIYABE; May 6 1928, S. Ito; Sept. 23 1922; Aug. 28 1923; June 11 1924; June 1929; June 14 1931; S. KAMEI; Mt. Moiwa, near Sapporo, Nov. 18 1913, S. KAMEI; Mt, Teine, Sept. 27 1926, S. KAMEI. Prov. Iburi: Mt. Makkarinupuri, Aug. 28 1923, S. KAMEI.

II, III. Hokkaido: Prov. Ishikari: Maruyama, near Sapporo, June 16 1931, S. KAMEI.

This species is rather nearly related to *Milesina vogesiaca* SYDOW on *Polystichum Braunii* Feè in our locality, but the uredospores of this species are smaller and more clearly echinulated. The mature teleutospores can be detected in the epidermal tissue of overwintered fronds and germinate in the early summer. With the sporidia thus gained the writer executed inoculation experiments and gained some numbers of spermogonia issuing on the first year needles of *Abies Mayriana* No. XVI_{11}, after thirty eight days from the beginning of the inoculation experiments. However, he failed to get the peridermia, and so the back inoculation is yet remaining to be carried in the future time. But it is highly probable that this species is heteroecious between Abies and *Dryopteris viridescence* completing its aecidial phace on the current year needles as in the usual species of Milesina.

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摘　　要

異株寄生羊歯銹菌新種に就て

龜　井　專　次

接種試験に依りて其異株寄生性を確め得たる羊歯銹菌新種（ウレジノプシス屬五種、ミレシナ屬二種）の記載文を掲げたり。其菌名、寄主名及採集地方名を表記せば次の如し。

菌名	寄主植物名		採集地方名
	雄精器及銹子腔時代	夏胞子及冬胞子時代	
Uredinopsis Woodsiae KAMEI	アチトドマツ	エゾイハデンダ	石狩
Uredinopsis Athyrii KAMEI	アヲトドマツ	メシダ	石狩、膽振
Uredinopsis hirosakiensis KAMEI et HIRATSUKA f.	アヲトドマツ	ヒメシダ	陸奥、石狩 膽振
Uredinopsis intermedia KAMEI	アチトドマツ	ミヤマシケシダ オホメシダ	石狩、膽振
Uredinopsis ossaeiformis KAMEI	アチトドマツ アカトドマツ モミ	シラネワラビ ミヤマベニシダ	石狩、膽振、 十勝、天塩、 國後
Milesina Miyabei KAMEI	アヲトドマツ	エゾメムマ	石狩、膽振、 十勝
Milesina Dryopteridis KAMEI	アチトドマツ （但し雄精器のみ）	コガネワラビ	石狩、膽振

OBSERVATIONS ON THE HIBERNATION LAIR OF THE YEZO BROWN BEAR

BY

TETSUO INUKAI

(With 5 Text-figures)

The Yezo brown bear, *Ursus arctos yesoensis* LYD. still found rather frequently in the forests and mountains of Hokkaido enters hibernation during the winter which lasts 4 months from December until March, the ground being covered with snow about a meter deep. As no desire of storing food for the winter use prompts the bear to provide any kind of food-hoard, the animal becomes particularly voracious towards autumn to be fattened preparing for hibernation. Appearing in the cultivated districts bears often inflict much damage upon grain and if the opportunity arises they will seize the cattle and even the human beings, though the animal in nature lives chiefly upon fruits, berries and nuts of all kinds, on roots and grass, sometimes on fishes, on the crayfish and on the flesh of the hare. Ants, wasps and other kinds of insects when obtainable form a favorite addition to the bear's food.

It is generally known that the bear after November popularly called "the bear without den" is most dangerous of any, sometimes fearlessly making an attack upon a village as otherwise there is nothing to eat in nature. Accordingly serious damage by the bear in this season to men, cows, horses, pigs, sheep, rabbits and even the fowls of the farmers has been occasionally reported in Hokkaido.

Usually most of the bears retire by the end of November to go into the winter sleep. The animal is apt to have its hibernation den in the mountains at an elevation as low as possible without any kind of molestation threatening him. Therefore it often happens that we are frightened at the bear coming out from hibernation after having lived in the lair so closed to us.

Either a natural cave or a hole dug out by the bear new or old is used for the hibernation den. However, as PEELLE* (1931) has mentioned, the den

* PEELLE, M. L. 1931. Notes on the Hokkaido bear *Ursus arctos yesoensis* Lydekker leaving hibernation as reported in Etorofu Island of the Kurile Group. Trans. Sapporo Nat. Hist. Soc. Vol. XII. Pt. 1.

[Transact. Sapporo Nat. Hist. Soc., Vol. XII, Pt. 3, 1932]

is located as a rule on a mountain slope in order to avoid any trouble there might be from surface or snow water. It is in this den during the hibernation that the female bear produces her cubs which number one to four. She leaves the lair with the cub to take care of it during the first year and takes it again with her into the den as she hibernates for the next winter. Otherwise it is known in general that more than one bear never gets into the same den for hibernation.

The brown bear in Hokkaido has also a so-called summer lair which is temporary and therefore very simple in structure consisting of not a cave but a mere ditch deep enough to hide the body below the ground level as the bear lies down.

Fortunately the present author had the opportunity to observe two rare examples of the hibernation den in Hokkaido one each in 1930 and in 1932, and he proposes herewith to describe them briefly as there has been lacking hitherto any exact knowledge in this respect.

Example I. On March 14, 1930 a bear's den was found in Mt. Teine near Sapporo and a female bear aged 4 years with a just born cub was driven out of it to be killed. The den was located on the mountain side about 500 meters above from the foot of the mountain and only 2 kilometers distant from the nearest village. It was in a birch forest where the breathing hole of the hiber-

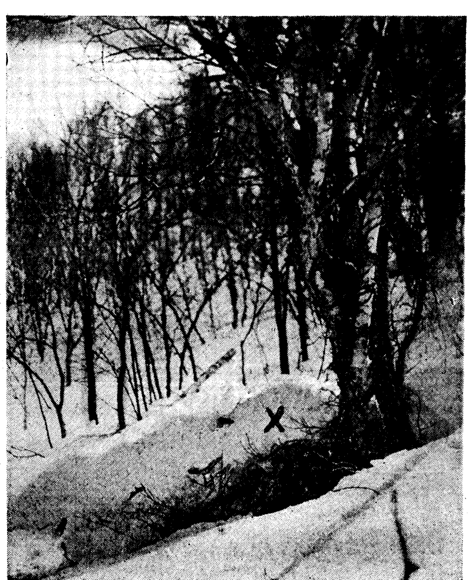


Fig. 1

Fig. 2

nating bear beneath was first found in the snow at the root of a big tree (Fig. 1, ×). Then the hunting was undertaken by several hunters. On visiting there after the killing and by taking off the covering snow the appearance of the entrance of the den which faced directly north became evident. So we were enabled to enter into the den to make observation.

Considering the size of the mother bear which emerged from the den (it measured 1.7 meter in body length) the entrance of the lair was rather small having a transverse diameter of 65 cm and vertical of 40 cm (Fig. 2). It was just capable of passing the human body. A narrow path from the entrance led directly into the inner part of the den going a little downwards about ½ meter distance.

The den was 1.3 meter in breadth and 2 meters in length, the height which became lower towards the periphery was 95 cm at the center of the den. Many rootlets of various length from 5 to 10 cm were hanging from above. The floor was spread with dried leaves and culms of the *sasa*bamboo as a litter which was 30 cm thick in the central deepest part covering a round area of 1.1 meter diameter. The den had a small hole which was about 40 cm in depth opposite to the entrance. It seems probable that the hole just mentioned was secondary, having been dug out quite newly by the bear and apparently from the fear of the hunter's attack. At any rate the inside of the den was completely protected against weather and cold of the outside. No sign of any unpleasant element like the faeces or the remains of a meal were found whithin the den and moreover the hay odour from the dried *sasa*bamboo made the den practically comfortable (Fig. 3) On visiting there in summer, the location of the den was hardly recognizable owing to the thick undergrowth of *sasa* which had grown much higher than human height. It is in this circumstance that the bear is understood to have dug out the den in the preceding autumn.

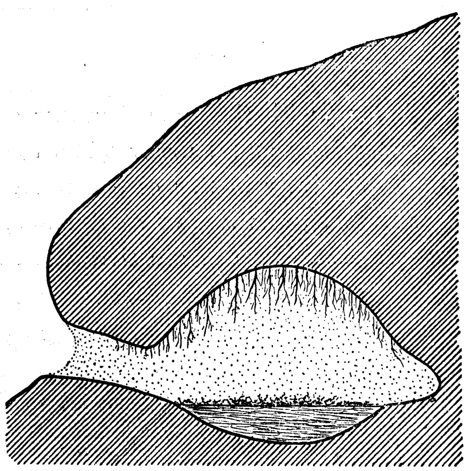


Fig. 3

Showing the inside of the den.

Example 2. Another case of the bear's den was observed in Shimamatsu mountain shortly after the killing of the bears, mother and young, on January 28, 1932. The age of the mother bear was estimated as 5 years and the

Fig. 4

young as just one year that is the second year of age. The location of the lair was on the east side of a hill which is continuous to the deep mountain range of Soranuma, at an elevation 250 meters above sea level. It was also in the thick bushes of *sasa*bamboo poorly forested by birch, being remote about 3 kilometers from human residence. The place around the den at the time of observation was not completely covered with snow as in the former case.

The bear had dug out its den under a big fallen tree pulling out plenty of earth and stones of good size. The entrance of the lair which was almost round measuring 60 cm in diameter was a rather small one for the bear (Fig. 4). It had a long slightly right curved path about a meter and a half long with the same diameter as the entrance. The inner den measured 1.4 meter long and 1 meter wide, the height being 80 cm at the center of the den. The litter in this case consisted of fallen leaves and twigs of deciduous trees and also of those of *sasa*bamboo with a thickness of 35 cm measured at the center. We can see that the *sasa* around the den had been broken or

a

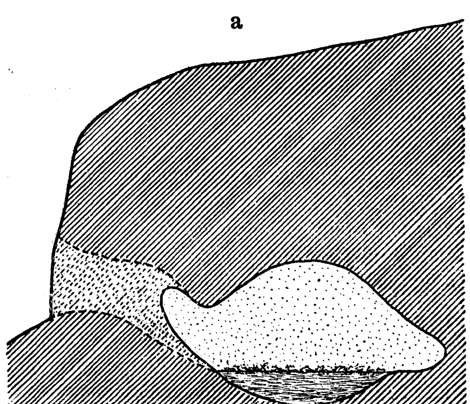
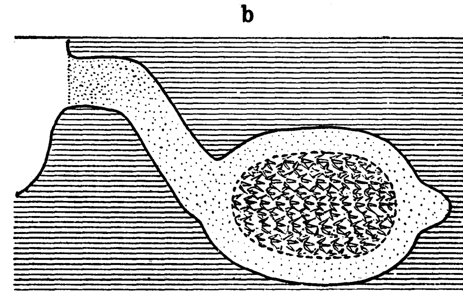


Fig. 5 Showing the inside of the den.
a. from side.
b. from above.

b



chewed off by the bear to be brought into the den as the litter. The inside of the lair has an air of comfort and safety from molestation. The den is also cleanliness itself (Fig. 5).

It is occasionally reported that the bear also hibernates in a lair in a forest of spruce trees which abound Hokkaido and in this case the leaves and twigs of the tree are used for the litter of the den. The broken branches of the spruce thus employed are said to give valuable indication to the hunter who is looking for the hibernating bear in the lair under snow.

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摘　　要

北海道産羆の冬穴の觀察

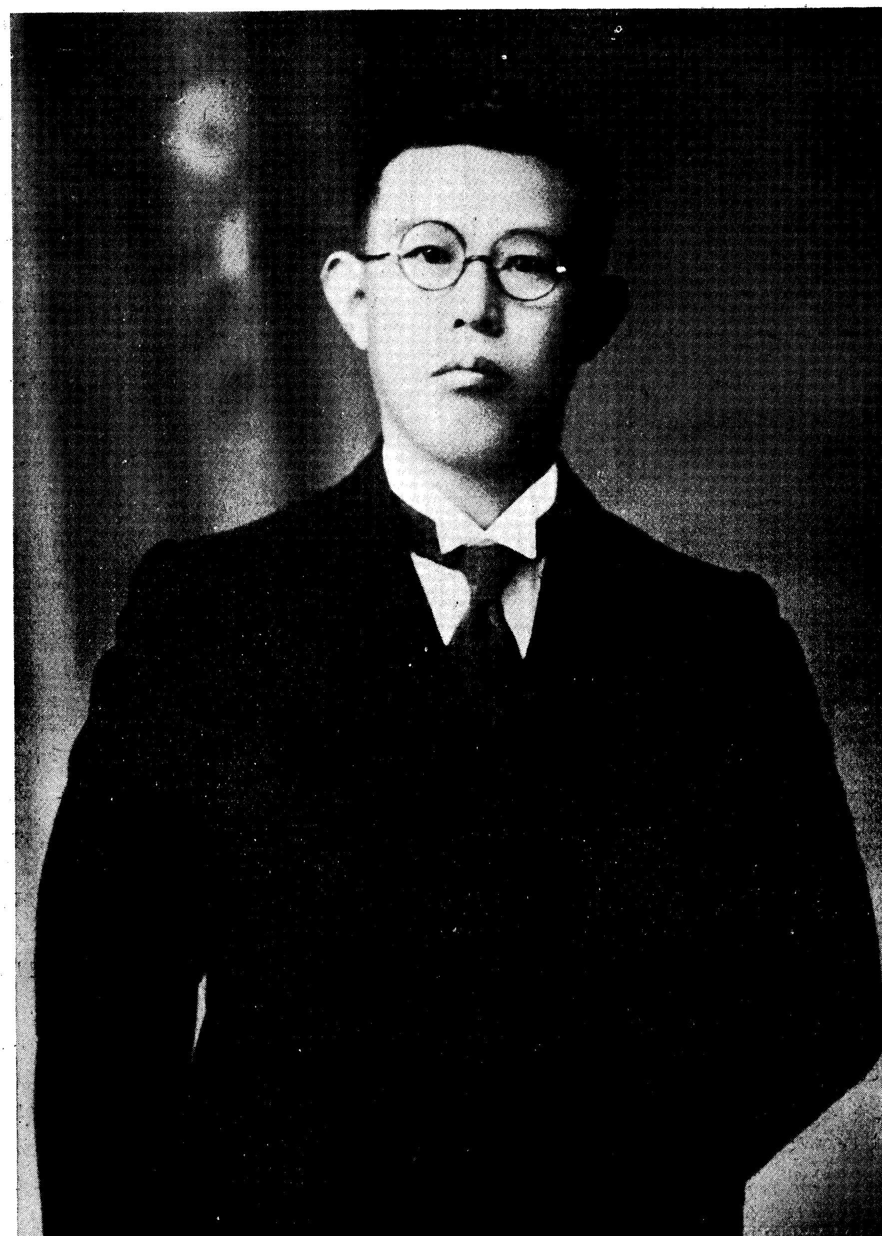
犬　飼　哲　男

羆は平常は植物の莖葉、果實、魚類、ザリガニ、兎、昆蟲類等を貪食し秋期に肥滿して十一月末迄には冬眠に入り、翌年三月末迄四ヶ月間は絶食のまゝにて冬穴中に籠居するものである。然し秋期に於ては往々人里に出沒して作物を荒らし且人畜をも襲ふことがある。十一月以後に現はれる羆は「穴持たず」と稱し好んで人畜を食害する危險なものである。

羆の冬穴は山の斜面に地上水の流入を防ぐために設けられ割合に人家に接近することもある。穴の中に於ては冬籠中にその仔を產し、その初年目は常にこれを伴ひてその年の冬も共に穴に入るものであるが、普通他の羆と同居して冬籠することはない。尤も羆の夏穴は單なる凹地を利用したもので窩をなさない。

第一例、余の觀察したものは昭和五年三月十四日に手稻山にて四才の雌羆と當才仔の入つた冬穴で、人家を去る二キロの樺林中にあり (Fig. 1) 山の北斜面で從つて入口も北に向ひ横65、縱40cmの隨圓形をなし (Fig. 2) 半米斜下に下りて穴に達する。穴は間口 1.3 奥行 2米で奥に小穴を有し高さは 95cm である。その底には一面に乾燥した熊笹の敷藁を敷き厚さ 30 cm にも達し極めて清潔で且溫く快きものである (Fig. 3)。但し夏期に於ては密生する笹のため穴の入口を發見することさへ困難で、羆は斯る笹の中に穴を堀つたものである。

第二例、上島松陸軍用地奥の白樺林中にあり、昭和七年一月廿八日五才の雌と一才の仔熊を捕へし穴にて一月卅日の觀察である。入口は東に面した斜面に表はれ (Fig. 4) 60×60 cm の廣さで、1 米半の細き右に迂廻する導路を有する穴である。穴の間口は 1米奥行は 1.4米 で高さは 80 cm である。この穴の敷藁は闊葉樹及笹の莖葉で、手稻のものと同樣極めて清潔に保たれ且安靜で居心地よきものである (Fig. a 及び b)。羆は一方に於て又針葉樹林中にも冬穴を有するもので、この際樹木の枝の折られたものは穴中に敷藁の代用とされ往々狩獵者に發見され易い目安となるものである。



YUSHUN KUDO

(born March 6, 1887; died January 8, 1932)

工　藤　祐　舜

（明治二十年三月六日生　昭和七年一月八日沒）

故工藤祐舜氏の傳

宮　部　金　吾

臺北帝國大學理農學部敎授理學博士工藤祐舜君には昭和七年一月八日、心臟狹窄症の劇しき發作に侵され、午後八時半突如として逝去せらる。哀惜の至りに堪えず。享年四十六歲。

君は明治二十年三月六日、工藤祐哲氏の長男として秋田縣增田町に生る。嚴父祐哲氏は眞宗東流山通覺寺第十九代の住職にして、同寺は該地方に於ける由緒深き寺院なり。

明治三十四年三月、增田高等小學校を卒業、同年四月秋田縣立橫手中學校に入學せり。君は旣に中學在學中より植物學に興味を有し、盛に鄕土地方の植物を採集せり。而して採集中、學名不明の標本を余のもとに送附せられ、屢々其の不審を正し、鑑定を乞はれたり。余と君との文通に依る友情は旣にこの時に結ばる。君が後年分類學界へ示せる覇氣は、橫手中學在學中よりうかゞはれ、一中學生の身を以て、海外各所の植物園、博物館と標本の交換をなし、當時より、シンガポール、オーストラリヤ、ブラジル、ナタル等の標本を所藏せり。

明治三十九年三月、中學卒業後、君は札幌への遊學を志し、植物學專攻の希望を報知せられたり。されど余はこの時、植物分類學專攻には、東京帝大の理科に入學することの可なることを懇々と說得せり。玆に於て君は意を飜し、嚴父の承認をも漸くにして得、高等學校の入學試驗を受け、首尾好く鹿兒島第七高等學校に入學することを得たり。第七高等學校在學中は、池田敎授指導の下に植物採集を爲せり。入學早々屋久島に採集を行ひ、四十一年夏期二ヶ月間同島に再度渡島、徹底的なる採集をなし、その研究結果は發表に到らざりしも、獨文を以て植物地理學的研究を起草せり。又造士館在學中、「生物學史に就きて」と題する一論文を、第七高等學校造士館學友會第十號(明治四十年十二月)に發表せらる。これ蓋し、君が學術的論文中の嚆矢たりしものならん。

進みて明治四十二年七月、東京帝國大學理科大學植物學科に入學、松村任三敎授の下に植物分類學を專攻することゝなれり。孜々として研鑽、卒業

論文は「本邦產唇形科植物」なり。其の緒言並びに日本唇形科研究歷史等も皆ラテン語を以て記述し、其中に新設せる亞屬、節、亞節、種、亞種、變種等凡て指導教授との連名を以て發表し、一つの學名をも私せず。君の心情の清廉と誠實、以て知るべし。明治四十五年六月三十日理科卒業。卒業に際し、余に寄せられし書中次の一章あり。

これ實に中學時代より先生の御高恩は感謝の至りに堪えず候。六年の昔、先生のたまへる御書信を思ひ、思はず感涙を催し候。思へば三十九年の六月、小生の鹿兒島高等學校入學を拒みし拙父が、先生の小生に賜ひし御書信を見、直ちに意を飜して小生を鹿兒島に送る事と相成りし當時を回顧すれば、轉た感涙を禁ずる能はず候。小生今日あるは實に先生の御賜と深く感謝の至りに堪へず候。

これより先、北海道フロラ完成の希望を以て、其の材料を蒐集すること約三十年、資料の整理、草稿編纂のため、余は專任助手希望の砌、偶々東北帝國大學澤柳總長の來札ありたれば、氏の了解を得て、卒業後就職に心なやませる君の採用を決定せり。かくして大正元年八月一日、君を本學實科講師として囑託し、植物學教室勤務を命せり。君は始めて渡道、何等授業に關係することなく、專心フロラの研究に從事し、約二年を經過せり。この間、フロラ編纂上、フオリー師の標本調查を要し、大正二年四月二十八日、青森市へ出張を命せられ、約四十日間に亙り、羊齒類、單子葉門、オトギリサウ屬、アカバナ屬等の調查を終了す。尙此年、故松村教授と共著にて [2] 日本產唇形科植物目錄の發表あり。

大正二年八月十一日、助教授三浦慶太郎氏死去したるを以て。同年九月十五日、君は實科講師の職を解かれ、本學植物學講師を囑託され、林學科の森林植物學講義並びに實驗を擔當す。更に同年同日、余と共に北海道廳より、北海道主要樹木の撰定、解剖及び圖譜調製に關する調查を囑託せらる。又同年北海道植物誌資料[3] 第一を著はす。(本著は大正十三年其第十一を發行し、終了せり。)

大正三年八月、イー、エツチ、ウイルソン氏來道し、同氏の依賴により、同行者梅田四郎氏と共に日高に赴き、ゴエフマツ、アカエゾマツ等の標本を採集し、且沿海地帶植物を觀察し、植物地理學上、日高の興味深き地點なることに注目せり。

大正二年三年に亙り、曩に余が樺太廳に提出したる三宅勉氏と共著なる

樺太植物誌を出版するに當り、其訂正增補を行ふに際し、君は、終始渝らざる熱誠なる援助を惜しまざりき。此の訂正中、新種と見做すべきもの、及び新變種と考察せしものは、君との連名にて新學名を發表せり。

Leontopodium sachalinense MIYABE et KUDO, l. c. p. 242.

Cirsium pectinellum A. GRAY, var. Mamiyanum MIYABE et KUDO, p. 273.

Cirsium modestum MIYABE et KUDO, p. 274.

Saussurea Miyagii MIYABE et KUDO, p. 279.

Eriophorum strigosum MIYABE et KUDO, p. 522.

大正四年、[4]北日本ヨブスマサウ屬の研究發表あり。

大正五年、[5]苫小牧演習林野生植物調査報告の著あり。同年十二月三十日、小谷レツ子と結婚す。

大正六年十二月三日、東北帝國大學農科大學助教授に任せらる。同年、[6]野幌國有林野生植物調査報告書（初版）出版され、大正十二年に其の增訂再版發行さる。

大正八年八月、信州八ヶ岳にてトウヒの研究をなし、エゾマツとの比較をなせり。大正九年九月、アカエゾマツ毬果採集のため苫小牧御料林に出張、この間、[7]タテヤマウツボグサ屬の發表あり。

同年、北海道廳の囑託に依り、多年其編纂に從事し居たる[8]北海道主要樹木圖譜を愈々三秀舍より出版に決定、豫約を以て其第一輯を發行す。原圖は須崎忠輔氏の精巧なる寫生により、解剖圖は君の手になりたるものを、須崎氏、生品に依り着色せるものなり。又其本文の最初の原稿は君の手に依りて作成せられ、余がこれに訂正增補を加へたるものなり。

大正十年、天然記念物臨時委員に囑託せらる。[10]北海道產唇形科植物の研究發表あり。六月、北千島幌筵島植物探險の途に就き、九月歸札す。此年、故ありて、夫人レツ子氏を離緣す。

大正十一年、[14]北千島幌筵島植物誌、[12]日本有用樹木分類學（昭和五年再版）及び[11]北海道藥用植物圖彙の著あり。五月、九州帝國大學農學部講師を囑託せらる。同年二月、嚴父死去。嚴父御他界後は、二男祐信氏に其後を讓り、君は衷心學界に盡くすことゝなれり。この年後藤フジヲ氏と結婚す。

尙此の年の夏、薩哈嗹軍政部より北樺太植物調査を囑託せられ、舘脇操氏等と共に北樺太中部以南の地の植物探險をなす。

大正十二年、[15] 北樺太植物誌への一貢獻なる題下に、前年探險の著述あり。同年夏、再度の北樺太北部の植物探險を行ひ、石田文三郎氏隨行す。

大正十三年、二回に亙る北樺太調査をまとめて、薩哈嗹軍政部より、北樺太植物調査書を發行す。

大正十四年、[17] 北海道本島植物景觀を著す。本邦植物群落生態學上、主要なる位置を占むべき文獻なり。

同年、北海道及び樺太植物誌の原稿成る。茲に於て之を歐米諸國腊葉館に存在するタイプスペシメンと比較研究の上、訂正をなす必要起れり。加ふるに君の專門たる東亞產唇形科植物の研究を完成せむがため君が胸中海外留學の希望に燃えたり。時、恰も北海道帝國大學に理學部設置の議あり、其の豫算を政府へ提出中なりしを以て、これが通過の場合には、海外研究生を拜命せられむことを希望し、自費海外出張を出願、十四年六月四日附にて文部省より歐米各國へ出張を命せられたり。

然るに北海道帝國大學理學部設立の議は、通過せざりしも、幸ひ臺北帝大理農學部新設されむとし、植物分類學講座擔當者を物色中、其の白羽の矢は君にたち、止むなく君を臺灣のために割愛せざるべからざるに到れり。留學出發に先だち、創立委員大島金太郎博士と面談、諸事打ち合せを濟し得たるは幸なりき。

大正十五年二月十九日、臺灣總督府高等農林學校教授に任せられ、同時に總督府在外研究員を命せられ、二ケ年間、英、獨、佛、米、瑞典及びソビエット聯邦六ケ國に在留することを命せらる。

昭和三年二月二日、二ケ年間の留學より無事歸朝し、臺北帝國大學教授に任せられ、理農學部植物分類學講座擔當を命せられ、又附屬植物園長に補せらる。

昭和四年四月、臺灣總督府中央研究所技師を兼任さる。同年、[22] 日本支那產唇形科植物を公にす。本著は君が二ケ年間歐米腊葉館を歷訪研鑽の結晶にして、東亞產唇形科植物に關する典型として永く記念せらるるに至らむ。

昭和五年以降、臺灣植物に關する小論文續出し、其の數頗る多し。

昭和五年三月、[26] 余との共著、北海道樺太植物誌第一部の發刊を見る。これ大正元年以來約十八年間、孜々として其の完成に努力せられたる力作の一部なり。第一部は、羊齒植物並びに裸子植物を含む。第二部は單子葉植物ガマ科よりカヤツリグサ科に至るものにして、昭和六年七月發行。昭和七年

三月、第三部單子葉植物テンナンシヤウ科よりラン科發行せられたり。此の原稿は、君がパリ滯在中自らタイプライトせるものにして、一二〇〇頁に達し、責任觀念强き君の心情に敬服せざるを得ず。

昭和六年三月、十二年の星霜を要せし余との共著北海道主要樹木圖譜は完成せり。これより先大正十二年第十輯を發行したる際、關東大震災に遭遇し、三秀舍の諸工場と共に圖譜既刊の部の在庫品全部と原圖三個も亦燒失せり。然るに三秀舍の鋭意努力復興の結果、大正十四年三月第十一輯の刊行を見、爾來繼續完了を見しものにして、本著完成は、君の永き勞苦を思ふと共に余の心より欣幸とする所なり。

君は臺北にありて屢々余に芳書を寄せたり。今その二三を引いて以てありし日の君が心懷を偲ぶべし。

昭和三年十一月八日附。

「小生當地の植物にも次第に親しみを生じ暖地植物の智識も加はり、小生も分類學者として、あまりかたはものでなくなる樣な氣が致します。」

昭和四年四月十二日附。

「先生、御病氣であつた由實に驚きました。少くともどうか、この仕事の終るまでは御身体を大切に願ひたいのです。亡くなつた先生の奥樣が、この仕事中はかげながら先生を保護して下さることゝ信じて居ります。」

昭和四年八月十二日附。

「樺太北海道植物誌は先生終生の大事業の一つに之れ有り候故、先生の御健康に御注意しつゝ御努力願上候。若し万一にも先生の御病氣等の場合は小生更りて完成致し申すべく候。」

昭和四年九月三日附。

「仕事に必用なもの（書籍）は大体集りました。腊葉室もこの十一月迄には出來ますから、落付いて仕事が出來ると思ひます。今後二十年は實のある仕事をなさうと充分な計畫をたてました。この仕事を大成するまでは如何なることをも、忍耐しやうと思ひます。爲に心身の安らかな氣分に始めてなりました。臺灣の植物は實に面白いのです。蘭科と樟科とに全力を盡して居ります。又たへず北日本の植物にも注意して居ます。」

昭和六年十二月二十二日附。逝去された日より十七日前に認められた最後の手紙。

「降りて小生壯健にて毎日研究にいそしみ居り候間、御安心下され度候。

扨て、十二月八日附御書面有難く拜讀致し厚く御禮申上候。植物園年報に關しては御親切なる御言葉深く々々御禮申上候。

北海道樺太植物誌の原稿（双子葉植物の部）は明年一月御送り申上ぐべく候。原稿の脱稿後早や六年と相成り申候。歸朝後名鑑出版後の全日本植物の文獻のカードの製作を始めやつと大体本邦で發表せられたるものは終り候。このカードにより北海道樺太植物學名の訂正をなさんとも一時考へ候へども、小生が在外中の事でもあり、寧ろ先生に御一任した方がよい樣に考へられ候。只小生がパリー發後、海外の腊葉館で研究せる所のみを訂正して御送り申上げたしと考へ居り候。」

今や北海道樺太植物誌は完成への半にあり、君の逝去を見しは洵に遺憾に堪えず。過去七年間を見るに、本邦及び外國に於ける植物分類學の著しき進歩に伴ひ、夥多の新種並びに學名の變更あり。この學界多端の秋、君を失へるは、心惜しき極みなり。

君は渡臺着任後、鋭意專心教室完成への企圖實行に努力され、植物園の新經營と植物園年報發刊を敢行し、又廣く島内を旅行して、植物生態地理學への新研究に意を注ぎ、同時に東洋屈指の腊葉館を建設せり。

かくて本邦南北の兩端を通じ、圓熟大成への歩みをなし、日本分類學界覇業への日も遠からざりしに忽焉として流星の如く逝ける君、余は君の死を痛惜すると共に、日本學界の大なる損失を痛惜す。

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注　　意

本會に對する總ての書信は北海道帝國大學
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CONTENTS