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A CASE OF A TESTIS-OVUM FOUND IN THE ADULT MALE FROG, *RANA TEMPORARIA L.*[1]

BY

SAJIRO MAKINO

(3 Text-figures)

エゾアカガヘルに見出された精巣異常の一例

牧 野 佐 二 郎

During the course of a series of investigations on the germ cells of the grass frog, *Rana temporaria L.* during 1930, I examined a large number of testes in sections and found an individual in which a testis showed anomaly. It is an ovum-containing testis[2] and only one case in about thirty males.

Description

This individual to be described was caught, together with a number of other grass frogs, in the afternoon of July 10, 1930, at Maruyama in the vicinity of Sapporo. It was killed in the evening and fixed in Flemming's strong solution. The testes were sectioned 10 micra in thickness and stained by Flemming's triple method. Althogh there is no special remark in my notes on the urogenital system and the measurement of body size, it seems to be certain, that from the external examination of the secondary sexual characters, the

1) Contribution No. 8, from the Zoological Institute, Faculty of Science, Hokkaido Imperial University, Sapporo.

2) In CHENG's ('29) nomenclature, an "ovum (ova)-containing testis" means a testis, in which there is contained the ovum-like body, to which the name "testis-ovum (ova)" is applied in an otherwise normal testicular tissue; while an "ovotestis" is such a testis that is composed of recognizable portions of both ovarian and testicular tissues containing ova in its spermatic substance.

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Fig. 1.

Part from a longitudinal section of the testis, showing a testis-ovum within a tubule. Microphotograph with aid of Leitz 'Makam', tube-length 170 mm., under magnification of Leitz obj. 3×oc. 8.

individual was considered to be a male, due to the presence of well-defined thumb pads. The appearances of both gonads were normal with respect to their shape, colouration and fat bodies. The size of gonads measured in section was about 2.4—2.6 mm. in length and 1.2—1.3 mm. each in width, thus somewhat smaller than the usual condition. The sections after examination showed that they were gonads of a male nature, but one of them, probably the left testis, exhibited an anomaly. In sections through the part close to the posterior end of this gonad, an ovum was found in a tubule near the periphery of the gonad, deeply imbedded among male cells (Fig. 1). It was the only one found throughout the gonad. Observed histologically, the gonad presents a normal testicular structure which corresponds exactly with that found in normal testes of this season. The tubules contain ripe spermatozoa and the cells of various stages of spermatogenesis. The chromosomes found in this gonad are also normal in number and behavior. Even the very tubule in which the ovum is imbedded, shows nothing deviated from the remaining tubules in its size and structure, and contains ripe spermatozoa, spermatocytes and spermatogonia of various stages (Fig. 2).

Fig. 2.

Enlarged view of a testis-ovum within a tubule, showing numerous nucleoli scattered throughout the nucleus. Note the spermatozoa and normal germ cells around the ovum. Microphotograph with aid of Leitz 'Makam', tube-length 170 mm., under magnification of Leitz obj. 7×oc. 8.

There is no anomaly in respect to the interstitial tissue surrounding the tubule, as often described in like cases by several investigators. The testis of the supposed right side is quite normal in appearance as well as in its microscopical structure.

The size of the ovum measures ca. 0.08 mm. in diameter and it was sectioned in eight pieces. Compared with cases described by CHENG ('29) and others, the ovum in the present case is much smaller in diameter. The shape of the cytosome is nearly oval and is devoid of ovarian follicles. The nucleus appears round in shape and possesses a magnitude covering five sections and measuring 0.05 mm. and 0.06 mm. respectively in vertical and horizontal diameters. Numerous nucleoli of various size and shape, stained dark red by safranin, are found scattered everywhere in the nucleus, which stains bright yellowish orange (Fig. 2). The oöplasm is compact in appearance, staining faintly dull violet and no yolk granules are visible. The numbers of nucleoli scattered in five sections, are respectively about 61, 109, 144, 128 and 53. In total, therefore about 500 nucleoli are found throughout the entire nucleus. They differ considerably in shape, but those of spherical shape are mostly abundant. They vary in size as measures show from ca. 0.0005 mm. to 0.007 mm.. But the most frequent ones, measure ca. 0.0015–0.0025 mm. in diameter. In most cases, the nucleoli of the largest category are composed of two or more smaller ones of various size and shape, which aggregate upon the ground substance stained dark violet (Fig. 3). Several vacuole-like granules stained reddish black are also found imbedded in the larger nucleoli. There is, however, no visible evidence of any chromatin-reticulum or any other like structure in the nucleus. All structures and conditions mentioned above seem to indicate no other features than those characteristic to degenerating processes.

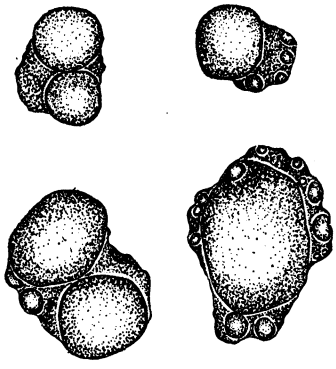

Fig. 3.
Various nucleoli found in the nucleus of the testis-ovum. Drawings are outlined with the aid of a Camera lucida, under magnification of Zeiss Apo. 2 mm. × K. 15.

From the facts above described, there is no doubt that the testis-ovum of

the present case is of no functional value. The presence of the thumb pads and perfect development of spermatozoa emphasize the conclusion that this abnormal testis must function simply as male, in spite of the presence of the ovum. Thus the significance of occurrence of the ovum or ova in the testis, remains unsolved.

Historical

The cases of sex-organ anomaly in anurans which have been described are summarized in two papers published in 1921, one by CREW and the other by WITSCHI. Of the forty cases enumerated by CREW ('21) in his review, twenty-one are represented by *Rana temporaria*.

Since 1921, more than forty reports of abnormal sex-organs in frogs and toads have been published and about eleven of these reports are concerned to *Rana temporaria*. CREW and FELL ('22) found in a male of *R. temporaria* a displaced testis which contained big round bodies closely resembling ova. According to the authors, these ovum-like bodies are no more than a product of liquefaction of the degenerating spermatozoa. WITSCHI ('23, '25, '29) described hermaphrodites of *R. temporaria* which had ovo-testes on one or both sides accompanying developed oviducts. DAUVART ('26, '27) recorded two specimens of heterotopic testis in *R. temporaria*. WORONZOWA ('26) and DRAIGOIU et POP ('27) described abnormal examples with ovotesticular glands in *R. temporaria*. SHAW and BRAMBELL ('28) noted one of aberrant ovary type in *R. temporaria*. More recently, EGGERT ('29) enumerates a new case of *R. temporaria* in which a single gonad is present on the right side only, and LLOYD ('29) describes two more cases of hermaphroditism in the same species.

That the numerous cases of sex-organ anomaly are discovered in *R. temporaria*, as stated above, does not mean, that this species is more prone to abnormality than other frogs, but should be attributed to the fact that this grass frog is used for laboratory purposes more commonly than others, thus offering more opportunities to meet with anomalies. Consequently I believe, that a more thorough and careful examination will show frequent occurrence of similar ova-like conditions in other species of anurans. It is by no means uninteresting that the

cases of sex-organ anomaly are found more frequently in anurans than in urodelans.

I wish to acknowledge my indebtedness to Prof. Dr. OGUMA for his valuable advice and suggestions. I also wish to thank Mr. H. YAMAGUCHI for his aid in making photographs.

27-Dec., 1930.

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————	1929	Jour. Morph., vol. 48
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————	1927	Cpt. Rend. Soc. de Biol., T. 97
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Shaw & Brambell	1928	Jour. Roy. Micr. Soc., London, ser. 3, vol. 48
Stohler, R.	1928	Zeitschr. f. Zellf. u. mikr. Anat., Bd. 7
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————	1923	Biol. Zentralbl., Bd. 43
————	1927	Biol. Bull., vol. 52
————	1929	Jour. Exp. Zool., vol. 54
Woronzowa, M. A.	1926	Trudy Lab. Eksper. Biol. Zoopark Moscow, T. 2

摘　　要

昭和五年の夏エゾアカガヘルの染色体をしらべてゐる間に、或る一頭の雄の生殖腺の一方に一個の卵の存在するのを見出したので、精巣異常の一例として玆に報告する次第である。

この個体は七月十日に固定されたもので、其の第二次性特徴から云つて完全に雄であつた者である。又其の精巣も形、色彩等に於て普通の雄に存在するものと異つた所は認められなかつた。卵の

見出されたのは恐らく左側の精巣と思はれるもので、この精巣に於ても、組織學的に云つて何等正常の雄と異つた構造は見當らず、只一個の卵が全く正規な精蟲發生をなしつゝある精巣の中に、ぽつんと存在するに過ぎないのである。卵の大さは約 0.08mm.其の核は約 0.05–0.06mm.で核の中には大小樣々な約 500個ばかりの仁が存在する。種々な点から推察して、恐らくこのものは卵としての機能を持つてゐるものではないと考へられる。他の一方の精巣は組織學的にも細胞學的にも全く正常なものである。

兩棲類中無尾類に於てはこの種生殖腺異常の現象は最も普通に見られるもので、文献に現はれたものだけでも驚くべき數に上つてゐる。同じ兩棲類でも有尾類にこの例が少いと云ふ事は興味のある事實であろう。

NOTES ON PLANTS OF THE WESTERN ALEUTIAN ISLANDS COLLECTED IN 1929 (II)

BY

MISAO TATEWAKI

西部アリユウシアン群島植物雜記（其二）

舘　脇　操

Pyrolaceæ.

19. ***Pyrola minor*** L. Sp. Pl. ed. 1. p. 396, (1753); MIYABE, Fl. Kuril. p. 248; MACOUN, Pl. Pribilof Isl. p. 568, (1899); KUDO, Fl. Isl. Paramushir, p. 140, (1922); KOMAR. Fl. Pen. Kamtschat. II. p. 353, (1929); Hult. Fl. Kamtchat. IV. p. 4, (1930).

Hab. In heaths and meadows: Chichagof, Isl. Attu. (n. 14814); Nazan, Isl. Atka. (n. 14382).

[Transact. Sapporo Nat. Hist. Soc., Vol. XI, Pt. 4, 1931]

Rhodoraceæ.

20. ***Rhododendron camtschaticum*** PALL. Fl. Ross. I. p. 48, (1784); MIYABE, Fl. Kuril. p. 247, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 190, (1904); KUDO, Fl. Isl. Paramushir, p. 142, (1922); KOMAR. Fl. Pen. Kamtschat. II. p. 360, (1929); HULT. Fl. Kamtchat. IV. p. 14, (1930).

Therorhodion camtschaticum SMALL, in Nor. Am. Fl. XXIX. p. 45, (1914); NAKAI, Tr. & Shr. Jap. 1. ed. 3, p. 40, (1927).

Hab. In heaths and on rocky cliffs: Chichagof, Isl. Attu. (n. 14604); n. 14163; n. 14276; n. 14730; n. 14814); Nazan, Isl. Atka. (n. 14383).

21. ***Loiseleuria procumbens*** DESV. in Journ. Bot. II. 1. p. 35, (1813); YABE & YENDO, Pl. Isl. Shumushu, p. 190, (1904); SMALL, in Nor. Am. Fl. XXIX. p. 40, (1914); MACOUN & HOLM, Rep. Canad. Arc. Exp. V. Bot. p. 18, (1921); KUDO, Fl. Isl. Paramushir, p. 142, (1922); NAKAI, Tr. & Shr. Jap. 1. ed. 3. p. 27, (1927); KOMAR. Fl. Pen. Kamtschat. II. p. 362, (1929); HULT. Fl. Kamtchat. IV. p. 17, (1930).

Hab. In heaths and bogs: Chichagof, Isl. Attu. (n. 14067; n. 14101; n. 14143; n. 14159; n. 14200; n. 14289; n. 14781); Constantine, Isl. Amchitka. (n. 14602; n. 14625); Nazan, Isl. Atka. (n. 14411; n. 14470).

22. ***Phyllodoce coerulea*** BAB. Man. Brit. Bot. ed. 1. p. 194, (1843); SMALL, in Nor. Am. Fl. XXIX. p. 50, (1914); NAKAI, Tr. & Shr. Jap. 1. ed. 3. p. 35, (1927).

var. ***yezoensis*** KOIDZ. in Tokyo Bot. Mag. XXXII. p. 58, (1918).

Phyllodoce coerulea BAB. form. *yezoensis* NAKAI, Tr. & Shr. Jap. 1. ed. 3. p. 36, (1927).

Phyllodoce aleutica × *coerulea* HULT. Fl. Kamtchat. IV. p. 20, (1930).

Hab. In heaths: Chichagof, Isl. Attu. (n. 14278; n. 14816).

23. ***Phyllodoce aleutica*** A. HELLER, in Muhlenbergia I. p. 1, (1900); SMALL, in Nor. Am. Fl. XXIX. p. 51, (1914); NAKAI, Tr. & Shr. Jap. 1. ed. 3. p. 29, (1927); HULT. Fl. Kamtchat. IV. p. 19, (1930).

Menziesia aleutica SPR. Syst. II. p. 202, (1825); BONG. Vég. Sitcha, p. 154, (1833).

Phyllodoce Pallasiana Don, in Edinb. New Phil. Journ. XVII. p. 160, (1834); Yabe & Yendo, Pl. Isl. Shumushu, p. 191, (1904).

Phyllodoce aleutica Makino, in Tokyo Bot. Mag. XIX. p. 134, (1905); Kudo, Fl. Isl. Paramushir, p. 143, (1922); Komar. Fl. Pen. Kamtschat. II. p. 19, (1929).

Hab. In heaths: Chichagof, Isl. Attu. (n. 14011; n. 14118; n. 14130; n. 14744); Nazan, Isl. Atka. (n. 14416; n. 14532).

24. ***Cassiope lycopodioides*** D. Don, in Edinb. New Phil. Journ. XVII. p. 158, (1834); Miyabe, Fl. Kuril. p. 247, (1890); Yabe & Yendo, Pl. Isl. Shumushu, p. 191, (1904); Small, in Nor. Am. Fl. XXIX. p. 60, (1914); Kudo, Fl. Isl. Paramushir, p. 143, (1922); Nakai, Tr. & Shr. Jap. 1. ed. 3. p. 164, (1927); Komar. Fl. Pen. Kamtschat. II. p. 333, (1929); Hult. Fl. Kamtchat. IV. p. 27, (1930).

Hab. In heaths and on rocky cliffs: Chichagof, Isl. Attu. (n. 14049; n. 14110; n. 14158; n. 14256; n. 14627; n. 14745; n. 14786); Constantine, Isl. Amchitka. (n. 14672); Nazan, Isl. Atka. (n. 14456; n. 14458).

25. ***Vaccinium Vitis-idaea*** L. Sp. Pl. ed. 1. p. 351, (1753); Bong. Vég. Sitcha, p. 152, (1833); Miyabe, Fl. Kuril. p. 246, (1890); Yabe & Yendo, Pl. Isl. Shumushu, p. 190, (1904); Ostenfeld, Vas. Pl. Arc. Nor. Am. p. 60, (1910); Macoun & Holm, Rep. Canad. Arc. Exp. V. Bot. p. 18, (1921); Kudo, Fl. Isl. Paramushir, p. 146, (1922); Nakai, Tr. & Shr. Jap. 1. ed. 3. p. 245, (1927); Hult. Fl. Kamtchat. IV. p. 41, (1930).

Hab. In heaths and boggy places: Chichagof, Isl. Attu. (n. 14055; n. 14187; n. 14723); Constantine, Isl. Amchitka. (n. 14572); Nazan, Isl. Atka. (n. 14448).

26. ***Vaccinium uliginosum*** L. Sp. Pl. ed. 1. p. 350, (1753); Bong. Vég. Sitcha, p. 150, (1833); Miyabe, Fl. Kuril. p. 246, (1890); Yabe & Yendo, Pl. Isl. Shumushu, p. 191, (1904); Ostenfeld, Vas. Pl. Arc. Nor. Am. p. 60, (1910); Macoun & Holm, Rep. Canad. Arc. Exp. V. Bot. p. 18, (1921); Kudo, Fl. Isl. Paramushir, p. 146, (1922); Nakai, Tr. & Shr. Jap. 1. ed. 3. p. 264, (1927); Komar. Fl. Pen. Kamtschat. II. p. 333, (1929); Hult. Fl. Kamtchat. IV. p. 38, (1930).

Hab. In heaths: Chichagof, Isl. Attu. (n. 14028; n. 14739; n. 14829; n. 14162).

27. ***Vaccinium Chammisonis*** BONG. Vég. Sitcha, p. 151, (1833); NAKAI, Tr & Shr. Jap. I. ed. 3. p. 261, (1927).

Hab. In meadows: Chichagof, Isl. Attu. (n. 14001; n. 14203).

Primulaceæ.

28. ***Primula cuneifolia*** LEDEB. in Mem. Acad. St. Petersb. V. p. 522, (1814); MIYABE, Fl. Kuril. p. 249, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 191, (1904); PAX u. KNUTH, in Engl. Pfl.-reich. IV. 237, p. 112, (1905); KUDO, Fl. Isl. Paramushir, p. 148, (1922); HULT. Fl. Kamtchat. IV. p. 48, (1930).

Hab. In meadows and heaths: Chichagof, Isl. Attu. (n. 14045; n. 14102; n. 14392; n. 14802); Constantine, Isl. Amchitka. (n. 14636); Nazan, Isl. Atka. (n. 14392).

var. ***albiflora*** KOIDZ. in Tokyo Bot. Mag. XXXI. p. 34, (1917).

Hab. In boggy places: Chichagof, Isl. Attu. (n. 14151); Constantine, Isl. Amchitka. (n. 14643); Nazan, Isl. Atka. (n. 14409).

29. ***Trientalis europaea*** L. Sp. Pl. ed. 1. p. 344, (1753); YABE & YENDO, Pl. Isl. Shumushu, p. 191.

var. ***arctica*** LEDEB. Fl. Ross. III. p. 25, (1847–1849); PAX u. KNUTH, in Engl. Pfl.-reich. IV. 237, p. 315, (1905); KUDO, Fl. Isl. Paramushir, p. 149, (1922).

Trientaris europaea L. subsp. *arctica* HULT. Fl. Kamtchat. IV. p. 56, (1930).

Hab. In meadows: Chichagof, Isl. Attu. (n. 14174; n. 14293); Constantine, Isl. Amchitka. (n.); Nazan, Isl. Atka. (n. 14349).

Ehretiaceæ.

30. ***Mertensia maritima*** G. DON, Gen. Syst. IV. p. 320, (1838); MACOUN, Pl. Pribilof Isl. p. 569, (1899); OSTENFELD, Vas. Pl. Arc. Nor. Am.

p. 63, (1910); HULT. Fl. Kamtchat. IV. p. 85, (1930).

Hab. On beaches: Chichagof, Isl. Attu. (n. 14250); Nazan, Isl. Atka. (n. 14317).

Rhinanthaceæ.

31. ***Mimulus Langsdorfii*** SIMS. in Bot. Mag. Pl. 1501, (1812); HOWELL, Fl. Nor. -West Am. I. p. 520, (1903); Piper, Fl. St. Wash. p. 509, (1906); FRYE & RIGG, Element. Fl. Northwest, p. 203, (1914).

Hab. In boggy places: Nazan, Isl. Atka. (n. 14360; 14529).

32. ***Pedicularis Chamissonis*** STEV. in Monogr. Ped. p. (20) (1822); Maxim. in Mel. Biol. X. p. 90, (1878); MIYABE, Fl. Kuril. p. 254, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 193, (1904); KUDO, Fl. Isl. Paramushir, p. 156, (1922); SIMPR. in Fedde, Rep. Spec. Nov. XX. p. 242, (1924); HULT. Fl. Kamtchat. IV. p. 109, (1930).

Hab. In meadows: Chichagof, Isl. Attu. (n. 14718; n. 14142); Nazan, Isl. Atka. (n. 14463).

33. ***Veronica serpyllifolia*** L. Sp. Pl. ed. 1. p. 12, (1753); BONG. Vég. Sitcha, p. 157, (1833); MACOUN, Pl. Pribilof Isl. p. 569, (1899).

? Veronica humifusa DICKSON, in Trans. Linn. Soc. II. p. 288, (1794); HULT. Fl. Kamtchat. IV. p. 99, (1930).

Hab. Chichagof, Isl. Attu. (n. 14033; n. 14263); Constantine, Isl. Amchitka. (n. 14595); Nazan, Isl. Atka.

34. ***Veronica Stelleri*** PALL. ex Link Jarhb. III. p. 40, (1820); MIYABE, Fl. Kuril. p. 254, (1890); MACOUN, Pl. Pribilof Isl. p. 570, (1899); YABE & YENDO, Pl. Isl. Shumushu, p. 194, (1904); FURUMI, in Tokyo Bot. Mag. XXX. p. 124, (1916); KUDO, Fl. Isl. Paramushir, p. 154, (1922); HULT. Fl. Kamtchat. IV. p. 101, (1930).

Hab. In meadows and heaths: Chichagof, Isl. Attu. (n. 14131; n. 14715; n. 14825); Constantine, Isl. Amchitka. (n. 14624); Nazan, Isl. Atka. (n. 14477; n. 14519).

35. ***Veronica ameriana*** SCHWEIN. apud Benth. in DC. Prodr. X. p. 468, (1846); YABE & YENDO, Pl. Isl. Shumushu, p. 194, (1904); KUDO, Fl. Isl. Paramushir, p. 154, (1922); HULT. Fl. Kamtchat. IV. p. 96, (1930).

Veronica Beccabunga L. var. *americana* GLEHN, ex Maxim. in Mel. Biol. XI. p. 278, (1881); MIYABE, Fl. Kuril. p. 253, (1890).

Hab. In damp places: Constantine, Isl. Amchitka. (n. 14593); Nazan, Isl. Atka. (n. 14359).

36. ***Veronica aphylla*** L. Sp. Pl. ed. 1. p. 11, (1753).

var. ***grandiflora*** BENTH. in DC. Prodr. X. p. 476, (1846); MIYABE, Fl. Kuril. p. 253, (1890); FURUMI, in Tokyo Bot. Mag. XXX. p. 126, (1916); KUDO, Fl. Isl. Paramushir, p. 155, (1922).

Veronica grandiflora GAERTN. in Nov. Comm. Ac. Imp. Sc. St. Petersb. XIV. p. 531, (1770); HULT. Fl. Kamtchat. IV. p. 97, (1930).

Veronica kamtchatica L. f. Suppl. Syst. Veg. p. 83, (1781); YABE & YENDO, Pl. Isl. Shumushu, p. 194, (1904).

Hab. In alpine meadows: Chichagof. Isl. Attu. (n. 14132; n. 14202; n. 14285; n. 14740; n. 14808); Nazan, Isl. Atka. (n. 14472).

Lentibulariaceæ.

37. ***Pinguicula vulgaris*** L. Sp. Pl. ed. 1. p. 17, (1753); BONG. Vég. Sitcha, p. 160, (1833); YABE & YENDO, Pl. Isl. Shumushu, p. 193, (1904); MACOUN & HOLM, Rep. Canad. Arc. Exp. V. Bot. p. 20, (1921); HULT. Fl. Kamtchat. IV. p. 127, (1930).

var. ***macroceras*** HERD. Pl. Radd. Monop. IV. 1. p. 98; KUDO, Fl. Isl. Paramushir, p. 159, (1922).

Hab. In bogs: Chichagof. Isl. Attu. (n. 14035; n. 14199; n. 14265); Constantine, Isl. Amchitka. (n. 14553); Nazan, Isl. Atka. (n. 14364).

Rubiaceæ.

38. ***Galium trifidum*** L. Sp. Pl. ed. 1. p. 159, (1753); BONG. Vég. Sitcha, p. 144, (1833); MACOUN, Pl. Pribilof Isl. p. 567, (1899); YABE & YEN-

DO, Pl. Isl. Shumushu, p. 195, (1904); KUDO, Fl. Isl. Paramushir, p. 159, (1922); HULT. Fl. Kamtchat. IV. p. 137, (1930).

Hab. In damp places: Constantine, Isl. Amchitka. (n. 14539; n. 14661); Nazan, Isl. Atka. (n. 14313).

Caprifoliaceæ.

39. ***Linnaea borealis*** L. Sp. Pl. ed. 1. p. 631, (1753); BONG. Vég. Sitcha, p. 144, (1833); MIYABE, Fl. Kuril. p. 238, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 194, (1904); NAKAI, Tr. & Shr. Jap. 1. ed. 3. p. 614, (1927); KUDO, Fl. Isl. Paramushir, p. 161, (1922); HULT. Fl. Kamtchat. IV. p. 141, (1930).

Hab. In heaths: Chichagof, Isl. Attu. (n. 14073; n. 14193; n. 14295; n. 14822); Constantine, Isl. Amchitka. (n. 14562); Nazan, Isl. Atka. (n. 14427).

Campanulaceæ.

40. ***Campanula dasyantha*** BIEB. Fl. Taur. Caucas. III. p. 147, (1819); YABE & YENDO, Pl. Isl. Shumushu, p. 195, (1904); KUDO, Fl. Isl. Paramushir, p. 162, (1922); HULT. Fl. Kamtchat. IV. p. 149, (1930).

Hab. In heaths: Nazan, Isl. Atka. (n. 14525).

41. ***Campanula lasiocarpa*** CHAM. in Linnaea IV. p. 39, (1829); MACOUN, Pl. Pribilof Isl. p. 568, (1899); YABE & YENDO, Pl. Isl. Shumushu, p. 195, (1904); KUDO, Fl. Isl. Paramushir, p. 163, (1922); HULT. Fl. Kamtchat. IV. p. 150, (1930).

Hab. In heaths and on rocky places: Chichagof, Isl. Attu. (n. 14191; n. 14771; n. 14848); Constantine, Isl. Amchitka. (n. 14621); Nazan, Isl. Atka.

Asteraceæ.

42. ***Anaphalis margaritacea*** BENTH. et. Hook. f. Gen. Pl. II. p. 303, (1876); MIYABE, Fl. Kuril. p. 241, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 196, (1904); KUDO, Fl. Isl. Paramushir, p. 165, (1922); HULT. Fl. Kamtchat. IV. p. 164, (1930).

Hab. In meadows: Chichagof, Isl. Attu. (n. 14027; n. 14201).

43. ***Achillea Millefolium*** L. Sp. Pl. ed. 1. p. 899, (1753); BONG. Vég. Sitcha, p. 148, (1833); MIYABE, Fl. Kuril. p. 241, (1890); MACOUN, Pl. Pribilof Isl. p. 568, (1899); OSTENFELD, Vas. Pl. Nor. Arc. Am. p. 67, (1910); HULT. Fl. Kamtchat. IV. p. 167, (1930).

Hab. In meadows: Constantine, Isl. Amchitka. (n. 14607); Nazan, Isl. Atka. (n. 14297; n. 14387).

44. ***Chrysanthemum arcticum*** L. Sp. Pl. ed. 1. p. 889, (1753); MIYABE, Fl. Kuril. p. 242, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 196, (1904); MACOUN & HOLM, Rep. Canad. Arc. Exp. V. Bot. p. 21, (1921); MAYEKAWA, in Trans. Sapporo Nat. Hist. Soc. VIII. p. 5, (1921); KUDO, Fl. Isl. Paramushir, p. 167, (1922); HULT. Fl. Kamtchat. IV. p. 172, (1930).

Hab. In heaths and near beaches: Chichagof, Isl. Attu. (n. 14014; n. 14145; n. 14189; n. 14227; n. 14708); Constantine, Isl. Amchitka. (n. 14576).

45. ***Artemisia vulgaris*** L. Sp. Pl. ed. 1. p. 466, (1753).

var. ***Tilesii*** LEDEB. Fl. Ross. II. p. 586, (1844–1846); MACOUN, Pl. Pribilof Isl. p. 568, (1899); OSTENFELD, Vas. Pl. Arc. Nor. Am. p. 68, (1910); MACOUN & HOLM, Rep. Canad. Arc. Exp. V. Bot. p. 22, (1921).

Artemisia Tilesii LEDEB. in Mem. Ac. Imp. St. Petersb. V. p. 568, (1812); HULT. Fl. Kamtchat. IV. p. 186, (1930).

Hab. On hill-sides: Chichagof, Isl. Attu. (n. 14709).

46. ***Artemisa arctica*** LESS. in Linnaea VI. p. 213, (1831); BONG. Vég. Sitcha, p. 147, (1833); HULT. Fl. Kamtchat. IV. p. 176, (1930).

Artemisa norvegica FRIES, form. *arctica* KUDO, Fl. Isl. Paramushir, p. 169, (1922).

Artemisia norvegica FRIES, var. *pacifica* A. GRAY, Syn. Nor. Am. I. 2. p. 371, (1884); MIYABE, Fl. Kuril. p. 243, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 196, (1904).

Hab. In alpine meadows: Chichagof, Isl. Attu. (n. 14116; n. 14260; n. 14776).

47. ***Petasites frigida*** FRIES, Summa Veg. Scand. I. p. 182, (1845); MACOUN, Pl. Pribilof Isl. p. 568, (1899); OSTENFELD, Vas. Pl. Arc. Nor. Am. p. 68, (1910); MACOUN & HOLM, Rep. Canad. Arc. Exp. V. Bot. p. 22, (1921); HULT. Fl. Kamtchat. IV. p. 192, (1930).

Hab. In boggy places: Nazan, Isl. Atka. (n. 14322).

48. ***Arnica unalascensis*** LESS. in Linnaea VI. p. 238, (1831); MACOUN, Pl. Pribilof Isl. p. 568, (1899); FERNALD, in Rhodora, XI. p. 141, (1909); KUDO, Fl. Paramushir, p. 170, (1922); HULT. Fl. Kamtchat. IV. p. 193, (1930).

Hab. In meadows: Chichagof, Isl. Attu. (n. 147712); Constantine, Isl. Amchitka. (n. 14623); Nazan, Isl. Atka. (n. 14327; n. 14422).

49. ***Cacalia kamtschatica*** KUDO, Contr. Fl. N. Saghal. p. 60, (1923) et Rep. Veg. N. Saghal. p. 238, (1924).

Senecio davuricus SCHULTZ-Bip. var. *kamtschaticus* MAXIM. in Mel. Biol. IX. p. 296, (1874); MIYABE, Fl. Kuril. p. 244, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 197, (1904).

Cacalia auriculata MAXIM. var. *kamtschatica* MATSUM. ex Shokubutsu Meii 1. ed. 3. p. 56, (1897); KUDO, in Tokyo Bot. Mag. XXIX. p. 225, (1915), et Fl. Isl. Paramushir, p. 170, (1922).

Cacalia auriculata HULT. Fl. Kamtchat. IV. p. 195, (1930).

Hab. On hill-sides: Chichagof, Isl. Attu. (n. 14025; n. 14208; n. 14218).

50. ***Senecio palmatus*** PALL. Reise III. p. 321, (1776); MIYABE, Fl. Kuril. p. 244, (1890); YABE & YENDO, Pl. Isl. Shumushu, p. 196, (1904); KUDO, Fl. Isl. Paramushir, p. 171, (1922); HULT. Fl. Kamtchat. IV. p. 199, (1930).

Hab. On hill-sides: Chichagof, Isl. Attu. (n. 14244; n. 14749).

51. ***Senecio Pseudo-Arnica*** LESS. in Linnaea VI. p. 240, (1831); MIYABE, Fl. Kuril. p. 244, (1890); MACOUN, Pl. Pribilof Isl. p. 508, (1899); YABE & YENDO, Pl. Isl. Shumushu, p. 197, (1904); KUDO, Fl. Isl. Paramushir, p. 171, (1922); HULT. Fl. Kamtchat. IV. p. 203, (1930).

Hab. On beaches: Chichagof, Isl. Attu. (n. 14775).

52. ***Cirsium kamtschaticum*** LEDEB. ex DC. Prodr. VI. p. 644, (1837); YABE & YENDO, Pl. Isl. Shumushu, p. 198, (1904); KUDO, Fl. Isl. Paramushir,

p. 172; HULT. Fl. Kamtchat. IV. p. 214, (1930).

Cnicus kamtschaticus MAXM. in Mel. Biol. IX. p. 310, (1874); MIYABE, Fl. Kuril. p. 244, (1890).

Hab. In meadows: Chichagof, Isl. Attu. (n. 14203; n. 14750).

53. ***Hieracium triste*** WILLD. Spr. Syst. III. p. 640, (1826); FROEL. in DC. Prodr. VII. p. 209, (1838); TORRY & GRAY, Fl. N. Am. p. 427, (1840); GRAY, Syn. Fl. N. Am. 1. 2. p. 427, (1884); HULT. Fl. Kamtchat. IV. p. 233 (1930).

Hab. In heaths: Chichagof, Isl. Attu. (n. 14075; n. 14127; n. 14134; n. 14225); Constantine, Isl. Amchitka. (n. 14580; n. 14169); Nazan, Isl. Atka. (n. 14402; n. 14406; n. 14523).

— [To be continued.] —

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摘　　要

本報には、一九二九年西部アリウシアン群嶋にて採集せる合瓣花植物中、三十五種、即ち
イチヤクサウ科 1 種； シヤクナゲ科 8 種； サクラサウ科 2 種； ムラサキサウ科 1 種；
ゴマノハグサ科 6 種； タヌキモ科 1 種； アカネ科 1 種； ニンダウ科 1 種；
キケウ科 2 種； キク科 12 種 を列擧せり。

A FOOD-HOARD OF *OCHOTONA* FROM TAISETSUZAN, THE CENTRAL MOUNTAINS OF HOKKAIDO

BY

TETSUO INUKAI

大雪山産ナキウサギ(ハツカウサギ)の食物貯藏所に就て

犬　飼　哲　男

In a previous paper writing with SHIMAKURA, the author gave a short history of finding of *Ochotona*[1], the pica, from Kitami in Hokkaido together with some œcological notes of the animal. Furthermore, quite recently it has become known that *Ochotona* is also a common inhabitant on the rocky part of the central high mountains of the island, many specimens having been actually collected. The mountains are a little more than 2000 meters above the sea level and being volcanic in origin the tops are rocky in most parts. Alpine meadows or frigid zone plants are developed above 1400 meters whence a rich flora of alpine plants is found.

In winter the land of Hokkaido except the south eastern part is completely under snow for months and it is particularly deep in the mountainous region where the weather is exceptionally severe with much ice and cold. Despite these conditions it has been found that the fauna in the frigid zone of the mountains is also very abundant with *Ochotona* and the striped ground squirrel or the striped chipmunk throughout the year. The former lives chiefly in rocky crevices or among crumbling rocks making a great association while the latter

1) *Ochotona* yezoensis KISHIDA.

[Transact. Sapporo Nat. Hist. Soc., Vol. XI, Pt. 4. March, 1931]

is the constant inhabitant of bushes of *Pinus pumila*. The visits of brown bears, foxes and ermines which are the regular summer visitors of the mountain do not occur so often in this region. Other kinds of rodents, hares, rats, mice and grey squirrels are generally found below in the shrubby zone.

The peculiar shrill cry or the whistling of the pica and that of the chipmunk closely resemble each other. They make together an almost continuous noise in some parts of the mountain particularly in the foggy or cloudy days and in the dimness of the morning and the evening. Since the pica as well as the chipmunk do not take the winter sleep or not hibernate they are diligent food-hoarders during summer. As generally understood the food of the striped squirrel consists of almost anything, including even small animals, besides vegetables,

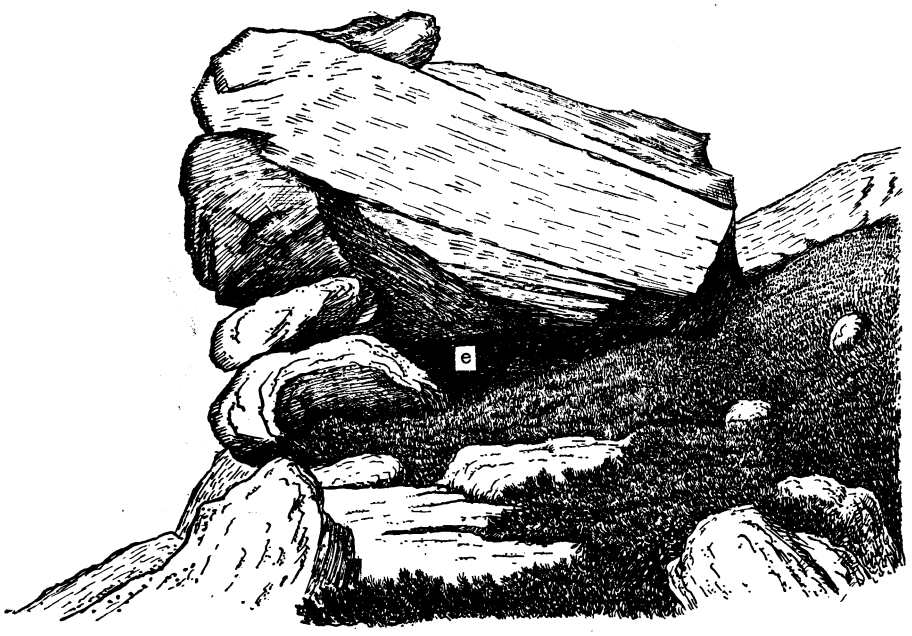

Fig. 1.

This shows the entrance (e) of the storage under a big rock. It is hardly recognizable from outside.

with a preference for fruits, seeds and nuts for the winter use. They are abundant around the dwelling of the animal in the mountain. As already

noted *Ochotona* in Kitami does severe damage to the forest plantings, as the food of the animal in that district comprises the saplings of the larch and the wild raspberry which it cuts into pieces to lay up in storage. Whether the animal from Kitami is the same species as that from Taisetsuzan is not yet dicided[2]. However, it is true that the food of the pica in Taisetsuzan is composed mostly of alpine plants which are the only growth on these mountains.

It was the end of August of 1926, in fact, when the present writer engaged in the collection of animals in the central mountains as a member of the Surveying Committee of Taisetsuzan that a large food-hoard was found on the rocky side of Haku-undake in Taisetsuzan (Fig. 1). It was a natural, horizontal crevice among rocks, measuring about 16 cm in height and 60 cm

Fig. 2.

Inferior of the storage, showing the leaves and twigs taken in by *Ochotona*. $\times\frac{1}{8}$

in width at the entrance, the depth being about the same as the width. At the time of finding about two-thirds of the room was filled up with leaves and twigs of plants which were all cut about 6 cm in length by the animal (Fig. 2 and 3). The whistling of the pica around this place was heard particularly

2) Mr. KISHIDA of the Imp. Agr. Exp. Station in Tokyo is going to publish on the subject.

boisterously. By examining the kinds of plants 16 different species of alpine plants were identified as follows[3].

Fig. 3.

Details of the contents of the hoard given as exsamples. 1. *Cetraria* sp. 2. and 4. *Cassiope lycopodioides*. 3. *Arcteria nana*. 5. *Phyllodoce aleutica*. 6. *Phyllodoce caerulea*. 7. *Salix Reinii*. 8. *Cladonia* sp. 9. *Rhododendoron chrysanthum*. 10. *Salix yezo-alpina*. 11. *Pentstemon frutescens*. ×¼

Salix yezo-alpina KOIDZ.
Salix Reinii FRANCH. et SAV.
Phyllodoce aleutica A. HELLER
Phyllodoce caerulea BAB.
Empetrum nigrum L.
Vaccinium Vitis-idaea L.
Rhododendron chrysanthum PALL.
Pentstemon frutescens LAMB.
Arnica unalascensis LESS.
Arcteria nana MAKINO
Saussurea sp.
Cassiope lycopodioide D. DON
Lagotis borealis BAIL.
Arctous alpina NIED. var. *japonica* TAKEDA
Cladonia sp.
Cetraria sp.

The first snow fall in Taisetsuzan occurs anually in October and by the middle of November the whole mountain is completely covered with snow. The melting of snow first begins in the mountain at the end of June. Therefore the animals must store the food to afford a supply more than 8 months in this region. Thus during summer the storage fever seems actually to take possession of the animal.

(Zoological Institute, Hokkaido Imp. Univ.)

3) Mr. M. TATEWAKI in the Botanical Institute of Hokkaido Imperial University kindly helped me in identification of the plants.

Literature

INUKAI, T. and SHIMAKURA, K.: On *Ochotona*, a New Rodent Unrecorded from Hokkaido. Transact. Sapporo Nat. Hist. Society. Vol. XI, pt. 2. 1930

KISHIDA, K.: A diagnosis of a new piping hare from Yeso. Lansania. (Journal of Arachnology and Zoology). Vol. 2, No. 13. 1930

要　　綱

ナキウサギなる名稱は曾て余が、鳥倉學士との共著に於て北見國置戸地方に、北海道に初めて發見された *Ochotona* の發見記及びその生態的調査の報告の際に附した名稱である。然るに近來岸田氏等はこれに廿日兎なる名稱を固持し、朝鮮産 *Ochotona* にも用ひ又他の人は鼠兎等とも稱してゐるので、斯界の當惑を避くるため余もハツカウサギなる名稱を併用するのである。

偖この動物は、昭和三年十月初めて置戸で捕獲されたのであるが、その後大雪山系にも多數に棲息することが判明し、既に旭川營林區署員等に依り標本も數多採集せられた。大雪山系は火山系の高山で山頂には岩石峨々としてゐるが、海拔二千余米を超へ千四百米以上には所謂、高山植物帶。即ち、寒地植物帶がよく發達し豊富な植物相を現はしてゐる。冬期は全山氷雪に閉され殊に山頂部は酷寒を示すのである。それにも拘らず山頂には四季を通じて二種の哺乳類が棲息する。即ち、一はシマリスで多くハイマツ中に棲み、他はハツカウサギで岩石の多い箇所を根據とし、何れも好んで群居して共同生活を營んでゐる。この二つの動物はその鳴き聲も非常に類似してゐるため、濃霧の日又は薄明薄暮に至ればその棲場所附近を通過する人の冶ど耳を聾するばかりである。

春期から秋期迄は羆、狐、エゾイタチ、貂、兎、野鼠、栗鼠等が時々山頂近くに出沒するが、冬期は前記のシマリス、ハツカウサギを殘し羆は冬眠し、他は山麓の森林帶に下つてゐる。然しシマリス及びハツカウサギは氷雪期に於てすら冬眠することがなく、專ら夏期貯藏した食料を食ひつゝ籠居生活を續けるのである。北見地方のハツカウサギの食物は、既に報告した如く落葉松及びキイチゴの稚樹で、このため植林地で大被害を見たのであるが、大雪山系のものは全く高山植物のみである。一言すべきは、シマリスは夏期に植物の芽葉根皮を食することがあれど、晩夏、秋期は特に好んで種子、果實を貯藏し冬期に備ふることである。余は既に大正十四年八月廿五日大雪山調査會會員として動物調査中、大雪山系の白雲岳東斜面で偶然にもハツカウサギの食物貯藏所を發見したのである。該貯藏所は大なる岩石の下で (Fig. 1) 入口は高さ十六センチ、幅六十センチ、深さ約六十センチの水平孔で、當時はその約三分の二が寸斷された植物の莖葉で充塡されてゐた。(Fig. 2) その中の植物は多くは先端部丈で悉く、約六センチの長さに切られてゐた。(Fig. 3) 余は館脇學士の援助により下記の十六種の植物を檢出し得た。即ち

マルバヤナギ、ミネヤナギ、アヲノツガザクラ、エゾノツガザクラ、ガンコウラン、コケモヽ、キバナノシヤクナゲ、タルマヒサウ、ウサギギク、コメバツガザクラ、トウヒレン屬、イワヒゲ、ホソバウルツプサウ、ウラシマツツジ、ハナゴケ類、依蘭苔類。

大雪山に於ける初雪は、毎年十月で十一月中旬より全山雪に埋れ六月末に初めて融雪がある。このため前記山頂に棲むシマリス及びハツカウサギは少くとも八ケ月の食料を貯藏しなくてはならない。從つて夏期はこれ等の動物は專らその貯藏に忙殺されるのである。

(北海道帝國大學動物學教室)

ON TWO SPECIES OF SPHACELARIALES NEW TO JAPAN.

BY

JUN TOKIDA

(With 6 Text Figures)

日本新産くろがしら族海藻二種に就て

時　田　　郁

According to the late Dr. K. YENDO (1914, p. 268), when he added to our algal flora an Atlantic species, *Sphacelaria radicans* Ag., there were found no less than nine species of *Sphacelaria* on our coast, of which only four, including just mentioned species, were determined with certainty. Afterwards Dr. K. OKAMURA, in his Meii, 2nd. ed. (1916), enumerated five species of *Sphacelaria* and one species of *Halopteris* as the members of the *Sphacelariaceæ* ever found in our boundary, and there has been no addition henceforth, as far as I know.

In the course of the preparation of the marine algal flora of the Southern Saghalien, I have found some interesting brown algae belong to *Sphacelariales*, and two of them are now identified with the following two species new to Japan.

In this opportunity I would express my sincere thanks to Dr. K. MIYABE for his kindest guidance and constant advices during my studies on the marine flora of the Southern Saghalien.

Sphacelaria plumigera HOLMES

Text figures 1-4.

HOLMES, New British Marine Algae, in Grevillea, Vol. XI, (1882-83), p.

145; REINKE, Uebersicht der bisher bekannten Sphacelariaceen, (1890), p. 208; DE TONI, Syll. Alg. III, (1895), p. 505; SAUVAGEAU, Remarques sur les Sphacelariacees, (1901), p. 94, f. 22.

Nom. Jap. *Hane-kurogashira.*

Loc. Saghalien at Tobuchi Lake, a lagoon in the Aniwa Bay (Herb. J. TOKIDA, no. 400, Aug. 1929), and Sakaehama on the east coast (Herb. J. TOKIDA, no. 409, Aug. 1929).

Distr. England, Helgoland, Cattegat and Écosse in North Sea.

Fronds 3.5 cm. high, densely corticated with rhizoidal filaments below, habit *Chaetopteris plumosa* like, of feathery shape, main axes alternately divided, lateral branches opposite and distichous, closely provided with pinnae arranged in the same manner, pinnae gradually increase in length from above downward for a short distance yielding a pyramidal shape in the terminal portions of axes and branches; apical segments of axes about 90 μ in diam., those of upper pinnae 47–57 μ in diam., while lower and longer pinnae, probably as "Kurztriebe" be called, lanceolate, tapering upwards, less than 30 μ in diam. at apices; unilocular sporangia broad ovoid, 48–60 μ in diam., 54–63 μ long, pedicellate, pedicels usually monosiphonous, simple or irregularly divided, distichous on the lower portions of older but ecorticated "Kurztriebe", either opposite and closely set accompanying no pinnules, or sparingly intermixed between pinnules, which are more thinner than the pinnae; plurilocular sporangium and propagulum unknown.

The above description is based upon the fertile plant found among the entangled masses of *Spongomorpha duriuscula* and *Chaetomorpha* thrown up ashore at Sakaehama, in August, 1929. Another locality in Saghalien is represented by a single specimen of sterile and more slender frond, axis being 60 μ and pinnae 30 μ in diameter.

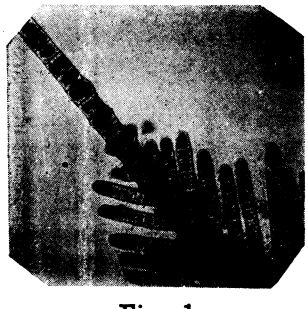

Fig. 1.

While the descriptions and illustrations in the works of the authors above cited assure that our plant is identical with the present species, I was able to ascertain that our plant, in general appearances, coincides with the Danish

specimens of this species, collected and probably determined also by Dr. F. BOERGESEN and distributed to the herbarium of Prof. Y. YAMADA, to whom I am much obliged for his valuable advices as well as his kind permission to examine above specimens for comparison.

Fig. 2.

Fig. 3.

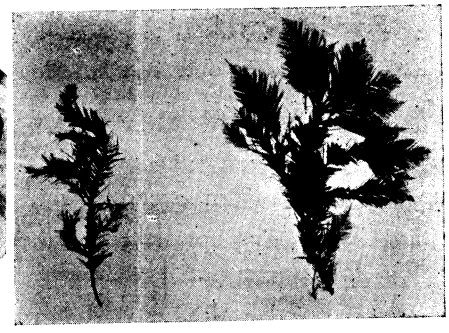

Fig. 4.

Figs. 1–4. *Sphacelaria plumigera* HOLMES. 1. Apical portion of a frond, showing the mode of branching. × ca. 33. 2. Fertile part of a frond, showing fertile ramuli scattered on the "Kurztriebe" distichous on lower axis densely covered with rhizoidal filaments. × ca. 33. 3. Unilocular sporangia. × ca. 83. 4. Two fronds from no. 409, showing the habit of the plant. Slightly larger than the natural size.

The photograph Fig. 4, as well as Fig. 6, on the page 219, is taken by Prof. T. HIKITA, to whom the writer returns his sincere thanks.

Halopteris scoparia (L.) SAUVAGEAU

Text figures 5 & 6.

SAUVAGEAU, Remar. sur les Sphac., (1904), p. 349–379, f. 69–73; BOERGESEN, Marine Algae from the Canary Islands, II, (1926), p. 75; *Conferva scoparia* L., Systema Naturae, II, (1759), p. 720; *Sphacelaria scoparia* LYNGB., Hydrophyt. Dan.. (1819), p. 104, t. 31, f. 4; HAUCK, Meeresalgen, (1885), p. 347, f. 145; *Stypocaulon scoparium* KUETZING, Phyc. gen., (1843), p. 293, t. 18, f. II; KJELLMAN, Algae of the Arctic Sea, (1883), p. 272; DE TONI, Syll. Alg., III, (1895), p. 518.

Nom. Jap. *Hake-kashirazaki.*

Loc. Saghalien at Tobuchi Lake,. a lagoon in the Aniwa Bay (Herb. J. TOKIDA, no. 267, July 1926, no. 395, Aug. 1929 and no. 422, Aug. 1930),

Airoppu on the east coast (Herb. J. TOKIDA, no. 141 and 272, Aug. 1927); Hokkaido at Nemuro (Dr. K. MIYABE, Aug. 1894).

Distr. Atlantic and North Sea coasts of Europe; West Indies; Arctic coasts of Greenland (?); Mediterranean, Adriatic and Baltic Seas; New Guinea; Australia.

Fronds 5–7 cm. high, growing on stones and shells, densely covered with rhizoidal filaments downwards, alternate in every direction, decomposito-pinnate, pinnae fastigiate, pinnules spinous, regularly alternate, distichous (f. *b*) or sometimes quaquaversal (f. *c*), stipe 308–322 μ in diam. including rhizoids, main axes up to 155 μ in diam. except rhizoids, "Kurztriebe" 42–49 μ in diam. at the base, gradually tapering upwards, apical cells of main axes and "Langtriebe" 45–154 μ in diam.; unilocular sporangia spherical, 98 μ in diam, pedicellate, pedicels

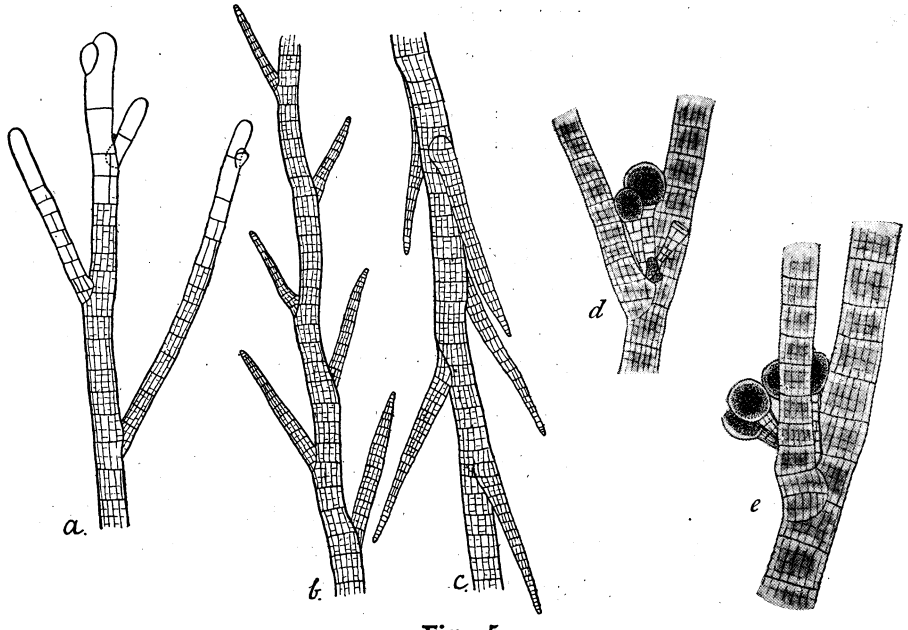

Fig. 5.

Fig. 5, a-e. *Halopteris scoparia.* a. apical growing region, × ca. 43; b & c. spinous branchlets on "Kurztriebe", × ca. 43; d & e. unilocular sporangia, × ca. 58.

simple, composed of a row of several cells axillary tufted (f. *d* & *e*).

The above measurement of the vegetative frond is based upon the plant from Airoppu, (no. 141), and that of sporangia upon a dwarf plant from the

same locality (no. 272). Text figure *a* shows the holoblastic character at the apical cells of our plant, and figures *d* and *e* unilocular sporangia axillary tufted. These characters lead us to place our plant in the genus *Stypocaulon* of KUETZING. Comparing with the illustrations by KUETZING cited in the Meeresalgen by HAUCK, l. c., our plant is proved to be none but the summer form of *Stypocaulon scoparium* Kuetzing. On the other hand I could compare, with a positive result, our plant with some Atlantic specimens of the present species, especially from the Canary Islands, collected and determined by Dr. F. BOERGESEN, which were laid in my hand by the kindness of Prof. Y. YAMADA. After J. REINKE (1890 and 1891), F. R KJELLMAN (1891) and DE TONI (l. c.) *Stypocaulon* is distinguished from *Halopteris*, having several sporangia instead of one in an axilla. In 1904, however, Prof. C. SAUVAGEAU published his new conception about the genus *Halopteris*, amalgamating three genera, namely, *Halopteris* and *Stypocaulon* of KUETZING and *Anisocladus* of REINKE, because there are found some intermediate forms of the extreme representatives of these genera.

In the herbarium of the Hokkaido Imperial University, there is kept a specimen collected by Dr. K. MIYABE at Nemuro in Hokkaido, in August, 1894, which has been labelled by him as *Sphacelaria (Stypocaulon) dura* Rupr. with a question mark. This is identical with our plant from Saghalien, and only material, as far as I know, to represent the occurrence of the species in our boundary outside Saghalien. As to the distribution of this species in the Arctic Sea at Greenland, KJELLMAN, (1883), followed ZELLER, although he himself had not seen any specimens.

Fig. 6.

Fig. 6. *Halopteris scoparia* (L.) Sauvageau, three plants from Airoppu (no. 141), left two showing the natural habit when dried, and right showing the mode of branching in a spread and pressed condition. ca. ⅔.

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摘　　要

樺太島南部(本邦領有地域)の海藻を調査中、褐藻類くろがしら族に屬する數種を發見したが、その中、二者を次の日本新産二種に査定し、自分の觀察を記載した。

Sphacelaria plumigera Holmes, はれくろがしら（新稱）

第一圖—第四圖。産地：遠淵湖及榮濱（樺太）。分布：北海。

第一圖は枝端生長部の一部の顯微鏡寫眞で、側枝が羽狀に櫛比するを示す。第二圖は体の下部の密に根様絲を以て包被された軸(圖の上端黑き部)から羽出する短條枝に單子嚢を有する小枝の散在せるを示す。第三圖は數個の單子嚢を廓大して示す。第四圖は二個の植物の自然大より僅かに大い寫眞で、その分枝の有様を示す。

Halopteris scoparia (L.) Sauvageau, はけかしらざき（新稱）

第五及六圖。産地：遠淵湖及愛郎（樺太）根室（北海道、宮部博士採集1894年八月）。分布：太西洋北海、地中海、西印度、濠洲等。

第五圖。*a*は先端生長点で特有な分枝法を示す。*b*, *c*, は短條枝上の短き刺狀の小枝が二列に互生せるもの(*b*)と、各方面に互生せるもの(*c*)とを示す。*d*, *e*, は何れも單子嚢が短い柄を有して枝の腋に叢生せる狀。第六圖は愛郎採集の三個の標本で左の二つは乾燥したものゝ自然の有様、右の一つは擴げて腊葉にしたもので分枝狀態を示したもの。

此の報告を草するに當り、常に懇ろなる御指導を賜はる宮部博士に深甚の謝意を表すると共に、比較のため貴重なる標本を貸與され、又有力なる助言を下されし山田幸男氏並に、寫眞(第四及六圖)撮影の勞を辱うせし正田教授に感謝す。

DESCRITION OF A NEW SPECIES OF *MYRMOSA* FROM JAPAN (HYM. *MYRMOSIDAE*)

BY

KEIZÔ YASUMATSU

(With 1 Plate)

日本産 *Myrmosa* 屬一新種の記載

安 松 京 三

Myrmosa nigrofasciata n. sp.

♂. Black and shining, antennae excepting scape brownish black; wings hyaline, violaceous in certain aspect, apical half of fore wings fuscous or smoky, stigma black and nervures brownish black; tibial spurs yellowish brown; densely covered with yellowish white hairs, hairs on the head somewhat blackish brown, those on the tibiae and tarsi yellowish brown and very dense; hairs on vertex, frons, genae, scapes, coxae, trochanters, femora, mesonotum, scutellum, sides of thorax, and abdomen erect or nearly erect; coxae, trochanters, femora, tibiae as well as the flagellum of antennae shining.

Punctuation on head (except clypeus and mandibles), pronotum, mesonotum, mesopleura, apical part of propodeum, each abdominal tergite excepting the apical part, and on apical segment of abdomen large, dense and conspicuous; those on mandibles not so dense as the last; those on clypeus very sparse and small; scutellum, postscutellum, medio-basal part of propodeum densely and minutely punctured; coxae with some punctures; posterior part of each abdominal tergite without punctures and shining (except the last abdominal segment).

Head large, rounded in frontal view, much wider than the length, vertex very broad; antennae thirteen-jointed, inserted at the apical part of the face, insertions of antennae depressed, making the anterior margin of frons in the

[Transact. Sapporo Nat. Hist. Soc. Vol. XI, Pt. 4, 1931]

form of a visor; eyes ovate, inner margins divergent upward, ocelli distinct, put in an acute-angled triangle; basal half of clypeus with a longitudinal carina; mandibles with a very large and two comparatively small teeth; maxillary palpi long and six-jointed, labial palpi four-jointed.

Thorax: pronotum wide, arcuately emarginate posteriorly, mesonotum with four longitudinal impressed lines (inner two deeper and outer two shallower) which are not reaching the anterior margin of mesonotum, inner two somewhat convergent posteriorly; sides of mesonotum rather conspicuously convergent posteriorly; scutellum with a very shallow, longitudinal median line, which is invisible in some aspect; propodeum with a median, longitudinal, and shining impression, medio-basal part of propodeum with but few hairs; mesopleura swollen conspicuously; coxae contingent, hind coxae with a prominent process above; claws unidentate.

Abdomen with the 1st dorsal segment depressed at the base; posterior margin of the first and second tergites longitudinally striated, especially pronounced in the former, the same portion of other tergites closely punctured; dorso-apical valve or the epipygium slightly bifid, with a shallow impression near the apex; first and second sternites each with a basal, tooth-like process.

The genitalia are figured in the Plate 3; claspers long and stout, arms projecting inward, haired, and somewhat hook-like.

Measurements 1.

	head	pronotum	mesonotum	metanotum	1st ab. seg.	2nd ab. seg.
Relative width	107	97	—	78	65	95

	pronotum	mesonotum	scutellum	postscutellum	propodeum
Relative width	20	60	35	9	58

	body	fore wing	hind wing
Length	12 mm.	9,5 mm.	6,5 mm.

Segments of antenna	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Relative length	30	10	20	20	20	20	19	18	18	19	19	18	25
Relative width	14	10	15	15	15	15	15	15	14	13	12	6	7

Seg. of max. palp.	I	II	III	IV	V	VI
Relative length	7	14	21	27	30	24

Seg. of lab. palp.	I	II	III	IV
Relative length	10	5	12	24

Seg. of legs.	coxa	trochanter	femur	tibia	tibial spur	tarsus I	tarsus II	tarsus III	tarsus IV	tarsus V
Relative length in fore leg	20	10	35	34	10	22	5	4	2,5	7,5
" " " mid-leg	24	10	45	38	17 / 13	30	13	9	6	9
" " " hind leg	30	10	55	55	20 / 15	43	19	14	9	9

Closely allied to *Myrmosa melanocephala* FABRICIUS, but differs from it as follows:—

Mesonotum with four longitudinal impressions, apical dorsal valve without a deep longitudinal impression near the apex, pronotum not so long as in *Myrmosa melanocephala*, and the shape and position of the prominent process of hind coxae are different.

Holotype—1 ♂ (Hikosan, Buzen, Kyushu, 2. viii. 1930. Collected by Mr. KÔYÔ OKABE). In the Entomological Laboratory of the Kyushu Imperial University.

Paratypes—1 ♂ (Hikosan, Buzen, Kyushu, 2. vii. 1930. Collected by the author), 1 ♂ (Beppu, Bungo, Kyushu, vii. 1930. Collected by Mr. TSUNEO TORIKATA), 1 ♂ (Kobaru, near Sobosan, Bungo, Kyushu, 25. viii. 1930. Collected by Mr. CHOKU TAKEYA), 1 ♂ (Ambo-Kosugidani, Yakushima, Kyushu, 29. vii. 1929. Collected by Mr. HIROSHI HORI). All kept in the Entomological Laboratory of the Kyushu Imperial University.

Measurements 2.

Specimens	length of body	length of fore wing	length of hind wing	collectors
Holotype	12,0 mm.	9,3 mm.	6,5 mm.	K. OKABE
Paratype 1	9,0 mm.	6,8 mm.	5,0 mm.	C. TAKEYA
Paratype 2	13,0 mm.	10,5 mm.	7,8 mm.	H. HORI
Paratype 3	11,5 mm.	9,0 mm.	7,5 mm.	T. TORIKATA

♀. Apterous, mutilliform, ferruginous; head, some six basal antennal segments, a broad fascia on mesothorax, most part of the first abdominal tergite and the following tergite, and apical half of the second abdominal sternite black; antennae, prothorax, metathorax, legs, basal part of the first abdominal tergite, first sternite, basal half of the second sternite and the basilateral parts of the second sternite ferruginous; closely haired or pubescence dense; rather shining; pubescence on antennae, tibiae, tarsi and on abdomen brownish or golden, especially conspicuously golden ont he posterior margin of each abdominal segment; the same on abdomen comparatively long. Punctuation on head and abdomen dense, on thorax very strong.

Head large, much thicker than that in male; eyes nearly ovate, ocelli distinct but very small; vertex and frons broad, mandibles and clypeus with long, but sparse hairs, insertions of antennae contiguous.

Thorax: pronotum broad and long, broader than the length, separated from the mesonotum by a nearly straight suture; neck striated slightly and transversely; hind coxae with a long sharp process above.

Abdomen: the second tergite the broadest, basal part of the first tergite depressed, with two tooth-like processes on each side of the anterior margin; the first sternite with a rather long basal prosess.

Measurements 3.

	head : pronotum : mesonotum : metanotum : 1st ab. seg. : 2nd ab. seg.
Relative length	38 : 49 : 41 : 45 : 65 : 70

	pronotum	:	meso.+metanotum
Relative length	30	:	35

Length of body—6,5 mm.

Segments of antenna	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Relative length	20	6	9	10	10	10	9	9	9,5	10	9,5	16

Seg. of legs	coxa	trochanter	femur	tibia	tarsus I	tarsus II	tarsus III	tarsus IV	tarsus V
Relative length in fore leg	25	—	40	32	11	5	4	4	5
" " " mid-leg	15	7.5	40	35	20	10	8	7	8
" " " hind leg	25	6	50	50	30	14	9	7	10

Allotype—1 ♀ (Hikosan, Buzen, Kyushu, 2. viii. 1930. Collected by Mr. K. OKABE).

Paratype—1 ♀ (Hikosan, Buzen, Kyushu, 2. viii. 1930. Collected by the author).

Both are deposited in the Entomological Labolatory of the Kyushu Imperial University.

Measurements 4.

	length of body	collectors
Allotype	6,5 mm.	K. OKABE
Paratype	4,0 mm.	K. YASUMATSU

Habitat—Japan (Honshu, Kyushu including Yakushima).

This species is comparatively rare in Japan.

The author wishes to acknowledge the indebtness to Prof. TEISO ESAKI and Messrs. HIROSHI HORI, CHOKU TAKEYA, KÔYÔ OKABE and TSUNEO TORIKATA for their kindness rendered to him.

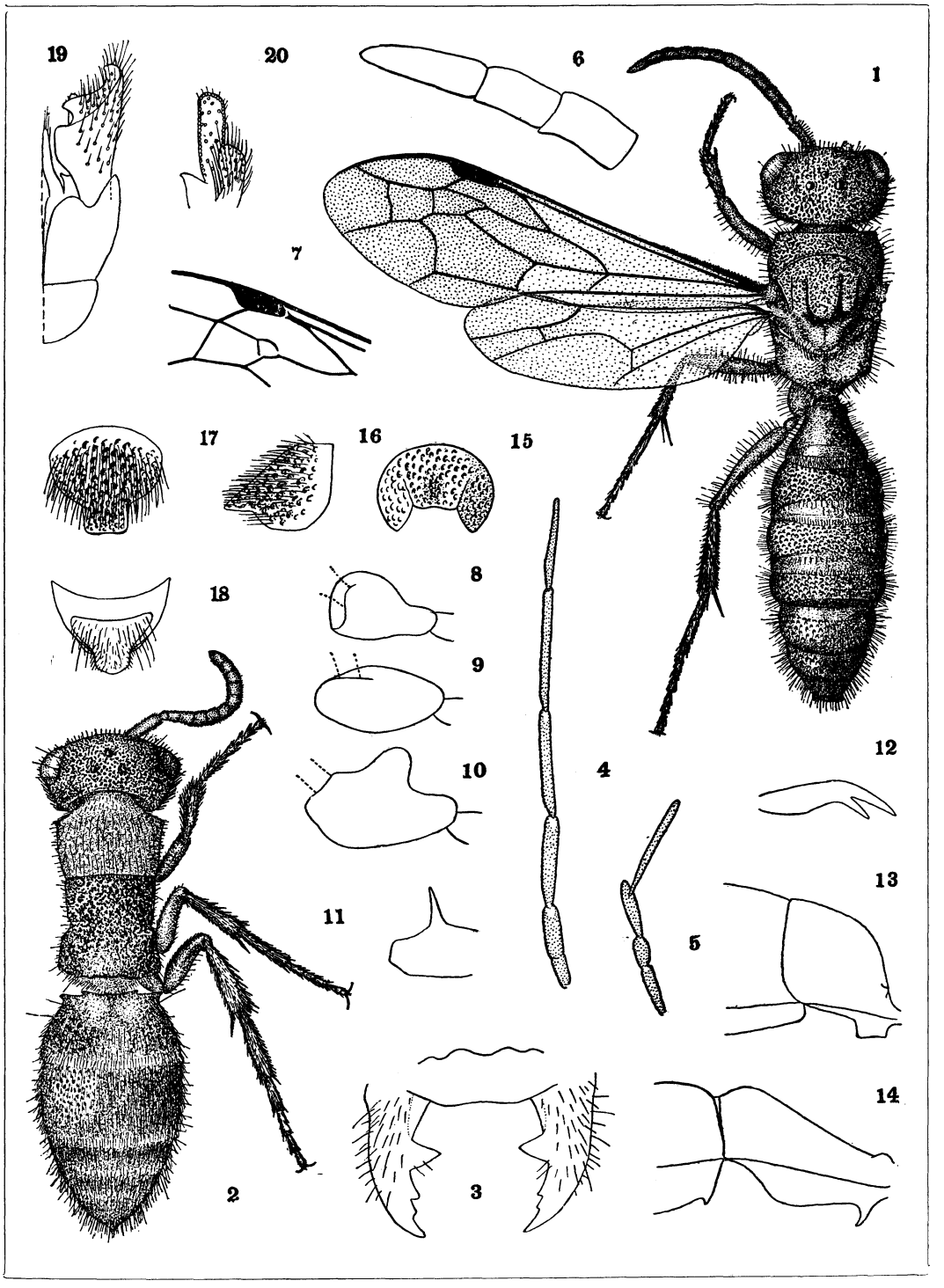
Explanation of Plate.

1. *Myrmosa nigrofasciata* n. sp. ♂.
2. Ditto. ♀.
3. Clypeus and mandibles in ♂.
4. Maxillary palpus in ♂.
5. Labial palpus in ♂.
6. Three apical segments of antenna in ♂.
7. Wing with a small excessive cubital cell.
8. Coxa of fore leg in ♂.
9. ,, ,, mid-leg in ♂.
10. ,. ,, hind leg in ♂.
11. ,, ,, ,, ,, in ♀.
12. Claw
13. 1st and 2nd abdominal segments in ♀, in profile.
14. ,, ,, ,, ,, ,, ,, ♂, in profile.
15, 16, 17. Epipygium in ♂, caudal, lateral, and dorsal view respectively.
18. Hypopygium in ♂.
19. Male genitalia in dorsal view.
20. Volsella and sagitta in dorsal view.

摘　　要

著者は本小文に於て、膜翅目中我が國に於て未記錄の一科なる、Myrmosidae アリバチモドキ科(新稱) の一新種を記載せり。即ち *Myrmosa nigrofasciata* と命名し、和名をアリバチモドキと新稱せんとす。從來 *Myrmosa* アリバチモドキ屬(新稱)は永らく Mutillidae アリバチ科に屬せしめられたれども、近來諸先學により特別の一科 Myrmosidae を構成さるゝに至れり。本科の模式屬の模式種なる歐洲の *Myrmosa melanocephala* は地中に營巢をなす Sphecidae コシボソバチ科の一種、*Oxybelus uniglumis* の寄生蟲にして、これらの生態調査は興味深きものと信ず。本邦には *Oxybelus lewisi* Cameron コキバチ(松村)なる種存すれども、*Myrmosa nigrofasciata* と關係あるものなりや、著者未だこれを詳にする機會を得ざれば他日の研究に俟つの外なし。本種の♂はさほど稀なるものには非ざるも♀を發見する事は極めて困難なり。交尾せるものを採集するを便とす。著者の記載に用ひたる材料は、即ちそれなり。本種の飛翔(♂)、或は步行(♀)はかのアリバチのそれらと何等差異を認めず。

(九州帝國大學農學部昆蟲學教室にて)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A PROVISIONAL LIST OF FUNGI COLLECTED IN SOUTHERN SAGHALIEN

BY

KATSUMI KAWAI and HIRONAO ÔTANI

南樺太採集菌類目錄

河合克己・大谷廣直

On account of the great diversity of the phanerogamic flora the Southern Saghalien offers an especially attractive field to the students of the parasitic fungi. About twenty years ago, Prof. Emer. Dr. KINGO MIYABE aud Messrs. TSUTOME MIYAKE and TETSUO MIYAGI made a quite extensive collection of fungi of the Island, and their specimens were deposited in the Herbarium of the Faculty of Agriculture, Hokkaido Imperial University. Following this, several collections were made by the members of the Phytopathological Laboratory of the same Faculty year by year. Among them, some of rust fungi were reported by Mr. NAOHIDE HIRATSUKA,* most of which was collected by himself.

In the late summer of 1929, Mr. YOSHIO TOKUNAGA and the senior author made a botanical collection along the western coast of the Southern Saghalien, and in the next summer the junior author with Mr. YÛZABURÔ IMAI collected many flowering plants and fungi along its eastern coast. In these excursions, a large number of fungi was collected, among which some unrecorded or new

* A provisional list of the Melampsoraceae of Saghalien. (Bot. Mag. Tokyo, XLII, p. 26–32, 1928)
Additional notes on the Melampsoraceae of Saghalien. (Transact. Sapporo Nat. Hist. Soc. X, p. 119–121, 1929)
Notes on the Melampsoraceae collected in the so-called "Tsundra" near Shikka, S. Saghalien. (Jour. Soc. Agr. & For. Sapporo, XXI, p. 56–63, 1929. *In Japanese*)
Erster Beitrag zur Uredineen-Flora von Südsachalin. (Mem. Tottori Agr. Coll. I, p. 63–98, 1930)

[Transact. Sapporo Nat. Hist. Soc., Vol. XI, Pt. 4, 1931]

species were found. The present paper was intended to enumerate not only rusts, but also downy mildews, smuts and powdery mildews collected by the writers.

The genera are listed alphabetically under each family and the species under genus similarly. Under each host a list of the specimens is given with locality and date. In order to avoid prolix repetition, eastern coast is designated as E. C., and western coast as W. C. Moreover, the names of the collectors are omited because it can be assumed that the collection of the eastern coast was made by H. ÔTANI and Y. IMAI, and that of the western coast by Y. TOKUNAGA and K. KAWAI.

The writers wish to express here their sincere thanks to Prof. Emer. Dr. K. MIYABE, Profs. S. ITO and Y. TOCHINAI for their valuable suggestions and critical advices, and to Mr. M. TATEWAKI for determination of some of the hosts. They are also greatly indebted to Messrs. Y. TOKUNAGA and Y. IMAI who have given so many helps during the excursions and the privilege to publish freely the present paper.

PHYCOMYCETES

Albuginaceæ

1. *Albugo candida* (PERS.) O.KUNTZE

On *Arabis pendula* L. *(Yezohatazao)*. E. C.–Higashi-Taraika (July 23, 1930). On *Arabis Stelleri* DC. var. *japonica* FR. SCHM. *(Hamahatazao)*. E. C.-Horo (July 11, 1930), Shikka (July 19, 1930). W. C.-Anbetsu (Sept. 2, 1929). On *Brassica Napus* L. *(Seiyô-aburana)*. W. C.-Tei (Aug. 13, 1929).

Peronosporaceæ

2. *Bremia Lactucae* REGEL

On *Picris japonica* THUNB.*(Kôzorina)*. W.C.-Kita-Nayoshi (Aug. 30, 1929).

3. *Peronospora alta* FUCK.

On *Plantago major* L. var. *asiatica* DECNE. *(Ôbako)*. E.C.-Horo (July 11, 1930). W.C.-Kita-Nayoshi (Aug. 30, 1929).

4. *Peronospora flava* GÄUM.

On *Linaria japonica* MIQ. *(Unran)*. E.C.-Higashi-Taraika (July 23, 1930).

5. *Peronospora Galii* FUCK.

On *Galium trifidum* L. (*Hosobano-yotsubamugura*). E.C.-Shikka (July 19, 1930), Higashi-Taraika (July 23, 1930). On *Galium trifloriforme* KOM. (*Kurumamugura*). W.C.-Kita-Nayoshi (Aug. 28, 1929).

6. *Peronospora Lamii* A. BRAUN.

On *Galeopsis Tetrahit* L. (*Chishima-odoriko*). E.C.-Konuma (July 9. 1930).

7. *Peronospora lapponica* LAGERH.

On *Euphrasia Maximowiczii* WETTST. (*Tachikogomegusa*). E.C.-Shikka (Aug. 7, 1930).

8. *Peronospora Lathyri palustris* GÄUM.

On *Lathyrus palustris* L. var. *pilosus* LEDEB. (*Yezo-renrisô*). E.C.-Shikka (July 22, 1930).

9. *Peronospora media* GÄUM.

On *Stellaria yezoensis* MAXIM. (*Shiraoi-hakobe*). W.C.-Kita-Nayoshi (Aug, 30 1929).

10. *Peronospora minor* (CASP.) GÄUM.

On *Atriplex Patula* L. (*Hama-akaza*). E.C.-Akashiki (Ang. 31, 1929).

11. *Peronospora Pedicularis* PALM.

On *Pedicularis resupinata* L. (*Shiogamagiku*). E.C.-Higashi-Taraika (July 23, 1930).

12. *Peronospora parasitica* (PERS.) FRIES.

On *Cardamine impatiens* L. (*Janinjn*). W.C.-Anbetsu (Sept. 4, 1929), On *Nasturtium palustre* DC. (*Sukashitagobô*). E.C.-Aba (July 31, 1930)

13. *Peronospora variabilis* GÄUM.

On *Chenopodium album* L. var. *centrorubrum* MAKINO (*Akaza*). E.C.-Shikka (July 22, 1930), Motodomari (Aug. 27, 1930). W.C.-Esutori (Aug. 27, 1929)

14. *Plasmopara pygmaea* (UNG.) SCHRÖET.

On *Anemone debilis* FISCH. (*Himeichige*). E.C.-Horo (July 11, 1930)

15. *Rhysotheca Umbelliferarum* (CASP.) WILSON

On *Angelica Maximowiczii* BENTH. (*Hosoba-senkiu*). E.C.-Mt. Tosso (Aug. 9, 1930). On *Angelica anomala* LALLEM. (*Yezono-yoroigusa*). E. C.-Horo (July 11, 1930). On *Ligusticum scoticum* L. (*Maru-a-tôki*). W.C.-Kita-Nayoshi (Aug. 28, 1929).

BASIDIOMYCETES

Ustilaginaceæ

16. *Cintractia Caricis* (PERS.) MAGNUS

On *Carex Arenelli* CHRIST. (*Aizu-suge*). E.C.-Higashi-Taraika (July 23, 1930) On *Carex caryophyllea* LATOUR. subsp. *nervata* KUK. (*Shiba-suge*). E.C.-Shikka (July 19, 1930), Higashi-Taraika (July 23, 1930)

17. *Sphacelotheca Polygoni-senticosi* (P. HENN.) MIYABE et TAKAHASHI

On *Polygonum sagittatum* L. var. *sibiricum* MEISN. (*Unagi-zukami*). W.C.-Kita-Nayoshi (Aug. 30, 1929).

18. *Ustilago Avenae* (PERS.) JENS.

On *Avena sativa* L. (*Enbaku*). W.C.-Kita-Nayoshi (Aug. 27, 1929)

19. *Ustilago echinata* SCHROET.

On *Phalaris arundinacea* L. (*Kusayoshi*). W.C.-Akashiki (Aug. 31, 1929)

20. *Ustilago utriculosa* TUL.

On *Polygonum Hydropiper* L. var. *vulgare* MEISN. (*Yanagi-tade*). E.C.-Manui (Sept. 7, 1929), W.C.-Kita-Nayoshi (Aug. 27, 1929)

Tilletiaceæ

21. *Urocystis Junci* LAGERH.

On *Juncus balticus* WILLD. var. *Haenkei* BUCH. (*Ôinui*). E.C.-Shikka (July 18, 1930)

Pucciniaceæ

22. *Miyagia Anaphalidis* MIYABE

On *Anaphalis margaritacea* BENTH. et HOOK. (*Yama-hahako*). E.C.-Mt. Tosso (Sept. 8. 1929). W.C.-Kita-Nayoshi (Aug. 27, 1929), Anbetsu (Sept. 2, 1929)

23. *Phragmidium americanum* (PECK.) DIET.

On *Rosa Marretii* LÉVEL. (*Karafuto-bara*). E.C.-Higashi-Taraika (July 23, 1930) W.C.-Kita-

Nayoshi (Aug. 27, 1929), Anbetsu (Sept. 2, 1929)

24. *Phragmidium arcticum* LAGERH.

On *Rubus arcticus* L. (*Chishima-Ichigo*). E.C.-Shikka (July 18, 1930)

25. *Phragmidium Rosae-acicularis* LIRO

On *Rosa acicularis* LINDL. var. *Gmelini* SCHNEID. (*Ôtakane-bara*). E.C.-Horo (July 11, 1930)

26. *Phragmidium Rubi-Idaei* (PERS.) KARST.

On *Rubus idaeus* L. var. *aculeatissimus* Rgl. (*Yezo-ichigo*). E.C.-Manui (Sept. 7, 1929), Mt. Kashipo (Sept. 9, 1929)

27. *Phragmidium yezoense* KASAI

On *Rosa rugosa* THUNB. (*Hamanasu*). E.C.-Shikka (July 18, 1930)

28. *Puccinia Absinthii* DC.

On *Artemisia vulgaris* L. var. *kamtschatica* BESS. (*Yezo-yomogi*). E.C.-Mt. Tosso (Sept. 8, 1929), Manui (Sept. 7. 1929). W.C.-Kita-Nayoshi (Aug. 28, 1929)

29. *Puccinia Acetosae* (SCHUM.) KOERN.

On *Rumex Acetosella* L. (*Hime-suiba*). W.C.-Kita-Nayoshi (Aug. 30, 1929)

30. *Puccinia agropyrina* ERIKSS.

On *Agropyron repens* BEAUV. (*Shiba-mugi*). E.C.-Toyohara (Sept. 5, 1929)

31. *Puccinia Agrostidis* PLOWR.

On *Agrostis hiemalis* B. S. P. (*Yezo-nukabo*). W.C.-Kita-Nayoshi (Aug. 28, 1929). On *Agrostis perenans* TUCKERN (*Yama-nukabo*). W.C.-Kita-Nayoshi (Aug. 28, 1929)

32. *Puccinia Allii* (DC.) RUD.

On *Allium splendens* WILLD. (*Chishima-rakkyô*). E.C.-Mt. Tosso (Sept. 8, 1929. Aug. 9, 1930). W.C.-Akashiki (Aug. 31, 1929)

33. *Puccinia Angelicae* (SCHUM.) FUCK.

On *Angelica refracta* FR. SCHM. (*Yezono-ôbasenkyu*). E.C.-Konuma (Aug. 5, 1930). W.C.-Kita-Nayoshi (Aug. 29, 1929)

34. *Puccinia Angelicae-edulis* T. MIYAKE

On *Angelica edulis* MIYABE (*Amanin*). W.C.-Kita-Nayoshi (Aug. 29, 1929). On *Angelica anomala*

LALLEM (*Yezono-yoroigusa*). E.C.-Mt. Tosso (Sept. 8, 1929) W.C.-Tsumanai (Sept. 8, 1929). On *Angelica ursina* BENTH. et HOOK. (*Yezoniu*). E.C.-Mt. Tosso (Sept. 8, 1929. Aug. 8, 1930), Mt. Kashipo (Sept. 6, 1929). W.C.-Akashiki (Aug. 31, 1929), Anbetsu (Sept. 3, 1929), Kita-Nayoshi (Aug. 28, 1929), Tsumanai (Sept. 3, 1929)

35. *Puccinia Arenariae* (SCHUM.) WINT.

On *Stellaria media* CYR. (*Hakobe*). W.C.-Kita-Nayoshi (Aug. 28, 1929)

36. *Puccinia argentata* (SCHULTZ) WINT.

On *Impatiens Noli-tangere* L. (*Kitsurifune*). E.C.-Konuma (Aug. 5, 1930). W.C.-Kita-Nayoshi (Aug. 28, 1929), Akashiki (Aug. 31, 1929), Anbetsu (Sept. 2, 1929)

37. *Puccinia asarina* KZE.

On *Asarum Sieboldi* MIQ. (*Usuba-saishin*). E.C.-Konuma (July 10, 1930)

38. *Puccinia brevicornis* S. ITO

On *Calamagrostis Langsdorffii* TRIN. (*Iwanogariyasu*). E.C.-Kurokawa (July 9, 1930)

39. *Puccinia Bupleuri-falcati* (DC.) WINT.

On *Bupleurum sachalinense* FR. SCHM. (*Hotarusaiko*). W.C.-Kita-Nayoshi (Aug. 28, 1929)

40. *Puccinia calumnata* SYD.

On *Polygonum Weyrichii* FR. SCHM. (*Urajiro-tade*). E.C.-Mt. Tosso (Sept. 8, 1929) Manui (Sept. 8, 1929)

41. *Puccinia Calthaecola* SCHROET.

On *Caltha palustris* L. var. *typica* REGEL. (*Yezo-ryukinka*). E.C.-Konuma (July 9, 1930)

42. *Puccinia Caricis* (SCHUM.) REB.

On *Carex Lyngbyei* HORNEM. (*Yarame-suge*). E.C.-Horo (July. 11, 1930). Konuma (Aug. 8, 1930). On *Carex laevirostris* BLYTT (*Ôkasasuge*). W.C.-Kita-Nayoshi (Aug. 28, 1929). On *Carex Gmelini* HK. et ARN. (*Nemuro-suge*). W.C.-Kita-Nayoshi (Aug. 31, 1929). On *Carex pisiformis* BCOTT. var. *sachalinensis* KUK. (*Ôito-suge*). E.C.-Horo, Kurokawa (July 10, 1930)

43. *Puccinia Clintoniae-udensis* BUBÁK

On *Clintonia udensis* TRAUTV. et MEY. (*Tsubame-omoto*). E.C.-Mt. Kashipo (Sept. 9, 1929)

44. *Puccinia Chrysosplenii* GREV.

On *Chrysosplenium flagelliferum* FR. SCHM. (*Kobano-nekonomesô*). W.C.-Anbetsu (Sept. 2, 1929)

45. *Puccinia Cicutae* LASCH

On *Cicuta virosa* L. (*Dokuzeri*). E.C.-Konuma (Aug. 8, 1930)

46. *Puccinia Cirsii* LASCH

On *Cirsium Weyrichii* MAXIM. (*Tani-azami*). W.C.-Kita-Nayoshi (Aug. 28, 1929). On *Cirsium pectinellum* A. GRAY var. *typicum* NAKAI (*Yezono-sawaazami*). W.C.-Anbetsu (Sept. 2, 1929)

47. *Puccinia Circaeae* PERS.

On *Circaea alpina* L. (*Miyama-tanitade*). E.C.-Mt. Kashipo (Sept. 8, 1929). W.C.-Kita-Nayoshi (Aug. 29, 1929), Akashiki (Aug. 31, 1929), Anbetsu (Sept. 2, 1929)

48. *Puccinia Eriophori* THUEM.

On *Eriophorum vaginatum* L. (*Watasuge*). E.C.-Kurokawa (July 10, 1930)

49. *Puccinia ferruginosa* SYD.

On *Artemisia vulgaris* L. var. *kamtschatica* BESS. (*Yezo-yomogi*). E.C.-Konuma (Aug. 5, 1930). W.C.-Kita-Nayoshi (Aug. 28, 1929)

50. *Puccinia Haleniae* ARTH. et HOLW.

On *Halenia sibirica* BORKH. (*Hanaikari*). E.C.-Mt. Tosso (Sept. 2, 1929. Aug. 9, 1930). W.C.-Kita-Nayoshi (Aug. 27, 1929), Akashiki (Aug. 31, 1929), Anbetsu (Sept. 2, 1929)

51. *Puccinia Hemerocallidis* THUEM.

On *Hemerocallis Middendorfii* TRAUTV. et. MEY. (*Yezo-kwanzô*). E.C.-Higashi-Taraika (July 23, 1930), Toyohara (Aug. 9, 1930). W.C.-Anbetsu (Sept. 2, 1929)

52. *Puccinia Hieracii* (SCHUM.) MART.

On *Hieracium umbellatum* L. (*Yanagi-tampopo*). E.C.-Shikka (July 20, 1930), Mt. Tosso (Aug. 9, 1930), Toyohara (Aug. 12, 1930). W.C.-Kita-Nayoshi (Aug. 29, 1929)

53. *Puccinia Iridis* (DC.) WALLR.

On *Iris setosa* PALL. (*Hôgi-ayame*). W.C.-Akashiki (Aug. 31, 1929).

54. *Puccinia lactucicola* MIURA

On *Lactuca sibirica* BENTH. (*Yezo-murasaki-nigana*). E.C.-Konuma (Aug. 5, 1930) Manui (Sept. 2, 1929), Mt. Tosso (Sept. 8, 1929). W.C.-Kita-Nayoshi (Aug. 29, 1929), Anbetsu (Sept. 2, 1929)

55. *Puccinia ligusticicola* T. MIYAKE

On *Ligusticum scoticum* L. (*Maruba-tôki*). W.C.-Kita-Nayoshi (Aug. 30, 1929) Akashiki (Aug. 31, 1929)

56. *Puccinia leioderma* LINDR.

On *Aegopodium alpestre* LEDEB. (*Yezo-bôfû*). W.C.-Akashiki (Aug. 31, 1929)

57. *Puccinia Magnusiana* KOERN.

On *Phragmites communis* TRIN. (*Kitayoshi*). W.C.-Akashiki (Aug. 31, 1929)

58. *Puccinia Majanthemi* DIET.

On *Majanthemum dilatatum* NELS. et MACBR. (*Ômaizurusô*). E.C.-Konuma (July 9, 1930), Shikka (July 22, 1930), Higashi-Taraika (Aug. 9, 1930), Tominai (Aug. 5, 1930), Tosso (Aug. 9, 1930). W.C.-Kita-Nayoshi (Aug. 27, 1929)

59. *Puccinia Passerinii* SCHROET.

On *Thesium repens* LEDEB. (*Kamayarisô*). E.C.-Horo (July 11, 1930)

60. *Puccinia Phragmitis* (SCHM.) KOERN.

On *Phragmites communis* TRIN. (*Kitayoshi*). E.C.-Manui (Sept. 7, 1929)

61. *Puccinia Picridis* HAZSL.

On *Picris japonica* THUNB. (*Kôzorina*). W.C.-Kita-Nayoshi (Aug. 28, 1929)

62. *Puccinia Poarum* NIELS.

On *Poa sphondylodes* TRIN. var. *strictula* KOIZ. (*Ichigo-tsunagi*). E.C.-Konuma (July 9, 1930), Shikka (July 22, 1930), Higashi-Taraika (July 23, 1930)

63. *Puccinia Polygoni-Weyrichii* MIYAKE in sched. n. sp.

Spermogonia and aecidia unknown.

Uredosori hypophyllous, small ($\frac{1}{3}$–$\frac{1}{2}$ mm.), scattered, roundish, naked, powdery, ferruginous; uredospores globoid, ovoid or ellipsoidal, echinulate, yellowish or subhyaline, 21–32 × 18–25 μ, wall ca. 2.5 μ, with often thickened apex (5–7 μ), germ-pores 2 in the lower half. Teleutosori hypophyllous, small ($\frac{1}{3}$–1 mm.), roundish, scattered or gregarious, early naked, compact, brown to black; teleutospores ellipsoidal, broad ellipsoidal or oblong-clavate, sometimes irregular in

shape, rounded at both ends, not thickened above, slightly or not constricted at the septum, smooth or with few minute warts, chestnut-brown, 27–45 × 15–26 μ, wall 2–2.5 μ thick, germ-pore of the upper cell mostly apical, rarely just above the septum, that of the lower just below the septum, without or with flattened hyaline papilla on them; pedicels hyaline, short, fragile.

Fig. 1.
Puccinia Polygoni-Weyrichii MIYAKE

On Polygonum Weyrichii FR. SCHM. *(Urajiro-tade)*.E.C.-Mt. Kashipo (Aug. 20, 1929). W.C.-Akashiki (Aug. 31, 1929). Anbetsu (Sept. 2, 1929).

Remarks. The present species somewhat relates to *Puccinia calumnata* SCHROET. and *Puccinia nitidula* TRANZ. but it differs from them by the position of the germ-pore of the lower cell of the teleutospore.

64. *Puccinia punctata* LINK

On *Asperula odorata* L. (*Kurumabasô*). E.C.-Tosso (Aug. 31, 1929). On *Galium verum* L. (*Kawara-matsuba*). E.C.-Tosso (Sept. 31, 1929). W.C.-Akashiki (Aug. 31, 1929), Anbetsu (Sept. 2, 1929)

65. *Puccinia Ribis* DC.

On *Ribes rubrum* L. var. *pubescens* SWARTZ. (*Karafuto-suguri*). W.C.-Tsumanai (Aug. 31, 1929)

6 *Puccinia Rubiae-tataricae* SYD.

On *Veratrum album* L. var. *Lobelianum* REICHB. f. *japonica* BAK. (*Baikeisô*). E.C.-Higashi-Taraika (July 22, 1930)

67. *Puccinia sessilis* SCHNEID.

On *Phalaris arundinacea* L. var. *genuina* HACKEL (*Kusayoshi*). E.C.-Manui (Sept. 7, 1929). W.C.-Kita-Nayoshi (Aug. 29, 1929), Anbetsu (Sept. 2, 1929)

68. *Puccinia Sonchi-arvensis* TOKUNAGA & KAWAI, n. sp.

Teleutosori hypophyllous, very rarely epiphyllous, small (0.2–0.5 mm.), roundish, isolated or densely gregarious in roundish or elongated groups up to 3 mm. across or 6 mm. long along the veins with conspicuous purple spots, early naked, ruptured epidermis not so conspicuous, sometimes confluent, compact pulvinate, blackish-brown. Teleutospores clavate or oblong, apex rounded

or obtusely pointed acute, thickened (6-11 μ), base rounded or attenuated, slightly constricted at the septum, smooth, chestnut-brown, darker at apex, 39–61 × 17–20 μ, germ-pore of the upper cell at the apex, that of the lower just below the septum; pedicels hyaline, 30–66 μ long, persistent.

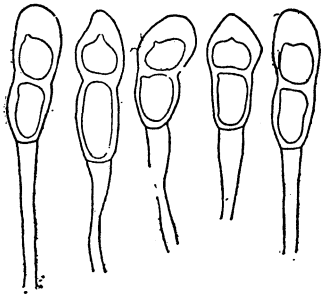

Fig. 2.

Puccinia Sonchi-arvensis TOKUNAGA & KAWAI

On *Sonchus arvensis* L. var. *uliginosus* TRAUTV. *(Hachijôna)* W.C.-Kita-Nayoshi (Aug. 28, 1929).

Remarks. The present fungus clearly differs from *Puccinia Sonchi* ROB. by the absence of paraphyses and the early naked sori. It is also distinguishable from *Puccinia sonchina* SYD. by the smooth epispore.

69. *Puccinia Spergulae* DC.

On *Spergula arvensis* L. (*Ôtsumekusa*). E.C.-Konuma (July 9, 1930)

70. *Puccinia Tokunagai* ITO et KAWAI, n. sp.

Teleutosori hypophyllous or on bracts, small, roundish (0.4–0.8 mm. across), scattered or gregarious in roundish groups (2–4 mm. across), with brownish discolored spot, black, early naked but covered by the hairs of the host plant, rather inconspicuous, compact. Teleutospores clavate or long ellipsoidal, apex slightly constricted at the septum, smooth, chestnut-brown, upper cell darker in color, 48–80 × 20–29 μ, germ-pore of the upper cell at the apex, that of the lower just below the septum; pedicels hyaline or subhyaline, fragile, up to 35 μ long; mesospores rarely mixed in the sori.

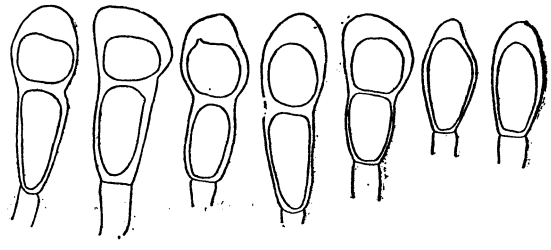

Fig. 3.

Puccinia Tokunagai ITO et KAWAI

On *Leontopodium sachalinense* MIYABE et KUDO *(Yezo-usuyukisô)*. E.C.-Mt. Tosso (Sept. 8, 1929)

71. *Puccinia tossoensis* TOKUNAGA & KAWAI n. sp.

Uredosori epiphyllous, small (0.2–0.5 mm. across), roundish, scattered, early

naked, pulverulent, blackish-brown. Uredospores ovate, ovate-oblong or ellipsoidal, echinulate, yellow or orange-yellow, 28–36 × 25–27 μ, epispore 2–2.5 μ thick, slightly thickened at the base, germ-pores 2 or 3, equatorial. Teleutosori mostly epiphyllous, early naked, surrounded by the ruptured epidermis, pulverulent, black. Teleutospores globoid, ovoid or broadly ellipsoidal, slightly or not thickened at the apex (ca. 5 μ) with lighter colored papilla, rounded at the both ends, slightly or not constricted at the septum, verrucose, chestnut-brown, 32–41 × 26–36 μ, epispore 2–3 μ; germpore of the upper cell at the apex, that of the lower at the upper half, with small lighter colored papilla on the lower one; pedicels short, hyaline, subdeciduous.

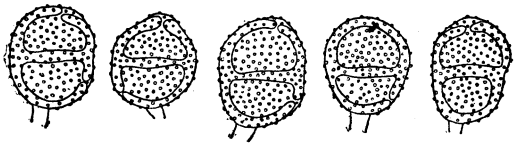

Fig. 4.

Puccinia tossoensis TOKUNAGA & KAWAI

On *Serratula atripricifolia* BENTH. et HOOK. *(Karafuto-yamabokuchi)* E.C.-Mt. Tosso (Sept. 8, 1929), Mt. Kashipo (Sept. 9, 1929)

Remarks. The present species somewhat relates to *Puccinia tinctoniae* P. MAGN. but it differs clearly by the broader teleutospore.

72. *Puccinia Veratri* NIESSL

On *Veratrum album* L. var. *Lobelianum* REICHB. f. *japonica* BAK. *(Baikeisô)* E.C.-Higashi-Tarai-ka (July 23, 1930)

73. *Puccinia Violae* (SCHUM.) DC.

On *Viola sylvestriformis* W. BECKR. *(Ainu-tachitsubosumire)*. E.C.-Tosso (Sept. 8, 1929), Toyohara (Aug. 12, 1930)

74. *Rostrupia Elymi* (WEST.) LAGERH.

On *Elymus mollis* TRIN. *(Tenkigusa)*. W.C.-Akashiki (Aug. 31, 1929), Anbetsu (Sept. 2, 1929), On *Elymus dahuricus* TURCZ. *(Hamamugi)*. W.C. Anbetsu (Sept. 2, 1929)

75. *Uromyces caryophyllinus* (SCHRANK) WINT.

On *Dianthus superbus* L. *(Kawara-nadeshiko)*. E.C.-Mt. Tosso (Sept. 8, 1929)

76. *Uromyces Fabae* (PERS.) DE BARY

On *Lathyrus maritinus* (L.) BIGEL. *(Hamaendô)*. E.C.-Mt. Tosso (Sept. 8, 1929), Shikka (July

19, 1930). On *Lathyrus palustris* L. var. *pilosus* LEDEB. (*Yezono-renrisô*). E.C.-Kashipo (Sept. 7, 1929). W.C.-Akashiki (Aug. 31, 1929). On *Vicia japonica* A. GRAY (*Hiroha-kusafuji*). W.C.-Akashiki (Aug. 31, 1929)

77. *Uromyces Geranii* (DC.) OTTH et WARTM.

On *Geranium erianthum* DC. (*Chishima-furô*). W.C.-Anbetsu (Sept. 2, 1929)

78. *Uromyces Hedysari-obscuri* (DC.) CAR. et PICC.

On *Hedysarum obscurum* L. (*Chishima-renge*). E.C.-Mt. Tosso (Sept. 8, 1929), Mt. Koshipo (Sept. 9, 1929)

79. *Uromyces japonicus* BERK. et CURT.

On *Allium Victorialis* L. (*Gyôja-ninniku*). E.C.-Kurokawa (July 23, 1930)

80. *Uromyces Polygoni* (PERS.) FUCK.

On *Polygonum aviculare* L. (*Michiyanagi*). E.C.-Higashi-Taraika (Sept. 4, 1929)

81. *Uromyces Veratri* (DC.) SCHROET.

On *Veratrum album* L. var. *Lobelianum* REICHB. f. *japonica* BAK. (*Baikeisô*) E.C.-Mt. Kashipo (Sept. 9, 1929), Higashi-Taraika (July 23, 1930), Chikahoro (Sept. 7, 1930)

82. *Xenodochus carbonarius* (WINT.) SCHLECHT.

On *Sanguisorba tenuifolia* FISCH. var. *alba* TRAUTV. et MEY. (*Shiro-waremokô*) E.C.-Shikka (Aug. 7, 1930), Kurokawa (July 10, 1930). W.C.-Kita-Nayoshi (Aug. 28, 1929)

Melampsoraceae

83. *Calyptospora Goeppertiana* KÜHN

On *Vaccinium Vitis-Idaea* L. (*Kokemomo*). E.C.-Mt. Kashipo (Sept. 7, 1929), Mt. Tosso (Sept. 9, 1929), Shikka (July 16, 1930), Horo (July 11, 1930). W.C.-Anbetsu (Sept. 2, 1929). On *Abies sachalinensis* FR. SCHM. (*Todomatsu*). E.C.-Konuma (July 9, 1930), Shikka (July 20, 1930)

84. *Chrysomyxa alpina* HIRATS.

On *Rhododendron chrysanthum* PALL. (*Kibana-shakunage*). E.C.-Mt. Kashipo (Sept. 9, 1929), Mt. Tosso (Aug. 9, 1930)

85. *Chrysomyxa Cassandrae* (PECK. et CLINT.) TRANZ.

On *Chamaedaphne calyculata* MOENCH. (*Horomui-tsutsuji*). E.C.-Shikka (July 20, 1930)

86. *Chrysomyxa Ledi* (ALB. et SCHW.) DE BARY

On *Ledum palustre* L. var. *diversipilosum* NAKAI (*Karafuto-isotsutsuji*) E. C.-Kurokawa (July 10, 1930). On *Ledum palustre* L. var. *vulgare* LEDEB. (*Hosoba-isotsutsuji*). E.C.-Shikka (July 20, 1930)

87. *Coleosporium Cacaliae* OTTH.

On *Cacalia hastata* L. var. *glabra* LEDEB. (*Yobusumasô*). W.C.-Anbetsu (Sept. 2, 1929). On *Cacalia auriculata* DC. var. *ochotensis* MAXIM. (*Karafuto-mimikômori*). E.C.-Mt. Tosso (Sept. 8, 1929), Mt. Kashipo (Sept. 9, 1929)

88. *Coleosporium cimicifugatum* THUEM.

On *Cimicifuga yezoensis* KUDO (*Yezoshôma*). E.C.-Mt. Kashipo (Sept. 9, 1929), Mt. Tosso (Sept. 8, 1929) Mt. Tosso (Sept. 8, 1929)

89. *Coleosporium Ligulariae* THUEM.

On *Ligularia calthaefolia* MAXIM. (*Takarakô*). E.C.-Mt. Kashipo (Sept. 9, 1929). W.C.-Akashiki (Aug. 31, 1929)

90. *Coleosporium Saussureae* THUEM.

On *Saussurea acuminata* TURCZ. (*Tonakai-azami*). E.C.-Mt. Kashipo (Sept. 9, 1930). On *Saussurea manshurica* KOM. (*Yanone-azami*). W.C.-Akashiki & Anbetsu (Aug. 31, 1929). On *Saussurea nupuripoensis* MIYABE et MIYAKE (*Nupuripo-azami*). E.C.-Mt. Tosso (Sept. 8, 1929). W.C.-Kita-Nayoshi (Aug. 28, 1929). On *Saussurea sachalinensis* FR. SCHM. (*Karafuto-azami*). E.C.-Mt. Tosso (Sept. 8, 1929)

91. *Coleosporium Senecionis* (PERS.) FR.

On *Senecio nemorensis* L. var. *fuchsii* KOCH. (*Hosoba-kion*). W.C.-Anbetsu (Sept. 2, 1929). On *Senecio palmatus* PALL. (*Hangonsô*). E.C.-Mt. Kashipo (Sept. 9, 1929). W.C.-Kita-Nayoshi (Aug. 29, 1929)

92. *Melampsora Larici-Capraearum* KLEB.

On *Salix Bakko* KIMURA (*Bakko-yanagi*). E.C.-Shikka (July 20, 1930)

93. *Melampsoridium Hiratsukanum* ITO

On *Alnus hirsuta* TURCZ. (*Keyama-hannoki*). W.C.-Kita-Nayoshi (Aug. 27, 1929)

94. *Melampsorella Cerastii* (MART.) WINT.

On *Stellaria radians* L. (*Yezo-byama-hakobe*). E.C.-Higashi-Taraika (July 23, 1930). W.C.-Anbetsu (Sept. 2, 1929). On *Stellaria longifolia* MÜHLB. (*Yezo-nomino-fusuma*). E.C.-Higashi-Taraika

(July 23, 1930). W.C.-Kita-Nayoshi (Aug. 27, 1929), Akashiki (Aug. 31, 1929)

95. *Mesospora Hypericorum* (DC.) DIET.

On *Hypericum Gebleri* LEDEB. (*Suzuya-tomoe*). E.C.-Konuma (Aug. 5, 1930)

96. *Pucciniastrum Circaeae* (SCHUM.) SPEG.

On *Circaea alpina* L. (*Miyama-tanitade*). E.C.-Mt. Kashipo (Sept. 8, 1929). W.C.-Akashiki (Aug. 31, 1929)

97. *Pucciniastrum pustulatum* (PERS.) DIET.

On *Epilobium angustifolium* L. (*Yanagi-ran*). E.C.-Tosso (Sept. 8, 1929), Mt. Kashipo (Sept. 9, 1929). W.C.-Kita-Nayoshi (Aug. 27, 1929), Anbetsu (Sept. 2, 1929)

98. *Thekopsora Vacciniorum* (DC.) KARST.

On *Vaccinium Vitis-Idaea* L. (*Kokemomo*). E.C.-Mt. Tosso (Sept. 8, 1929), Horo (July 11, 1930), Sakaehama (July 16, 1930)

99. *Thekopsora myrtillina* KARST.

On *Vaccinium Sinaïi* A. GRAY (*Ôba-sunoki*). W.C.-Anbetsu (Sept. 2, 1929)

ASCOMYCETES

Erysiphaceæ

100. *Erysiphe aquilegiae* DC.

On *Aconitum umbrosum* KOM. (*Oreijinso*). W.C.-Tsumanai (Sept. 3, 1929). On *Caltha palustris* L. var. *typica* RGL. (*Yezo-ryukinkwa*). E.C.-Konuma (Aug. 5, 1930). On *Ranunculus repens* L. var. *major* NAKAI (*Haikinpôge*). W.C.-Kita-Nayoshi (Aug. 29, 1929). On *Thalictrum Thunbergii* A. P. DC. var. *majus* NAKAI (*Yezo-akikaramatsu*). W.C.-Anbetsu (Sept. 2, 1929)

101. *Erysiphe cichoracearum* DC.

On *Arabis pendula* L. (*Yezo-hatazao*). E.C.-Tei (Aug. 13, 1930). On *Artemisia vulgaris* L. var. *latiloba* L. (*Hiroha-urajiro-yomogi*). E.C.-Tosso (Sept. 8, 1929). On *Artemisia vulgaris* L. var. *kamtschatica* BESS. (*Yezo-yomogi*). E.C.-Toyohara (Sept. 5, 1929). W.C.-Kita-Nayoshi (Aug. 29, 1929). On *Artemisia laciniata* WILLD. var. *latifolia* MAXIM. (*Hiroha-kiku-yomogi*). E.C.-Tosso (Aug. 9, 1930) On *Cirsium schantarense* TRAUTV. et MEY. (*Okuyezo-azami*). W.C.-Kita-Nayoshi (Aug. 27, 1929). On *Cirsium Weyrichii* MAXIM. (*Yezo-azami*). E.C.-Tosso (Aug. 9, 1930). On *Plantago kamtschatica* LINK. (*Yezo-ôbako*). W.C.-Kita-Nayoshi (Aug. 29, 1929). On *Plantago major* L. var. *asiatica* DECNE. (*Ôbako*). E.C.-Konuma (Aug. 5, 1930). W.C.-Kita-Nayoshi (Aug. 29, 1929), Tsumanai (Sept. 3, 1929). On

Polemonium coeruleum L. var. *laxiflorum* MIYABE et KUDO (*Karafuto-hanashinobu*). W.C.-Kita-Nayoshi (Aug. 29, 1929). On *Polemonium coeruleum* L. var. *racemosum* MIYABE et KUDO (*Kushiro-hanashinobu*). E.C.-Shikka (Aug. 7, 1930). On *Sonchus arvensis* L. var. *uliginosus* TRAUTV. (*Hachijôna*). E.C.-Konuma (Aug. 5, 1930)

102. *Erysiphe galeopsides* DC.

On *Galeopsis Tetrahit* L. (*Chishima-odoriko*). E.C.-Shikka (July 22, 1930). W.C.-Kita-Nayoshi (Aug. 29, 1929), Anbetsu (Sept. 4, 1929). On *Lamium album* L. var. *barbatum* FRANCH. et SAV. (*Odorikoso*). W.C.-Akashiki (Aug. 31, 1929)

103. *Ersiphe graminis* DC.

On *Agropyron repens* BEAUV. (*Shibamugi*). E.C.-Shikka (July 22, 1930). On *Poa sphondylodes* TRIN. var. *strictula* KOIDZ. (*Ichigotsunagi*). E.C.-Higashi-Taraika (July 23, 1930). On *Trisetum flavescens* BEAUV. var. *genuinum* HACKEL (*Chishima-kanitsurigusa*). E.C.-Higashi-Taraika (July 23, 1930)

104. *Microsphaera Bäumleri* P. MAGN.

On *Vicia japonica* A. GRAY (*Hiroha-kusafuji*). W.C.-Kita-Nayoshi (Aug. 28, 1929) Akashiki (Sept. 3, 1929)

105. *Podosphaera Oxyacanthae* (DC.) DE BARY

On *Crataegus chlorosarca* MAXIM. (*Kuromi-sanzashi*). E.C.-Konuma (Aug. 5, 1930)

106. *Sphaerotheca epilobii* (WALLR.) SACC.

On *Epilobium cephalostigma* HAUSSKN. (*Kegon-akabana*). E.C.-Konuma (Aug. 28, 1930). On *Epilobium glandulosum* LEHM. (*Karafuto-akabana*). E.C.-Konuma (Aug. 5, 1930) W.C.-Kita-Nayoshi (Aug. 28, 1929). On *Epilobium palustre* L. (*Hosoba-akabana*). E.C.-Tominai (Aug. 5, 1930)

107. *Sphaerotheca fuliginea* (SCHLECHT.) POLLAC.

On *Cacalia auriculata* DC. var. *kamtschatica* MAXIM. (*Mimikômori*). E.C.-Chikahoro (Aug. 9, 1930). On *Cacalia auriculata* DC. var. *ochotensis* MAXIM. (*Karafuto-mimikômori*). W.C.-Akashiki (Sept. 3, 1929). On *Cacalia hastata* L. var. *pubescens* LEDEB. (*Urage-yobusumasô*). W.C.-Anbetsu (Sept. 3, 1929). On *Cirsium Weyrichii* MAXIM. (*Yezo-azami*). E.C.-Chikahoro (Aug. 9, 1930). On *Filipendula kamtschatica* MAXIM. form. *typica* KOIDZ. (*Oni-shimotsuke*). E.C.-Aba (July 31, 1930), Tominai (Aug. 3, 1930). W.C.-Kita-Nayoshi (Aug. 30, 1929). On *Impatiens Noli-tangere* L. (*Kitsurifune*). E.C.-Chikahoro (Aug. 9, 1930). W.C.-Akashiki (Aug. 31, 1929). On *Pedicularis respinata* L. (*Shiogama-giku*). W.C.-Kita-Nayoshi (Aug. 29, 1929). On *Saussurea manshurica* KOM. (*Yanone-azami*). W.C.-Akashiki (Aug. 31, 1929). On *Senecio nemorensis* L. var. *Fuchsii* KOCH. (*Hosoba-kion*). W.C.-Anbetsu (Sept. 2, 1929)

108. *Sphaerotheca Mors-Uvae* (SCHWEIN.) BERK. et CURT.

On *Euphorbia Sieboldiana* MORR. et DECNE. (*Natsutôdai*). E.C.-Tosso (Aug. 9, 1930)

摘　　要

１９２９年夏著者の一人河合は德永芳雄氏と共に、南樺太特に其の西海岸地方に於て、植物採集旅行を試み、翌年夏著者の一人大谷は今井勇三郎氏と共に、其の東海岸に於て、顯花植物並に菌類の採集を試みたり。

本報告は此等の旅行に於て採集せる寄生菌類中、藻菌十五種、黑穗菌六種、銹菌七十八種、及びウドン粉菌八種に就いて報告せるものなり。內新種と認めて記載せるものは、次の四種なりとす。

Puccinia Polygoni-Weyrichii MIYAKE
Puccinia Sonchi-arvensis TOKUNAGA et KAWAI
Puccinia Tokunagai ITO et KAWAI
Puccinia tossoensis TOKUNAGA et KAWAI

A MORPHOLOGICAL STUDY ON THE GASTRIC GLAND CELLS IN *HYNOBIUS* WITH SPECIAL REFERENCES TO NUCLEAR ACTIVITY

BY

TEIJIRO HAYASHI

(With 2 Text Figures and 2 Plates)

山椒魚胃中の分泌細胞の研究、特に其の核に就いて

林　禎　二　郎

Introduction

In a previous paper on the poisonous glands of *Hynobius lichenatus*, BOUL.,* it was observed, that during the activity of the gland cells, the nuclei have an exceedingly important function on the new formation of the poisonous granules within cytoplasm. Furthermore, while studying the gastric gland cells of *Hynobius lichenatus*, the author has recently lighted upon some evidences, leading him to believe also in the nuclear secretions of these gland cells.

The secretive activities of nuclei in gland cells, however, were already observed by many authors; namely MARSHALL and VORHIES (1906), MAZIARSKI (1911), NAKAHARA (1917), KINNEY (1926), NOEL and PAILLOT (1927), BEAMS and WU (1929) and WU (1930) respectively on the spinning glands of insect larvae, and GARDIER (1927), GRESSON (1929) and MEHTA (1930) each on the insect oogenesis.

* Synonym of *H. retardatus* DUNN.

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Recently JACOBS (1929) published his studies on the gland of midgut of *Astacus leptodactylus*, stating that "Unabhängig von diesen Sekretbildungsvorgängen kommt oft, höchstwahrscheinlich in enger Beziehung zum Zellkern (Ausstossung von Nukleolensubstanz) die Bildung von sogenannten „Parasomen" vor; diese bleiben in Ein- und Mehrzahl gewöhnlich dicht distal vom Kern liegen".

The above mentioned observations are so far the important studies which have been made in the recent years concerning the interrelation between nucleus and the secretory granules of a gland cell. So far as I am aware there are but few contributions to literature on the gastric glands of the animals in this field, except, the remarkable observation by MA (1928) on the mitochondrial contents of the gastric glands of domestic animals. According to him, the zymogen granules of the gland cells are directly derived from the filamentous mitochondria by fragmentation of the granules. Though such mitochondrial theory of the secretory granules has been supported hitherto by many observations, quite recently WU (1930) described how in the spinning gland cells of Galleria mellonella, the mitochondria shows a negligible function in silk secretion.

Now with a view to determine the secretory questions of nuclei I have carried out the cytological study on the gastric gland of *Hynobius lichenatus* which stands very low in the zoological scale in many respects.

Material and Methods

The material employed was a species of Urodela, *Hynobius lichenatus* BOUL., which is found abundantly in Hokkaido. The animal was kept in our laboratory, being fed artificially with small pieces of fish flesh, meat and insects. As the animal has preserved its health well, I could observe the normal tissues of the stomach which contained the food materials in it.

For fixation Gilson's fluid and Zenker's fluid were employed and for staining either the Delafield's haematoxylin-eosin method or Mallory's connective tissue stain method was used.

The method for the mitochondrial study was as follows: Fixed in the

mixture of 80 parts of 3% aqueous solution of potassium dichromate and 20 parts of neutral formalin for two days, changing the fluid every day. Then washed the tissue a few seconds in distilled water and transferred into the mixture which contained in equal parts acet. pyrolignosum rect. and 1% aqueous solution of chromic acid, to remain for 24 hours. Then continued the chromation in 3.5% potassium dichromate solution for three days changing the fluid every day. Next washed in running water for 24 hours. After cutting in paraffin stained the sections with Heidenhain's iron-haematoxylin.

General observations

The gastric wall of *Hynobius* consists of four membranes as other vertebrates as follows; mucous, submucous, muscular and serous membranes (Text fig. 1).

The mucous membrane which makes the innermost coat of the stomach and includes the true functional cells for digestion, is divided into three layers; the epithelial layer (e), tunica propria (t.p) and muscularis mucosae (m.m). The epithelium of the membrane consists of tubular glands of various length and the epithelial cells. Tunica propria is the tissue which contains connective fibres arranged loosely making a reticular structure. It was an areolar appearances being provided with blood vessels or capillaries. In muscularis mucosae we can find two kinds of muscular bundles; the inner circular and the outer longitudinal layers of plain

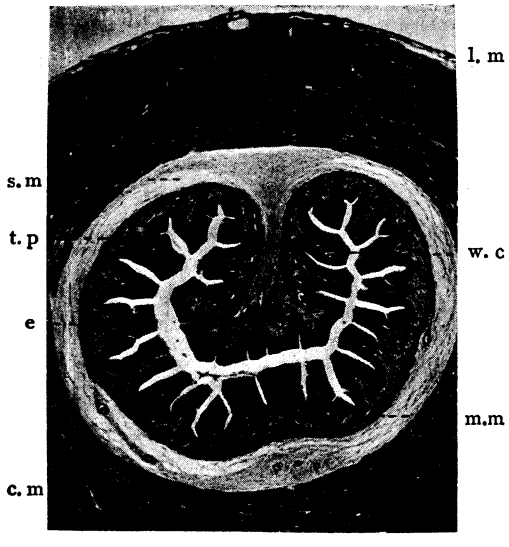

Fig. 1.

Cross-section of the pylorus region, surface epithelium (e); Muscularis mucosae (m); circular (c.m) and longitudinal (l.m) muscle bundles of muscular membrane; submucosa (sm); wandering cell (w.c). ×40

muscular fibres. As OPPEL (1896) described the mucous membrane of the amphibian stomach is divided into two areas, the anterior and the posterior regions. These are characterised by the distribution of the special glands, the former being occupied by the proper gastric glands (gl. gastricae), while the latter includes the pylorus glands (gl. pyloricae).

The submucosa (Text figure 1. s.m) consists of loosely arranged fibres of connective tissue with some elastic fibres. In this layer there are again many blood vessels besides nervous fibres and lymphaticus.

The muscular membrane comprises large bundles of the plane muscle fibres which make the inner circular (Text fig. 1, c.m) and the outer longitudinal (Text fig. 1, l.m) layers. In *Hynobius* in the pylorus region of the stomach, the inner circular muscle bundle occupies a greater part of the gastric wall, the outer longitudinal muscle bundle becoming minor, while in the anterior fundus region both develop equally.

At present the author confines himself to the study of the epithelial cells which take a direct part in the gastic secretion.

I. Surface epithelium

The free surface of the gastric mucous membrane is covered with a single layered columnar epithelium (Text fig. 1, e) in which we can distinguish three kinds of cells of different structure, that is the ciliated epithelial cells, the ordinary mucous cells and the goblet cells.

i. The ciliated epithelial cells (Fig. 1)

The ciliated epithelial cells of the stomach of Urodela were alreadv observed by SCHULTZE (1867). They were also found by PARTSCH (1877) and recently by ROGOSINA (1930) existing in the fish stomach. In the mucous membrane of *Hynobius lichenatus*, these ciliated columnar cells are found usually in the anterior part of the stomach. In the posterior pylorus region, most parts of the free surface are covered only by the ordinary mucous cells (Text fig. 1).

The ciliated cell shows a pyramid in shape and is somewhat greater than ordinary mucous cells. Its apical pole directs to the basement membrane. The cilia are stained weak reddish with Delafield's haematoxylin-eosin and the base-

ment granules of the cilia are stained deep purple. The nuclei in the cells occur in the broad cytoplasmic part of the pyramid and show either oval or long oval form. In the ordinary mucous cells, however, they occupy generally the basal part leaving a large space in the cytoplasm. Therefore the nuclear rows of the ciliated cells are seen more superficially than those of the mucous cells. From this we can easily distinguish the occurrence of the cells. There are usually two or three large nucleoli within the nucleus among numerous chromatin granules in the ciliated cells.

Sometimes, surrounding these oval nuclei there appears a clear zone, especially in the supranuclear part of the cytoplasm, and in addition to this by the mitochondrial method the fine granular bodies are often observed outside of the clear zone. Such a clear zone appears not only in the ciliated cells but also in the other kind of gland cells of the mucous membrane, perhaps as an indicator of the nuclear secretion which the writer will describe in detail later in this paper.

ii. The ordinary mucous cells

The ordinary mucous cells are found most frequently in the surface epithelium of the stomach. The cells are possessed of the typical columnar forms. On the distal surface which is usually broad, there is always some amount of secretion which is stained either deep blue with Mallory's stain (Fig. 3) or grayish black with Heidenhain's iron-haematoxylin. The amount of secretion, as well as its staining capacity is variable according to the phases of the physiological activity of the cells. In the early stage of secretion there appear some granules on the surface of the cells. The granules show an intensive staining capacity. In a later stage the secretion becomes homogeneous and the affinity to any staining reagent is a little reduced. The present author could find neither the networks of fibrous structure nor the hyaline substances in the nucleus of the columnar epithelium which were once described by KLEIN (1878).

The nucleus of the mucous cell is observed in its basal part. This nucleus is generally long oval in shape (Fig. 2, 3, 4), the long axis of which corresponds to the long axis of the cell.

Usually, two large nucleoli occur within a nucleus being quite separately in the distal and the proximal parts (Fig. 3, 4). Sometimes, the nuclei contain just one great (Fig. 2) or several rather small nucleoli (Fig. 3).

In the mucous cells with a little mucous substance, the nuclei frequently have a peculiar form showing invagination in the nuclear membrane as illustrated in Fig. 3 and Fig. 4. In the nuclei, the nucleoli usually appear on the invaginated surfaces of the membranes and sometimes we observe large granules even outside of the nuclear membranes (Fig. 7). In Fig. 7 we see two granules within a pocket-like invagination. The one which is found close to the nuclear membrane stains almost the same colour reddish as the nucleoli, by the acid fuchsin (Mallory's method).

The other granule which appears in the distal part is stained blue with Mallory's stain. In this case these two granules are connected by a narrow bridge which shows the intermediate colour between the two granules. It is highly probable, that the former is the granules which was derived directly from the intranuclear nucleolus through the nuclear membrane while the latter is converted from the former.

In addition to this, the nuclear membrane of the mucous cell is frequently seen folded longitudinally, particulary in the active cells. This appears clearly in the cross-sections of the mucous membrane (Fig. 9). The condition has been already described by TSCHASSOWNIKOW (1927) being assigned no particular physiological significance.

In the ordinary mucous cells the author found numerous mitochondrial contents in comparison with other cells.

The mitochondria of the mucous cells were carefully observed by HOVEN (1912) and TSCHASSOWNIKOW (1927). According to them they consist of long filaments. On the other hand EKÖLF (1914) maintained that the mitochondria of the cells are possessed of granular units which take a linear arrangment. In my observation, in the mucous cells of *Hynobius*, mitochondrial granules are stained deep black with the iron-haematoxylin of Heidenhain's method (Fig. 4) and with Mallory's stain they show deep reddish colour (Fig. 3). These granules are found abundantly in the submucous layer of the cells, taking a linear arrangment.

OGNEFF (1892) described the structure of intercellular bridges between the epithelial cells, but according to CHAMBERS and RÉNGI (1925) who applied a recent method for the research, these intercellular bridges are probably the artefact of the fixative treatment. In case of the epithelial cells in the present study, I agree with CHAMBERS and RÈNGI (Fig. 9).

iii. The goblet cells

The presence of the goblet cells in the fundus region of the stomach was first found by OPPEL (1896) in a fish and then in an Amphibian, *Bufo*, by BENSLEY (1928).

In *Hynobius* in the epithelium of the anterior fundus region, we can see the characteristic mucous cells (Fig. 5), in which a certain secretion occurs actively, leaving a little space for the cytoplasm in the apical pole. The nucleus is seen in the proximal cytoplasmic part, showing often an irregular form pressed by the secretion. The cytoplasm of the cell is stained a reddish colour with Delafield's haematoxylin-eosin. By this method we can observe in the secretion only some reticular structure which is of protoplasmic nature, showing the weak reddish colour. The distal pole of the cell opens to free surface with a small opening, the margin of which is surrounded by a membrane of cuticular nature. The cell above described, is the so-called goblet cell after OPPEL and BENSLEY without any doubt.

As mentioned above these goblet cells are found only in the anterior region of the stomach where the ciliated epithelial cells are present but their occurrence is not so frequent as in OPPEL's case in the fish stomach. In the pylorus region of *Hynobius*, I could hardly find the goblet cells, despite careful investigation.

It is generally accepted that there exists another kind of cell called "enterochromaffine cell" in the mucous epithelium of mamalian stomachs as HEIDENHAIN (1870), KULL (1925), and TEHVER (1930) respectively observed in domestic animals. Recently ROGOSINA (1930) also reported it in a ganoid fish, *Acipenser ruthenus*.

I could not find such "enterochromaffine cell" so far in the surface epithelium of *Hynobius*. However, in the fundus gland of the animal some cells have a

structure resembling the enterochromaffine cell of the above authors. On this subject I shall write again in detail later.

By the way it is remarkable that multiplication occours actively in the epithelial cells of the gastric gland, where we can find many fine mitotic figures of the cells (Fig. 6). However in the other parts generally the mitosis is very rare.

II. The gastric gland

The gastric gland of the animal is composed of epithelium which invaginates to make a deep tubular depression. Each gland consists of three divisions, the mouth, the neck and the glandular body proper. The mouth of the gland (Text fig. 2, m) is formed by the low columnar cells continuous directly to those of the surface epithelium. Generally two or three conducting ducts of the glands open into a common opening, the mouth. The cell of the mouth has the structure of the mucous cell in which the amount of the secretion is not very great.

Fig. 2.

Cross-section of the fundus region, gland mouth (m); gland neck (n). ×160

Next, in the neck division (Text fig. 2, n) we can see the characteristic gland cells, which have almost the same appearance as the goblet cells of the surface epithelium. Then comes the proper gastric gland cell which shows in the inner part of the gland a different appearance according to the region of the stomach. As mentioned previously, the gastric glands of the animal are divided into two large groups according to the nature of the glandular tissues; namely the

funnus gland which is found in the fundus region and the pylorus gland which is observed only in the pyloric region.

i. The fundus gland cells

Regarding the glandular cells of the fundus gland we much owe to the prior observation of HEIDENHAIN (1870), who worked on the fundus gland of the frog and found two different kinds of cell groups in it. As he described, the one which occupies the gland body proper corresponds to the parietal cells of a mammalian fundus gland and the other, which is found in the neck, possesses the nature of a mucous cell.

Hereupon we can enumerate a number of authors who worked respectively on amphibian fundus gland from the different points of view. Among others there are PARTSCH (1877) who found the characteristic mucous cells between the neck and the body of the gland; LANGLEY (1881) who described the granulated cells in the glandular bodies supposing that the granules have some relation to the pepsin formation; OPPEL (1889) who observed in *Proteus anguineus* the mucous secreting cells and granulated cells and BENSLEY (1898) who, reported on the other hand, on three kinds of cells, the mucous secreting cylinder cells, the large vesicular looking cells which are also regarded as mucous cells in the neck and the granular protoplasmic cells in the body of the gland.

Now, in the fundus gland of *Hynobius lichenatus* I found many large mucous secreting cells (Text fig. 2, n) as mentioned already, which are similar to those of the "neck chief cells" after BENSLEY (1898, 1928).

The next division is bordered with neck cells only which transform gradually into the body cells in the deeper part of the gland.

Subsequently one can distinguish two kinds of neck cells according to the place they take (Fig. 11). The first type is very large which shows a clear appearance after preparation (Fig. 10, 11, 12). In the clear region one can find minute reticular fibres of protoplasmic nature which are stained light reddish with Delafield's haematoxylin-eosin (Fig. 11) and faint blackish with iron-haematoxylin (Fig. 12). The nucleus is found in the apical protoplasmic pole of the cell attaching closely to the basement membrane (Fig. 12) and is provided

with numerous chromatin granules which are stained intensively with iron-haematoxylin (Fig. 10, 12). By MALLORY's stain the reticular structure of cytoplasmic fibres, above mentioned, appears in blue colour and the nucleus shows a deep reddish colour. In some cases we find some secretory materials stained blue among the reticular structure of the cell.

Of the second type of neck cell which appears in the inner part, the great majority is filled up with cytoplasm in which we can find some mitochondrial granules of reddish colour through Mallory's staining method. The nucleus is oval in shape. (Fig. 11).

Considering the above evidence, the opinion that these neck cells of the animal are possessed of the nature of mucous secretion as stated by the above authors, is quite valid.

The body cells show polygonal in form, and is characterised by containing rich granular bodies in it. (Fig. 10, 13, 15, 16, 18).

Through the mitochondrial method there appear in the cell abundant mitochondrial granules which are typical of it (Fig. 10). With Delafield's haematoxylin-eosin these granules are not so clearly demonstrated, but in turn there frequently come to appear large granules in the cytoplasmic area especially in the neighbourhood of the nuclei as in the case of ordinary mucous cells (Fig. 14, 17).

The nuclei of the cells are generally oval in form, each containing one large oval nucleoli within it (Fig. 15, 16, 18). There are a few chromatin granules in the nuclei, suspended in the intranuclear linin reticulum. (Fig. 15, 16). The nucleoli are stained either intensively black with iron-haematoxylin (Fig. 15, 18) or deep reddish by Mallory's staining method (Fig. 16). It is remarkable that the number and form of the nucleoli in the cell vary according to the phases of the activity. The nucleus often shows a peculiar form in the cell which has only a small number of characteristic granules in cytoplasm and is possessed of many nucleolar elements as compared with the other cell. Sometimes there occurs a pocket-like invagination from outside in the nuclear membrane as in the case of ordinary mucous cells (Fig. 13, 14, 17). In the early stage of the invagination the characteristic nucleolar granules come to appear in contact with the invaginated surface in the nucleus (Fig. 13). In another

case these granules are seen not only within the nucleus but also in the external cytoplasmic part, showing actually the same staining capacity. The more distant the granules are from the nucleus, the more they differ in grade of staining. By Mallory's stain the materials are stained deep blue (Fig. 16) and by Delafield's haematoxylin-eosin reddish (Fig. 14, 17).

In some cells the secreted nucleoli have gathered together into a certain mass in which the distal part from the nucleus differs from the proximal part in colour reaction (Fig. 14).

In the material which is fixed by Gilson's fluid and stained with Mallory's method one can distinguish two kinds of granules, namely the one of deep bluish colour and the other of reddish colour. The former is distributed in the peripheral part of the cells, while the latter occurs usually close to the nucleus which shows an oval form with one great nucleolus (Fig. 16).

Applying the method of the mitochondrial staining one can find some reticular structures in the cytoplasm close to the nuclear membrane as well as in the intranuclear part. Some of them are found connecting directly through the nuclear membrane (Fig. 18).

ii. The pylorus gland cells

In the anterior part of the pylorus region we find a few mucous secreting cells similar to those of the neck division of the fundus gland. The granulated body cells are also greatly reduced in number as was already stated by OPPEL (1889, 1896) and BENSELEY (1898, 1928). In the posterior part of the region there are no neck cells in the gland which is greatly shortened in length as compared with that of the anterior part (Text fig. 1). The gland is composed of low columnar cells which have poorly granulated cytoplasm, an oval nucleus with two or three round nucleoli and in their distal part mucous fluid.

From the morphological point of view the gland cells of the pylorus gland are a part of the epithelial cells found in the surface of that region. The latter is mostly composed of long columnar mucous cells among which one can frequently find wandering cells (Text fig. 1, w. c), the significance of which has not yet been studied.

iii. The basement membrane

According to IWAKIN (1895) the basement membrane of the vertebrate mucous epithelium is transformed from the material of the connective tissue of the tunica propria. Recently ROGOSINA (1930) also described in his studies on fish stomach the connective tissue origin of the membrana basilaris which is consisted in "homogene, kollagene Stoff".

By the staining method after Mallory I confirmed that the reticular fibre of tunica propria forms the basement membrane in *Hynobius*. Fig. 19 shows some connective tissue fibre being thrown into the above epithelium to make the membrane.

Summary

The gastric epithelium of *Hynobius lichenatus* is composed of the surface epthelium and the gastric glands as in other amphibia. In the surface epthelium we can find three kinds of cells, that is ciliated cells, the ordinary mucous cells and the goblet cells. The goblet cells which are common in *Lophius piscatorius* (OPPEL, 1896) occur not so frequently in this case and are lacking completely in the pylorus region. The same is true in the case of ciliated cells which are seen mostly in the anterior part of the stomach. The middle and the posterior parts consisted of only ordinary mucous cells.

The gastric glands of the animal can be divided into two types; the fundus gland and the pylorus gland. Both show a tubular appearance branching into two or three. The fundus gland which is much greater than the pylorus gland, is divided into three divisions, the mouth, the neck and the body. The differentiation of the cells in the pylorus gland occurs not so conspicuously as in the fundus gland. The neck cells are found only in the anterior pylorus region in a small number. Now, there are found, so far, four kinds of glandular cells in the gastric mucous membrane, the goblet cells, the ordinary mucous cell, the neck and the body cell. The nucleus of each of these gland cells excepting the goblet cell always takes an active part in the secretion. In the present investigation the nuclear behaviour of the goblet cell is uncertain, but

in the other cells, in the early stage of the secreting activity the intranuclear granules come out into the cytoplasmic part through the invaginated part of the nuclear membrane, even though the process of secretion of these granules could not be actively followed.

These nucleolar extrusions were also described by many authors, MARSHALL and VORHIES, MAZIARSKI, NAKAHARA, KENNEY, NOEL and PAILLOT, BEAMS and WU, WU, GARDIER, GRESSON, MEHTA, JACOBS (loc. c) and others respectively.

It is highly probable that these granules are not extruded from the nuclear membrane keeping their original forms but are broken up into many fine threads as they pass, which in the cytoplasmic part again gather into a certain mass which is seen as a granule after fixation.

The nucleolar granules thus secreted, contain at first the nucleolar nature of the nucleus even in the cytoplasm but sooner or later they convert into substances of different chemical nature. This transformation usually occurs first from the peripheral part of the granules or from the distant part far from the nucleus. A similar phenomenon was also found by WU (1930) in his studies on the spinning gland cells. When the secretion of nuclear material is completed the nucleus which has an invagination on its surface recovers the form showing smooth oval in shape and in the adjacent area of the nucleus in this case there are found nucleolar granules in a great number. The granules which are situated farther from the nucleus have suffered from the greater chemical changes, Fig. 16.

Concerning the significance of the mitochondrial contents I could not find that they have any direct rôle in the secretion of the gland cells, even though their occurrence sometimes indicates active secretion by the cells.

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Explanation of plates

All the photomicrographs were taken by Leitz "Makam". Plate: Ilford screened and chromatic. Filter: Zettnow's mixture.

Plate I

Fig. 1. Ciliated epithelium, fixed in Gilson's fluid, Delafield's haematoxylin-eosin stain. ×720

Fig. 2. Invagination in nucleus in the ordinary mucous cell. Gilson's fluid; Mallory's stain. ×1200

Fig. 3. Ordinary mucous cells in early phase of the activity, the invaginated nuclear membrane, mitochondrial granules and nucleoli are clearly seen. Gilson's fluid; Mallory's stain. ×1400

Fig. 4. Mitochondrial granules in submucous region, two nucleoli in a nucleus with reduced chromatin. Mitochondrial method. × 1400

Fig. 5. Goblet cell. Zenker's fluid; Delafield's haematoxylin-eosin stain. × 1400

Fig. 6. Mitotic figure in an epithelial cell, early metaphase. Mitochondrial method. × 1400

Fig. 7. Nucleolar secretion in the ordinary mucous cell. Gilson's fiuid, Delafield's haematoxylin-eosin stain. × 1400

Fig. 8. Two columnar cells containing chromatin-like materials. Gilson's fluid; Delfield's haematoxylin-eosin stain. × 1400

Fig. 9. Cross-section of the surface epithelium, Mitochondrial method. × 1400

Fig. 10. Fundus gland with granulated body cells and clear neck cells. Mitochondrial method. × 320

Plate II

Fig. 11. Cross-section of a neck division in a fundus gland. Zenker's fluid; Delafield's haematoxylin-eosin stain. × 360

Fig. 12. Typical large neck-cell. Mitochondrial method. × 1400

Fig. 13. Nucleus with pocket-like invagination in a body cell. Mitochondrial method. × 2400

Fig. 14. Nuclear secretion in body cell. Gilson's fluid; Delafield's haematoxylin-eosin stain. × 1800

Fig. 15. Granulated body cell, in resting stage. In the nucleus one great nucleolus and fine chromatin granules are present. Mitochondrial method × 1400

Fig. 16. Three body cells in cross-section. Panchromatic plate and orange G filter were used. The granules having a blue colour are distinct while the granules having red are faint. The oval formed nuclei with large oval nuclei, chromatin network. Gilson's fluid; Mallory's stain. × 1350

Fig. 17. Nucleolar secretion in body cell. Gilson's fluid; Delafield's haematoxylineosin stain. × 1400

Fig. 18. Supranuclear network of body cell. Mitochondrial method. × 1800

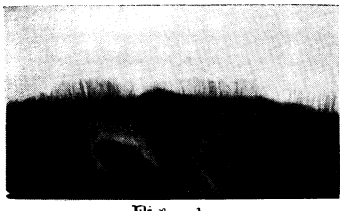


Fig. 1

Fig. 2

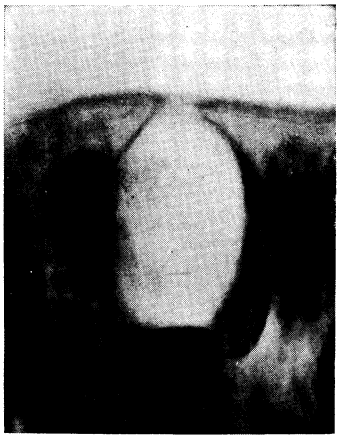
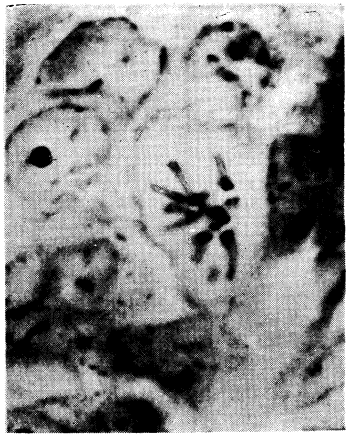


Fig. 5

Fig. 8

Fig. 3



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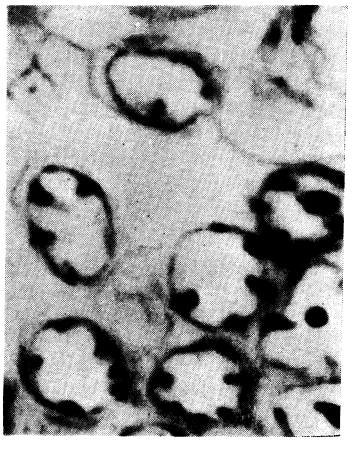

Fig. 9

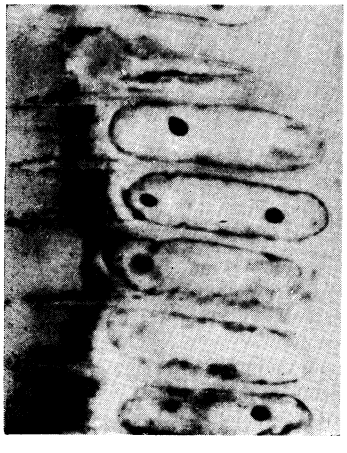

Fig. 4

Fig. 7

Fig. 10

Fig. 11

Fig. 14

Fig. 17

Fig. 12

Fig. 15

Fig. 18

Fig. 13

Fig. 16

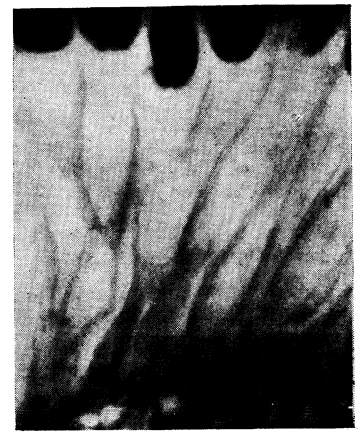

Fig. 19

Fig. 19. Basement membrane in surface epithelium. Gilson's fluid; Mallory's stain. × 1800

摘　　要

山椒魚の胃の内面を被覆せる上皮組織は纖毛上皮細胞(ciliated cell)酒盃細胞(goblet cell),粘液細胞(mucous cell)等に依つて構成され、上皮組織の陷沒に依つて生じたる、腺組織は泡狀の頸部細胞(neck cell)及び特に顯著なる顆粒を含有せる体細胞(body cell)に依つて其の主要部を構成さる。以上の内纖毛上皮細胞以外のものは腺細胞として直接胃の消化に與るも酒盃細胞は其の分布の範圍狹く胃の前部に限られ數も亦僅少なり。而して粘液細胞、頸部細胞、体細胞等は其の分布も廣く數も亦過大にして粘膜に於ける主要なる分泌要素を構成す。之等三種の腺細胞は共に類似の分泌物轉化の過程を示し、分泌物の本原は共に核の内容に由來す。即ち將に活動期に入らむとする細胞に於ては核の一部が著しく灣入し、仁は其の灣入部に向つて移動し遂に核膜を通じて細胞質内に分泌さるゝ事を觀察せり。

尙、細胞質中に出されたる核の内容も其の當初に於ては核内に於ける其等と全く同樣の染色反應を示すも細胞の游離面に移動を開始するや、周圍より漸次各腺細胞の分泌物に類似の染色反應を現はす事を見たり。

サンドベツチ斑點病（豫報）

田中一郎・岩垂　悟

OVULARIA-DISEASE OF SAND-VETCH

(Preliminary Report)

BY

ICHIRO TANAKA and SATORU IWADARE

緒　　言

1929年夏北海道農事試驗場十勝支場（十勝國河西郡帶廣町）より其圃場に栽培せるサンドベツチ（*Vicia villosa* ROTH.）の葉に褐色の斑點を形成する病害發生し、相當の被害を爲しつゝあることを報じ、被害の標本を北海道農事試驗場本場（札幌市外琴似）に送付せられたり。余等は北海道農事試驗場本場に在りて、該被害標本を檢する傍ら、本場にて栽培せるソラマメ屬の綠肥作物圃につきて觀察せるに、斯くの如き病害が本場圃場にも極めて多く發生し相當の被害あるを認め、これが調査を繼續せしところ、サンドベツチの葉に褐色の斑點を形成する病害に二種あることを知れり。即ち一つは其病斑極めて鮮明なる同心圓の輪紋を形成するものにして、サンドベツチの外數種のソラマメ屬綠肥作物を侵害し、他の一つは同心圓紋を爲さゞる褐色の斑點を形成するものにして、サンドベツチ或はヘアリーベツチ（*Vicia villosa* ROTH.）を侵害するのみにして、他のソラマメ屬綠肥作物を侵害せるを見ざるものなり。尙北海道に於て野生のクサフヂ（*Vicia Cracca* L.）にも後者と同樣の病害發生するを知れり。

余等は目下是等の病害に就きて調査中なるが、こゝに後者につきて尠しく知り得たるところを報告せん。本病は本邦に於て未だ記錄なき病害なるを以て、之に『サンドベツチ斑點病』の和名を附せんとす。

[Transact. Sapporo Nat. Hist. Soc., Vol. XI, Pt. 4, 1931]

本調査を爲すに當り懇切なる指導を賜りたる北海道帝國大學教授伊藤誠哉博士に深甚なる謝意を表す。

病　　狀

本病は六月頃より晩秋に至るまで發生し加害するものなれども、其最も猖獗を極むるは六月下旬より七八月の候にして、サンドベツチが漸く旺盛なる生育期に達し開花、結實を見る頃なり。而して本病は常に相當成長せし植物に於て發生甚しく、其の幼小なるものには殆んど發病を認めざりき。

最初下葉に發病し、漸次頂葉に及ぼし、遂に全葉悉く害を被むるに至る。其狀初め葉面に褐色の小なる斑點現れ、漸次擴大し、徑3乃至5粍位の類圓形となる。病斑を精細に觀察せば其の多くは褐色類圓形の斑點內に濃褐色なる部分不規則に混入して擴がれるを見る。

第一圖
被害葉（略自然大）

病斑裏面には本病々原菌の白色なる菌叢形成せられ、恰も白粉を附着せるが如く觀ゆ。早朝露の未だ乾燥せず、胞子の飛散せざる前に、手にて病葉に觸るれば、豊富に形成せられたる分生胞子の白粉狀に飛散するを見るを得べし。

本病は其の分成胞子の形成旺盛なるが故に、速に傳染するものにして、一小葉上に十數乃至數十個の病斑を形成するを普通とし、相接近せる病斑は互に合して大斑となり、被害の葉は褐變乾枯するに至る。又被害せられたる葉は健全なるものに比し極めて脫落し易きを以て、枝條は往々裸狀となり其生育を大いに阻害せらる。

本場にありては同一圃場に列を並べて *Vicia villosa*, *V. sativa*, *V. pannonica*, *V. atropurpurea*, *V. calcarata*, *V. dasycapa*, *V. Ervilia*, 及 *V. monantha* 等の綠肥作物を栽培しつゝありしが、本病は *V. villosa* には甚しく發生したれども、之に隣接せる他の植物には全然發病を認めざりき。尙余等は本道の野生植物なるクサフヂ上に之と同樣の病害の極めて普通に發生しつゝあるを認めたり。

病原菌の形態

菌叢は白色にして病斑裏面に形成せらるゝを普通とすれども、極めて稀に表面にも形成せらるゝことあり。

擔子梗は氣孔より抽出し、一氣孔より極めて多數、多きは數十本を叢生す。菌叢形成の旺盛なる病斑の切片を作りて檢鏡せば、擔子梗叢は各氣孔より抽出するを以て、一切片上に略等間隔に配列するを見ることを得べし。擔子梗は氣室内に集合せる菌絲より生じて氣孔より抽出し、無色透明にして直立し分岐せず、其最低部に一個の隔膜を有す。初め其頂端に分生胞子を着生すれども、胞子成熟すれば其の着生點直下より稍膝曲或は撚轉して伸長し、更に其先端に次の分生胞子を形成す。斯くして伸長するが爲に、擔子梗の上部はコルク栓抜狀に撚轉し、或は又左右、又は一方に膝曲せる雁木狀を呈す。而して之等膝曲部には分生胞子の着生せし痕小突起として殘存すること多し。培養基上に形成せられたる擔子梗は往々にして、極めて規則的なる螺旋狀をなして撚轉せるものあり。擔子梗は其全長 75.0–125.0 μ 巾 3.3–4.0 μ あり。

第二圖

擔子梗（被害葉切片の顯微鏡寫眞）

分生胞子は薄膜、無色にして卵形或は類圓形を呈し、大さ 11.3–22.3×10.0–15.0μ にして、其の多くは 13.8–16.3×11.3–13.8 μ あり。水中或は諸種の培養液中にて易く發芽す。

培養基上に於ける病原菌の性質

本病々原菌の分生胞子を寒天培養基上に置けば、頁く發芽して數日後には白色の小菌苔を成生するを以て、之より易く純粹培養を行ふことを得たり。

本菌は諸種豆類、同蔗糖或は葡萄糖加用、葱頭、杏、馬鈴薯、同ペプト

ン加用、稻藁等の諸種煎汁寒天培養基を用ひて、攝氏25度の溫度にて培養を試みたるに、何れの培養基上に於ても極めて遲々たる發育を爲し、一箇月後に菌苔は漸く 0.5 乃至 1 糎の直徑の大さに達したるのみにして其儘發育を停止せり。一般に菌絲は密に集合し、極めて緊密なる菌苔を形成せり。ために之を針にて取らんとすれば、其全体は培養基と共に剝脫す。成長せる菌苔は概して暗褐色を呈すれども、多くの培養基に於ては其表面に擔子梗及分生胞子を密生するを以て、表面初めは純白色を呈し、後漸次淡紅色を帶ぶるに至る。

菌絲は初め無色にして、隔膜部にて縊れを爲さず、多く分岐すれども、古き培養にありては褐色乃至黑褐色を呈し、細胞は著しく膨大し、殆んど球狀或は偏球狀を呈するもの相連續或は多數分岐集合するもの多し。稻藁煎汁寒天及馬鈴薯煎汁寒天培養基にありては、培養基中處々に著しく膨大、縊れ、分岐せる菌絲密に集合し、子囊殼形成の初期とも想はるゝ如き黑褐色の小菌絲塊を形成せり。

分生胞子發芽し菌絲を生ずれば二三日にして、菌絲より分岐して擔子梗を生ず。寄主上に形成せらるゝものゝ如く叢生せざれども、古き菌苔にては其面上一面に密生す。其形態は寄主上に於けるものに大差なけれども、培養基上にては極めて規則的に撚轉せるものあり。多くの培養基上に於て分生胞子は多數に形成せられ、其の形は寄主上に形成せられたるものに異ならず、成熟後は培養基上に於て直ちに發芽するもの多し。

病原菌の種名

本病々原菌は其性質よりして *Ovularia* 屬に屬するものなり。而して、*Ovularia* 屬中にてソラマメ屬植物に寄生することを報せられたるものに四種あり。即ち *O. Schwarziana* P. MAGNUS, *O. Villiana* P. MAGNUS, *O. Viciae* (FRANK) LIND. 及び *O. fallax* (BON.) SACC. 之なり。此等の中前二者は 1900年に P. MAGNUS によりて記載せられたるものにして、前者は *Vicia villosa* 上に、後者は *V. cassubica* 上に發見せられたるものなり。*O. Viciae* は1880年に FRANK によりて初めて *V. tenuiforia* 上の菌を *Ramularia* として報告せられたるものにして、其後 LINDAU によりて *Ovularia* 屬に編入せられたるものなり。*O. fallax* は 1861年に BONORDEN が *Vicia* 上に發見し *Crocysporium fallax* と命名せるものにして、其後 SACCARDO は之を *Ovularia* 屬に編入せり。然るに其後に至り SALMON によりて BONORDEN が *Crocysporium* として報告せし菌は全

くウドンコ菌科の分生胞子時代なることを明にせらるゝに至れり。

故に前記三種の菌につきて考察するに、其形態は極めて類似せるものゝ如く、Lindau* は *O. Villiana*. *O. Schwarziana* 及 *O. Viciae* の三種は極めて類似のものにして、其間に認めらるゝ僅少の差異は菌が其寄主を異にせるに依りて生ぜしに非ずやと思はるゝ程なるを以て、斯る疑問は唯培養試驗に依りてのみ解決するを得べきを述べ、尙 Schroeter** は *O. Vill iana* と *O. Schwarziana* とを同種となし、之を *O. fallax* なる名稱中に入れ、此の菌の寄主植物として *Astragalus austriacus*, *Colutea arborescens* 及 *Vicia Cracca* をも記載せしことを附記せり。

Saccardo*** は *O. Villiana* は其擔子梗の分岐せることによりて、易く *O. Schwarziana* 及 *O. Viciae* より區別し得ることを述べたり。

余等は伊藤教授の許可を得て、北海道帝國大學植物學教室所藏の貴重なる標本 Sydow Mycotheca germanica Fasc. XXVI, No. 1285, *Ovularia Villiana* P. Magnus 及 Sydow Mycotheca germanica Fasc. XXXV, No. 1750, *Ovularia Schwarziana* P. Magnus と余等の菌とに就きて、其病狀及形態等を比較することを得たり。余等の菌と *O. Villiana* とは其病狀に於て全く異るのみならず、其擔子梗及胞子の形態に於て直ちに之を區別し得る明なる差異を有せり。然るに *O. Schwarziana* とは其病狀全く相一致せるのみならず、形態的にも極めてよく一致せるを認めたり。*O. Viciae* とは其實物標本に就きて比較を行ふこと能はざりしが、其記載によりて此の菌は *O. Schwarziana* 及余等の菌と明なる差異を認め得べし。故に余等は北海道にてサンドベツチの葉を侵害する本病々原菌は、歐洲に於て同寄主上に發生するを報ぜられたる *Ovularia Schwarziana* P. Magnus と同種と認むるを至當と考ふるものなり。

尙本菌と野生のクサフヂ上の菌とは其病狀及形態類似せるを以て、或は兩者は同一種類にして、從來野生のクサフジ上に寄生し來りし菌が栽培せられたるサンドベツチを侵害し、斯くの如き甚しき被害を爲したるに非ずやと思考せらるゝところあれども、此等の點に就きては後來の研究に俟ちて解決し其除防法等と共に發表するところあらんとす。

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* Rabenhorst's Kryptogamen-Flora I Bd. Abt. 8, p. 246, 1907.

** Pilze Schles. II, p. 482, 1894.

*** Sylloge Fungorum Vol. XVI, p. 1035, 1911.

RÉSUMÉ

In the summer of 1929 the outbreak of a disease was noticed on sand-vetch (*Vicia villosa* ROTH.) in Hokkaido, which causes brown spots on the leaves. The damage was so great, that the disease was brought into our attention. After more careful examination we found that there were two kinds of brown leaf spot diseses of sand-vetch: the one is characterized by the distinct concentric zonations on the spots and attacks not only sand-vetch but also several other species of green-manure plants belonging to the genus *Vicia*, and the other attacks only sand-vetch, producing no zonations on the lesions but white tufts on the undersurface of the diseased spots. The present paper was intended to report on the latter disease, which has not been recorded up to the present in Japan.

The causal fungus is one of the species belonging to the genus *Ovularia*. Three species of *Ovularia* have been reported to be parasitic on *Vicia*: viz. *O. schwarziana* P. MAGNUS, *O. Villiana* P. MAGNUS, and *O. Viciae* (FRANK) LIND. With the permission of Prof. S. ITO we had opportunity to compare our fungus with the former two species in Sydow Mycotheca germanica deposited in the Phytopathological Institute, Faculty of Agriculture, Hokkaido Imperial University. After our investigations we were led to the belief that the causal fungus of the disease under consideration is identical with *Ovularia Schwarziana* P. MAGNUS.

本會記事

昭和四年二月二十三日學生集會所に於て昭和三年度總會を兼ね例會を開き次の講演あり。

氣孔メカニズムに關する最近の學說　坂村徹君

終りて總會に移り各幹事の事務報告に次で役員の改選を行ひ從來の諸氏重任に決したり。

昭和四年二月二十八日本會々報第十卷第二號發行さる。

昭和四年六月八日學生集會所に於て例會を開き下記の講演あり。

小腦の老後の形態的變化と其意義に就て　附 歐米二三研究室の現況　犬飼哲男君

烟草モザイク病の病原に就て　福士貞吉君

昭和四年七月三十一日本會々報第十一卷第一號發行さる。

昭和四年十一月十六日農學部植物學敎室に於て例會を開き下記の講演あり。

絲腺の構造と絹絲の分泌に就て　林禎二郎君

北洋を巡る　館脇操君

昭和五年五月二十五日本會々報第十一卷第二號發行さる。

昭和五年五月三十一日昭和四年度總會を兼ね例會を開き例會に於て下記の講演あり。

樹の溫度の變化　富樫浩吾君

歐米事情　栃內吉彥君

終りて總會に移り各幹事の事務報告に次で役員の改選を行ひ下記の諸氏に決定したり。

會長	宮部金吾	
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會計幹事	犬飼哲男	今井三子
編纂幹事	福士貞吉	內田登一

昭和五年十一月廿九日學生集會所に於て例會を開き下記の講演あり。

生きた細胞に關する實驗觀察二、三　島倉亨次郎君

「アリオ」、「ハーベー」氏等の査定せる日本產海藻に就て　山田幸男君

昭和五年十一月三十日本會々報第十一卷第三號發行さる。

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Part 4 (page 195–266) issued on April 25, 1931.

Errata

Page 235, line 19; *for* **6**, *read* **66**.

Page 235, line 20;

for *Veratrum album* L. var. *Loberianum* REICHB. f. *japonica* BAK. (*Baikeisô*).

read *Rubia tatarica* FR. SCHM. var. *grandis* FR. SCHM. (*Akanemugura*).

Page 236, line 19, *after* apex *insert*

rounded and thickened (6–11 μ), base rounded or attenuated,

注　意

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