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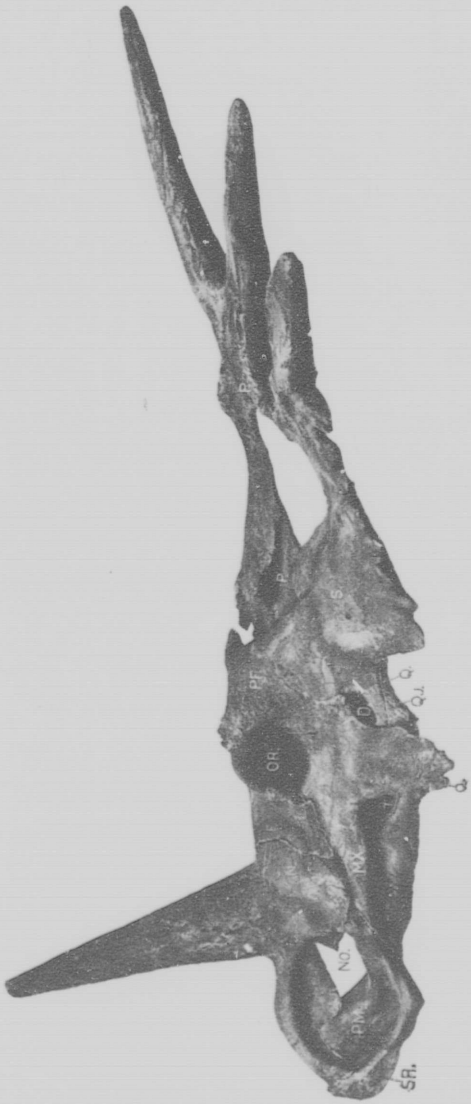

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THE OTTAWA NATURALIST

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A NEW GENUS AND SPECIES OF CERATOPSIA FROM THE BELLY RIVER FORMATION OF ALBERTA.*

By Lawrence M. Lambe, F.G.S., F.R.S.C., F.G.S.A.
Vertebrate Palæontologist to the Geological Survey, Canada.

Styracosaurus, gen. nov.

Skull massive, elongate, pointed in front, and greatly extended behind to form a neck-frill with long, robust, tapering outgrowths projecting obliquely backward and outward from its posterior border. Fontanelles of moderate size within the coalesced parietals. Squamosals somewhat quadrangular and entering largely into the formation of the front part of the frill. Postfrontal fontanelle large. Supratemporal fossæ opening widely behind. Nasal horn-core large, upright, straight, rising from the back of the nasals. Supraorbital horn-core incipient.

Styracosaurus albertensis, sp. nov.

The skull of this species is remarkable for the largeness of the nasal horn-core, the remoteness of the same from the acute rostral apex, and for the great development of backwardly directed spike-shaped processes on the posterior margin of the coalesced parietals.

The horned dinosaur above named is represented by the skull only, which is the type of the proposed new genus and species. This magnificent specimen was discovered last summer in the Belly River formation on Red Deer river, Alberta, by the vertebrate palæontological expedition of the Geological Survey under Charles H. Sternberg. It is almost perfect on the left side and is in a splendid state of preservation. It occurred imbedded horizontally, in a natural position, in a thick layer of light grey clayey sandstone with the neck-frill and the upper surface as far forward as the anterior part of the nasals exposed to view. Later it was found that the lower jaw and the rostral bone were not present. At the time of the discovery of the skull the nasal horn-core had been broken off a little below its mid-height, and the foremost and last of the

*Communicated by permission of the Director of the Geological Survey.

large posterior processes of the frill on the left side had lost about three and six inches respectively from off their pointed ends. These parts were not found. On the right side, the jugal had fallen to pieces and the lateral border of the frill had suffered some damage from exposure. The posterior processes had been broken off and fractured, but, with the exception of a few fragments, they were recovered and have been restored and replaced in position.

The front part of the skull has been crushed down to some extent. This has caused an overlapping of some of the bones, notably at the junction of the nasals with the premaxillæ and maxillæ, and along an irregular line through the lachrymal foramen, the lower rim of the orbit and the lower edge of the postfrontal. The orbits and the lateral temporal fossæ have been reduced in vertical diameter and the left jugal has been squeezed slightly outward below.

This specimen brings to light an entirely new phase of frill development, which is unique among the horned dinosaurs. It may be regarded as one of the most complete and best preserved of the Ceratopsian skulls hitherto discovered in Cretaceous deposits of this continent.

The name selected for this genus has reference to the shape of the large processes on the frill, which resemble spikes, and must have made this bristling reptile in life a veritable moving chevaux de frise.

Viewed from above, the skull presents a facial wedge-shaped portion from the orbits forward, a middle section which broadens abruptly into a somewhat circular expansion and includes the anterior half of the neck-frill, and a hindermost part formed of the widely divergent posterior processes which add so greatly to the length and breadth of the frill.

In lateral aspect the skull is depressed and very long in contrast with its height. The spike-shaped processes double the length of the frill, which, without them, would compare favourably in relative size with the corresponding expansion in later forms of the Ceratopsia, such as Triceratops, in which the orbit is but slightly in advance of the mid-length of the skull. Behind the nasal horn the upper outline is straight, then somewhat depressed near the middle of the crest, finally rising to its highest point at the termination of the hindermost process. The orbital rim rises above and breaks the continuity of the superior outline of the head. Midway between the posterior rim of the orbit and the anterior end of the nasal the straight nasal horn rises abruptly, with a slight inclination forward, and is the most conspicuous feature of the anterior part of the head.

The nasal outline in advance of the horn is highly arched and descends rapidly in front to the premaxilla. The sinuous border of the squamosal slopes upward and backward, and its general direction is continued behind by the anterior free margin of the parietal. From this aspect the processes are given off one above the other in an ascending series. The inferior outline of the premaxilla is obtusely angular and drops to a point considerably lower than the alveolar border of the maxilla. In general terms the skull's greatest depth, without considering the nasal horn-core, is at the orbit, whence it is reduced to some extent forward, and very conspicuously so backward.

At the time of writing, the upper and side surfaces only of the skull had been freed from the matrix. Some of the sutures are distinct and can be traced, others, where coossification has taken place, are not seen with certainty or are entirely obliterated.

The neck-frill or crest is formed of the squamosals and the immense expanse of the coalesced parietals. The main part of the squamosal is slightly broader than long and has its lateral free edge regularly sinuous. Behind this, for a short distance, the anterior lateral border of the parietal is conspicuously tortuous. The massive, tapering projections or outgrowths are given off postero-laterally from the frill, three on each side. These processes conform to the general slope of the part of the frill from which they spring. The two forming the hindermost pair are the largest and are directed backward and slightly outward. Those of the next pair in advance are nearly as large and point more outward than backward. The two anterior ones are the smallest, are nearly parallel to the middle ones and spring partly from beneath them. The processes have a perceptible curve outward. The central part of the posterior border of the frill, between the hindermost processes, is thick and rounded, its outline, as seen from above, being regularly concave with a decided convexity at the base of the processes.

The intraparietal fontanelles are irregularly oval in outline, with the longer diameter from back to front. They are set obliquely in the frill, being slightly divergent forward. They are more distant from each other than from either the central concavity of the posterior border, or the lateral sinuous margin of the frill. Their anterior end approaches closely to the squamoso-parietal suture.

The nasals are greatly enlarged posteriorly for the support of the nasal horn-core, whose anterior basal surface is slightly behind their mid-length. In advance of their union with the

maxillæ they send down a short, stout process to meet an ascending process from the premaxillæ. This process is displaced upward and forward on each side of the skull. The one on the left side is seen, in the figure of the lateral aspect of the skull, as a triangular projection silhouetted against the back part of the nasal opening. In advance of the horn the nasals contract rapidly and continue forward as a vertically narrow, laterally compressed arch, which descends anteriorly in a sweeping curve to join the premaxillæ. A vertical nasal septum, contributed to by each nasal, descends from their longitudinal junction to form the upper margin of the nasal opening and in front to join the premaxillæ. This septum supplies to the nasals anteriorly a large vertical surface of contact and greatly strengthens them. An admirable provision for the support of the nasal horn-core is seen in the formation of the nasal bones, which, under the horn, form a massive, transverse arch, and in front a longitudinal arch braced beneath by the septum, the whole wonderfully adapted to withstand heavy strains transmitted from the horn above.

The maxilla narrows rapidly to the front, where it reaches the premaxilla. Its upper half, which is overlapped behind by the jugal, overhangs the lower half, whose concave hinder end is covered by the triangular transverse bone.

The premaxilla has a smooth surface, is narrow in front and flares outward below. In lateral aspect it is obtusely angular in front and beneath. It consists of a well defined marginal strip of nearly the same breadth as, and in continuation downward and backward of, the arched portion of the nasal, standing out from and circumscribing below a sunken, inflected area, which rises as a thin plate to meet the nasal septum anteriorly and to form the lower free edge of the nasal opening behind. It is overlapped at its front angle by the rostral bone, which fits into a sutural groove between the premaxillæ in front and is closely applied to them as far back as the lower angulation. Posteriorly an ascending process reaches the descending process of the nasals.

The exact boundaries between the frontals, prefrontals, postfrontals and lachrymals have not been determined, as these bones were coossified and the sutures between them are for the most part obliterated. The frontals were not large and met in the midline for a short distance only, as indicated seemingly by impressed markings, which appear to be the remains of a fronto-postfrontal suture. The postfrontals, however, were extensively developed. In the midline anteriorly they met for some distance in sutural contact, but posteriorly they were widely separated by a long postfrontal fontanelle. They

formed the posterior border of the orbit and met the jugal and the squamosal below and the parietal behind. The upper orbital rim is thickened and overhangs the orbit, and rises conspicuously above the level of the flat postfrontal surface between the orbits. The lachrymal probably forms the anterior rim of the orbit and the prefrontal the overhanging upper margin of the same. Set well back posteriorly on the raised ridge above the eye-opening is a small, shallow, smooth depression, irregularly oval in outline, which indicates the position of an extremely small, or incipient, supraorbital horn-core, which appears to have been present as a separate ossification and to have become detached.

The jugal had much the same shape as in Triceratops; it was pointed below, and, in its upper part, extended to either side, anteriorly to overlap the maxilla and posteriorly to meet the squamosal. It formed the lower rim of the orbit and the whole of the upper margin of the lateral temporal fossa, which was enclosed below by a forwardly directed process from the squamosal. The thin upper end of the quadratojugal is wedged between this process and the quadrate, which is seen in the lateral aspect of the skull, passing beyond the quadratojugal to effect a union with the under surface of the squamosal.

The squamosal is well developed, of a fair size, roughly quadrangular in shape, and a little broader than long on its main outer surface. At the middle of its anterior breadth it sends forward an outwardly flat process, which encloses the lateral temporal fossa below and behind. Its lateral free margin is smooth, rounded, and regularly undulating with five somewhat vertically compressed convexities to the outline.

The neck-frill in its anterior half is saddle-shaped. The surface of the coalesced parietals between the fontanelles is equal to their transverse diameter and is flatly convex across and slightly concave longitudinally. The bone surrounding the fontanelles is very thin at the edge. Between these openings it remains moderately thin, but toward the lateral free edges and posteriorly it becomes thickened, especially so at the bases of the large processes and along the posterior border. Behind each fontanelle the surface of the bone rises into a rough, obliquely placed short ridge or keeled boss. Proximally the posterior processes are somewhat vertically compressed, but outwardly they become more nearly circular in transverse section. The median portion of the coalesced parietals is continued forward, in advance of the fontanelles, as a distinct raised surface with parallel sides, to meet the postfrontals, where it probably formed the hinder margin of the postfrontal fontanelle. This anterior part of the parietal is damaged, but on

each side of the posterior end of the postfrontal fontanelle and between it and the supratemporal fossa a small part of it remains, shewing its sutural contact with the postfrontal. Where the upper median portion of the parietal has been broken there is a short transverse bar across the midline, which appears to mark the posterior limit below of the postfrontal fontanelle. Behind this bar is a small, shallow, oblong depression. The very large excavations beneath the postfrontals, the supratemporal fossæ, debouch widely backward with a smooth, lower surface, or floor, formed of the parietal and the squamosal. Although mainly beneath the postfrontal, this fossa extends laterally at its exit beneath the squamosal on the outer side, and the anterior end of the parietal inwardly, these three bones together composing the roof of the excavation at its mouth where they come to a sharp, overhanging, free edge, which slopes upward from about the middle of the back part of the squamosal, obliquely forward and inward and then descends backward, apparently without interruption, if the specimen were perfect, as the lateral edge of the median portion of the parietal. The smooth floor of the supratemporal fossa extends backward beyond its main opening toward the anterior end of the parietal fontanelle and inward beneath the median portion of the parietal, which it undercuts, leaving a free, overhanging edge, and at a higher level enters a subsidiary fossa, which is directed obliquely inward and backward and terminates next to the midline of the skull, where it is separated only by a thin bony partition from the corresponding excavation on the other side. These subsidiary fossæ, one on each side of the midline, beneath the parietal, are behind the transverse bar already mentioned,

The parietal crest evidently rose behind at a rather steep angle during the life of the animal. In the specimen now described the crest has been crushed and bent downward, with the result that the parietal has been broken across behind the postfrontal fontanelle and pulled back, leaving the gap in the upper surface, as seen in the two photographic reproductions of the skull accompanying this paper.

The bone forming the margin of the postfrontal fontanelle comes to a thin rounded edge and within the fontanelle near its anterior end is another transverse bar not so stout as, but longer than, the one behind.

The lachrymal foramen is seen between the maxilla and the nasal in advance of the back end of the former bone. It has been reduced in vertical diameter by the downward pressure to which the skull has been subjected.

As with most Ceratopsia, the outer and upper surfaces of the skull are marked by vascular grooves, notably so on the horn-core, the postfrontal above, and the posterior processes.

The magnificent specimen here described has been skillfully prepared for study by Mr. Charles H. Sternberg, who discovered it last summer on Red Deer river, Alberta, on the south-west side of the river, about twelve miles below the mouth of Berry creek. The plates are reproductions from excellent photographs taken by Mr. Geo. G. Clarke.

The genus Styracosaurus is distinguished from Ceratops, Marsh, by having incipient instead of well developed supra-orbital horn-cores, by the shorter squamosals, and by the intraparietal fontanelles of moderate size, instead of greatly enlarged ones enclosed by the squamosals and parietals together.

From Monoclonius, Cope, it differs in its greater size, the smaller fontanelles of the frill, the larger squamosals, and in having a straight, upright nasal horn instead of one which curves backward.

In Styracosaurus the shape and position of the nasal horn-core, the spike-shaped outgrowths from the back of the frill, the long postfrontal fontanelle, and the great size of the supra-temporal fossæ are additional characters separating this from all other known genera of Ceratopsia.

It is not possible to arrive at a definite conclusion regarding the generic and specific affinities of *Monoclonius sphenocerus*, Cope, from Montana, on account of the fragmentary condition of the material on which this species is based, and the very small part of the skull represented. The general resemblance of Cope's specimen, which includes the nasals, the nasal horn-core and the left premaxilla, to the corresponding parts of *Styracosaurus albertensis* suggests the advisability of referring the Montana species to the genus Styracosaurus. It is likely, however, that the species are not the same. In so far as a comparison can be made between *M. sphenocerus* and *Styracosaurus albertensis* it is seen that in Cope's species the nasal horn-core is farther forward on the nasals, is proportionately shorter, and more laterally compressed, with a much greater antero-posterior diameter at the base. The nasals in front of the horn descend rapidly instead of rising conspicuously before they curve downward, and the nasal opening is larger and placed more under the horn. These differences are regarded as probably indicating a specific but not a generic distinctness.

MEASUREMENTS.	Feet.	Inches.
Maximum length of specimen from midway between the points of the back processes..	6	1¼
Greatest breadth of same across the processes..	4	8½

	Feet.	Inches.
Length of squamosal from the posterior termination of its free edge to the back margin of the jugal	1	3 5/8
Breadth of same from its lowest point to the top of the squamoso-postfrontal suture		12 1/2
Length of nasal horn-core as found		9 7/8
Transverse diameter of same, at break		2 1/2
Longitudinal " " " " "		3 7/8
Transverse diameter of same, at base		4 3/8
Longitudinal " " " " "		6 3/8
Length of nasal horn-core as restored	1	9 1/2

NOTE—Since the above was written, a specimen collected last summer and consisting of the squamosal, jugal and postfronal of the right side, with the front margin of the orbit completing the circumference of the eye-opening, proves to be referable to *S. albertensis*. This specimen was obtained from the Belly River formation, about four miles up stream from where the type was discovered. In it a narrow, flat process is seen to proceed backward from the jugal below the lateral temporal fossa and to overlap the forwardly directed process of the squamosal as far as the middle of the lower margin of this opening. This process was not at first recognized in the type, but is now clearly seen. It has been broken from the main portion of the jugal, but is in place between the posterior termination of the quadratojugal and the lateral temporal fossa. In all particulars this second specimen fully agrees with the type. Above the eye a similar smooth surfaced depression marks the position of the supraorbital horn-core and the free margin of the postfrontal fontanelle and supratemporal fossa is present.

EXPLANATION OF PLATES.

PLATE X.—Lateral aspect of type of *Styracosaurus albertensis*, one-twelfth the natural size.

PLATE XI.—The same specimen viewed from above and similarly reduced.

PLATE XII.—Restored outline of the same specimen, viewed from the side and similarly reduced.

Abbreviations.—*F*, frontal; *J*, jugal; *L*, lachrymal; *MX*, maxilla; *N*, nasal; *NO*, nasal opening; *P*, parietal; *PF*, postfrontal; *Q*, quadrate; *QJ*, quadratojugal; *S*, squamosal; *SH*, surface for supraorbital horn-core; *SR*, surface for overlap of rostral; *T*, transverse; *A*, parietal fontanelle; *B*, postfrontal fontanelle; *C*, supratemporal fossa; *D*, lateral temporal fossa.

BIRD NOTE.

PILOT MOUND, MAN., Sept. 18.—My opposite neighbour has a nest of *Spinus tristris*, the goldfinch, with two half-fledged nestlings out of a clutch of four eggs. Two of the eggs did not hatch out. I wonder whether Mr. Norman Criddle can beat this for a record of late nesting in Manitoba. Usually we have frost enough by Sept. 15th to kill all half-hardy plants in the garden, but this year we have escaped frost entirely, up to date.

H. M. SPEECHLY.

NEW AND OTHERWISE INTERESTING LICHENS FROM VANCOUVER ISLAND AND THE ROCKY MOUNTAINS.

By G. K. MERRILL.

Parmelia olivacea var. multisporum (Schneid.) Merl. Bryologist XII, 4, 1909, p. 73.

Alder trunks. Sidney, Vancouver Island; Prof. J. Macoun. Asci containing from eight to forty spores. The eight-spored conditions absolutely inseparable from *P. olivacea*, and no reason appears for giving the polysporous anomaly other than a varietal rank.

Lecanora (*Callopisma*) **atrosanguinea** sp. nov.

Thallus effuse, thin, whitish or ashy, smooth or roughened, K—, C—. Apothecia sessile, small (less than 1 mm.), at first plane, then convex, opaque or shining, rounded or lobed, sometimes connate or composite, often proliferous, margin persistent, slightly elevated, concolorous with the blackened-crimson disk. Spores 8, ellipsoid, the terminations acute, polar-bilocular, 15–18 x 10-11μ, hypothecium reddish, asci ventricose, paraphyses distinct, slender, coherent, tips dark or reddish-black, hymenium in section gives a violet or purple reaction with K.

Trunks of willows, alders and birches. Sidney, Vancouver Island; Prof. J. Macoun. Type in herbarium Merrill. Differs from *L. ferrugineum Pollinii*, for which it might be mistaken in the color of the apothecia, epruinose disk, and the persistent and concolorous margin.

Lecanora epibryon Ach. Syn. p. 155 (1814).

L. subfusca b. *hypnorum* Schaer, of Tuckerman's Synopsis. Humus and decayed mosses. Yoho Valley, British Columbia; and mosses, Jumping Pound Creek, Athabasca; Prof. J. Macoun.

The specimen from Yoho Valley is remarkable from affording a hymenial reaction with Iodine like that of *L. subfusca*. The apothecia are medium, disk somewhat convex, blackish, with an inconspicuous fuscescent exciple. The apothecia of the Athabascan plant are concave with an elevated exciple similar in color to the thallus.

Lecanora (*Rinodina*) exigua (Ach.) Nyl. Flora 1873, p. 197.

Rinodina sophodes e. *exigua* Fr. of Tuckerman's Synopsis. Trunks of willows, maples, alders and Douglas fir. Sidney, Vancouver Island; Prof. J. Macoun.

The various specimens present a great diversity of coloration and conditioning for the thallus. The colors, white, whitish-ashy, ashy to sordid-glaucous, and the thallus from smooth and continuous to verruculose or rugged and more or less rimulose. The spores are variable in size and shape, ranging from 10-26 x 7-14μ, either bilocular with approximate sporoblasts, the cells without nuclei, or more or less nucleolate with a connecting canal visible. In the greater part of the material the thalline margin of the apothecia is perfectly to be made out, and is variously entire or crenulate, but a condition occurs in which the margin is obliterated, and the plant may then be correlated with:—

Lecanora exigua forma **lecideoides** (Crom.) comb. nov.

L. exigua var. *lecideoides* Cromb. Grevillea XVIII, p. 46 (1889).

Apothecia black, convex, and the magrin wholly excluded. Found on willows with the species.

When found unassociated with the normal forms of the species, the present may easily be mistaken for a *Lecidea* of the section *Buellia*. The hypothecium is destitute of color, however, and in thin section algae are always to be found in the envelope.

Lecanora exigua forma **pruinosa** f. nov.

Entirely like the species in thallus, apothecia and spores, and differing only in that the disk of the apothecia becomes gray-pruinose. The pruina does not extend to the exciple. The very dubious *Rinodina Hallii* Tuck. Synopsis, Pt. I, p. 208, in some of its exhibits is no different from the present. On the same trees with the species.

Sidney, Vancouver Island; Prof. J. Macoun. Type in herbarium Merrill.

Lecanora (*Rinodina*) colobina Ach. Lich. Univ. p. 358 (1810).

Thallus effuse or sub-limited, thin, granulate, the predominent color blackish. Apothecia small (0.05 mm.), adnate, plane, the disk black with a conspicuous thickened entire margin. Spores 8, ellipsoid, bilocular, nucleolate, with a connecting canal, 20–25 x 10–12μ, paraphyses distinct.

Willows. Sidney, Vancouver Island; Prof. J. Macoun.

Previously unrecorded from America.

Phlyctis speirea sp. nov.

Thallus effuse, tartareous, granulate, cinereo-glaucous, K + red. Apothecia small, difform, erumpent, the thalline margin irregular, lacerate-dehiscent, margin white, nucleus depressed, darker. Spores 2, ellipsoid or oblong-ellipsoid, muriform, hyaline, or yellowish, 100–120 x 25–40μ, hymen-

ium and hypothecium without color, paraphyses distinct, slender, discrete, asci inflated, hymenial gel. with I+ faint blue.

Bark of willows. Sidney, Vancouver Island; Prof. J. Macoun. Near to *Phlyctis argena* (Ach.) Koerb, but differing in the color of the thallus and aspect of the apothecia. The whole appearance of the plant is that of a *Pertusaria*. Type in herbarium Merrill.

Biatora (*Biatorina*) **Griffithii** var. **Pacifica** (Tuck.) comb. nov. *Biatora mixta Pacifica* Tuck. Syn. Pt. 88, p. 30.

Thallus thin, ashy for the most part, limited and decussated by black hypothalline lines. Apothecia small to minute, depressed, plane or convex, from waxy, through various shades of brown, or finally blackening, sometimes pruinose, margin persistent or sub-persistent, but not conspicuous, not showing the color mutation of the disk and commonly brown. Spores 8, fusiform or oblong-ellipsoid, straight or curved, one-septate or rarely with two septa, 12–15 x 4–5μ, hymenium and hypothecium without color, asci ventricose-clavate, paraphyses distinct, coherent, epithecium fuscescent downward, hymenial gel., with I + intense blue.

Bark of alders, willows, oaks and other trees. Sidney, Vancouver Island; Prof. J. Macoun.

Apothecia sometimes strongly convex, blackening, and excluding the margin. When the disk is pruinose or light colored the margin is conspicuous from its darker hue.

Biatora (*Biatorina*) **Columbiana** sp. nov.

Thallus effuse, thin and granulate, or thicker and areolate, cinerous or greenish-cinereous. Apothecia small or moderate (1–2 mm.), at first concave with a relatively thick margin, but ultimately strongly convex and immarginate, brownish-black or black, the margin concolorous. Spores 8, ellipsoid or fusiform-ellipsoid colorless, 16–18 x 4.5–6μ, hymenium hyaline or suffused with purple, hypothecium blue or green, asci clavate or ventricose-clavate, paraphyses distinct, slender, discrete, tips purple, hymenial gel., with I + blue. Bark of alders, maples and Douglas fir. Sidney, Vancouver Island; Prof. J. Macoun.

The affinities of the plant are with *B. Laureri*, and *B. atro-purpurea*.

The hypothecium is often imposed on a stratum of confused hyphema of a distinctly purple color. Under the microscope the hymenium is a beautiful object.

Biatora (*Bilimbia*) sabuletorum forma simplicior Nyl. Scand. p. 205 (1861).

Thallus not differing from that of the species. Apothecia within brownish-yellow. Spores variable in form and size, oblong or fusiform-oblong or somewhat cymbiform, usually one, sometimes two or three septate, 11–18 x 4–5μ, asci inflated-clavate with a thick apical wall, hypothecium sometimes fuscescent, hymenial gel. with I + blue.

Over mosses. Pipestone Pass, Rocky Mountains; Prof. J. Macoun.

Not heretofore recorded from a Continental North American station.

Biatora (*Bilimbia*) **syncomista** (Flk.) comb. nov.

B. artyta (Ach.) Tuck. Gen. p. 162 (1872).

Mosses over rocks. Pipestone Pass, Athabasca; Prof. J. Macoun.

Th. M. Fries in Lich. Scand., Pt. II, p. 336, states that the original specimens of *Lecidea artyta* Ach., as designated in the Acharian herbarium, are to be referred to *Stereocaulon tomentosum* b. *alpinum* and *S. denudatum* b. *pulvinatum*. Acharius in Synopsis p. 20, cites *Lecidea sabuletorum* b. *syncomista* Flk. in Berol. Mag. 1808, p. 310, as equivalent to his own *L. sabuletorum* b. *geochroa*. On page 33 of the Synopsis he defines *Lecidea artyta*. This may only be construed as a definite opinion of the distinctness of the two plants. Schaerer in Spicig., p. 151, cites *L. artyta*, *L. sabuletorum geochroa* of Acharius and *L. sabuletorum* b. *syncomista* of Floerke as synonymous with his own *L. sabuletorum* b. *muscorum*. Tuckerman asserts that Schaerer knew *Lecidea artyta*, as sent to Acharius by Schleicher, and there is evidence that he was acquainted with the Floerkeian plant, for it is cited with a mark of emphasis. There seems to be a total lack of definite knowledge regarding *L. artyta*, and Tuckerman's effort to save the name is merely an example of ingenious inference. While in most of the essentials the authors agree in their descriptions of the species, there are discordances that prove perplexing. The hypothecium is noted to be extremely variable in color, ranging from yellowish to deep black, and the hymenial reaction is given as blue, deep-blue, violet, blue followed by violet and sordid-violet, sordid-yellow or wine-red. The following description of our specimen is inserted for purposes of comparison.

Thallus indeterminate, granulose-squamulose, the squamules small, thickened, crenate-lobulate, more or less contiguous, grayish-white K—, C—. Apothecia sessile, aggregated,

often 3–7 connate, plane and thinly margined when young, at length strongly convex and immarginate, disk blackish-brown with the epithecium roughened. Spores ellipsoid, oblong-ellipsoid or cymbiform, one to three septate, 14–34 x 3–6μ, paraphyses distinct, concrete or somewhat lax, bluish-green at the apices, hypothecium reddish-brown, hymenial gel., with I + blue, the color persisting.

The species is reported from Port Clarence, Alaska, Greenland and Newfoundland, under the generic synonym of *Lecidea* of its section *Toninia*, and from Lake Nipigon, Ontario, Arctic America, Islands of Behring Straits, and from the Canadian Rockies under the name of *Biatora artyta*.

Lecidea sublatypea Leight. Lich. Flora G. Brit. ed. I, p. 271 (1871).

Thallus effuse or sub-determinate, granulate, ashy-fuscous, K—, C—, Apothecia small (0.5 mm.), sessile, scattered or connate, plane or concave, with a persistent or evanescent, opaque or shining entire margin, disk black. Spores 8, ellipsoid, simple, 12 x 6.5μ, hypothecium brown, asci ventricose, paraphyses distinct, compacted, tips blackish-green, hymenial gel., with I + deep-blue.

Granite rocks. Sidney, Vancouver Island; Prof. J. Macoun. Previously unreported from America.

Xylographa micrographa sp. nov.

Thallus hypophlaeous, the hyphema ramifying through the superficial fibers of the substratum, algae Palmella, few and scattered, K—, C—, Apothecia innate, scattered, parallel with the fibers, small (less than 1 mm. in length), lirelliform or fusiform, accuminate, typically concave, but sometimes plane, with a prominent slightly inflexed margin, or the margin reduced and the disk nearly plane, black. Spores 8, ellipsoid, simple, nebulous, filled with granular protoplasm or developing nucleoli, 11–13 x 7μ, hymenium and hypothecium colorless, asci inflated-clavate, paraphyses distinct, slender, lax, abundant.

Old decorticated log. Sidney, Vancouver Island; Prof. J. Macoun.

The thallus visibly whitens the wood, and is effuse. The internal characters ally the plant with *X. parallela* (Ach.) Fr., the external with *X. hians* Tuck. Type specimen in herbarium Merrill.

Rockland, Maine.

SOME RARE CASES OF ALBINISM IN ANIMALS.

By PROFESSOR EDWARD E. PRINCE, LL.D., D.Sc., F.R.S.C.
Dominion Commissioner of Fisheries, Ottawa.

In a paper which I contributed to THE OTTAWA NATURALIST, Nov., 1906, I summarized my views upon the large subject of Animal Coloration, and I dealt with the evolution of the colors of living creatures, attempting to classify exhaustively a large variety of examples known to me. In referring to "Physiological Coloration" I made mention of a closely allied phenomenon, which I regarded as "Pathological," and due to abnormal or diseased conditions, grouping thereunder albinos, such as white crows, hawks, peacocks, moles, etc. I mentioned, as a likely cause, a diseased or defective peripheral nerve supply; a white hedgehog (*Erinaceus*) being found to have an abnormal condition of the peripheral nerve twigs ending in the skin, and resulting in a lack of the usual color or pigment in the integument, or rather in the spines and hairs developed from the skin. I stated that, according to Darwin, white cats have blue eyes, are, as a rule, deaf, and, if Dr. Lawson's statement be correct, are always tom-cats. The eyes of most animals are dark or colored, owing to pigment massed in the retina, and in the iris; but in albinos, color being absent, the retina is without it and the rich blood-supply renders the eyes red or pink, as well as the nose and tips of the ears, as in albino rabbits and white rats and mice.

All white animals are not albinos, because the absence of color in the fur or plumage may be due to seasonal and other normal causes. Thus the grey harbour seal is snow white when very young, but its nose and eyes are jet black. The Polar bear, Arctic fox, the stoat or ermine, the varying hare, the ptarmigan, and other animals, are permanently or seasonally white, and thus resemble their wintry surroundings. Dr. Starr Jordan observes that the white color of Arctic animals may be useful not alone in rendering them inconspicuous, but may also serve a direct physiological function in preventing loss of heat from the body by radiation. He adds, "the dark colors of animals may be of value in absorbing heat rays and thus helping to keep them warm. But by far the most widespread use of color is to assist an animal in escaping from its enemies or in capturing its prey." Now, while cold and dryness tend to produce whiteness, damp and warm conditions result in darkening the fur or plumage and the external color of animals generally.

"Melanic varieties, as they are termed," says Beddard, "often occur on islands and other situations where the climate is moist as well as warm." On the other hand, in such a country as New Zealand, white, or what are called albino, varieties of birds, and many living forms, are said to be frequent owing to very dry seasons or periods of drought, and to the presence of snow on the lofty ranges of mountains, which for height and grand scenic features resemble our own Pacific coast mountains. The whitening process in our Northern Hare (*Lepus americanus*, Erxl.) has been carefully studied, and it has been proved that the summer coat actually bleaches, but the change is accompanied by a growth of new hair, so that the coat is thicker than in summer and the hairs are longer. The outer border of the ears remains black, but the rest of the fur becomes pure white, the blanching successively passing from the black tip of each hair down the reddish middle part to the basal leaden-colored part. The hairs of the forehead and shoulders are the last to change and a few long black hairs are always present above and below the eyes and extend backwards. One observer, Mr. Welch, tells us that the entire change occupies about three months, from early in October till late in December, but further north, in the latitude of Quebec, it is said to be, usually, early in November, and the whitening is also more rapidly accomplished. Sir John Ross observed a lemming on board his vessel change color in a week, in February. Whether the assumption of a white winter coat is due to Arctic environment, or to natural selection and heredity (the white examples surviving when other examples were more readily seen by enemies and exterminated), it is not necessary here to discuss. The brown musk-ox, the black raven, the sable and other northern animals do not change, and thus the matter is a complicated one. But the term albino should not be applied to forms which are white normally, or turn white seasonally as an established feature in their life; but should apply rather to the somewhat erratic and abnormal cases of whiteness and lack of normal coloration due to some congenital cause, apparently allied to a diseased or pathological condition.

An extremely rare and interesting case of this true albinism was discovered this season (1913) at the St. Andrew's Biological Station, New Brunswick. A specimen of the common sea-urchin (*Strongylocentrotus drobrachiensis*) of our Atlantic shores, over three inches in diameter, instead of exhibiting the reddish purple and variegated colors of typical specimens, was of the purest chalk-white, the plates of the somewhat depressed globular test or shell, as well as the crowded sharp-pointed moveable spines, being entirely destitute of color. Even the eye spots,

which are rudimentary colored visual organs on the five ocular plates, alternating with the five genital plates round the peri-proctal space at the aboral pole, did not show any pigment. It was a perfect albino, and, so far as I have been able to ascertain, the first albino sea-urchin ever seen. It was a beautiful object, appearing as though its characteristic apple-shaped form were delicately carved in white marble. It is now conspicuous in the faunal collection of fishes and invertebrates at the Dominion Biological Station, St. Andrews, N.B.

An interesting albino specimen of the lobster (*Homarus americanus*), from the Pictou shore, Nova Scotia, came into my possession some time ago. Pale tinted specimens of lobsters have long been known, some of which, in place of the dark blackish blue of the usual type, show reddish or yellowish coloration; but the specimen which I secured was dappled all over with irregular patches of yellowish white and the blue-black color was confined to small, irregular spots, chiefly on the upper parts of the tergum, or dorsal portion of the body and tail-segments. This very unusual specimen was only 8 inches in length and cannot have been more than three or four years old. It might be suggested that, instead of being an albino, the specimen merely retained some of the varied coloration of the infantile stages, for when half-an-inch long, at the stage when salts of lime and pigment first appear in the delicate shell, the general color is maroon, or sometimes pale brown with green intermingled, and especially prominent are some chalk-white spots, four or five in number, apparently marking the attachments of the tendons of the cephalo-thoracic muscles inside. These spots are even more distinct at the sixth stage, about the fifth week after hatching, when its length is three-fifths of an inch. At the seventh stage (seventh week), when three-quarters of an inch in length, a definite pigment layer appears below the external cuticle. In the adult lobster this pigment layer, called by Dr. W. B. Carpenter the areolar layer, is a canaliculated stratum crowded with lime salts, and is hypodermic in origin, and mainly constitutes the thick, dense shell. A tubular layer occurs beneath, likened by some authorities to dentine, being thick and dense, and forming the gleaming white part which is seen when the shell is broken. Lowest of all is a thin lamellar non-calcified layer. The color in the areolar layer is due to chromogens, which are converted by boiling, dehydration by alcohol, etc., and even by exposure to excessive light, into a red lipochrome. Every one is familiar with the change, by boiling, of a dark blue or blackish-green lobster into a bright scarlet one. The normal prevailing color of lobsters on the Atlantic coast is blackish-blue, sometimes of

a greenish cast, those on rocky bottoms being darkest, as off the western Nova Scotia shores, but on sandy, shallower areas, as off Prince Edward Island, the color is paler, and often greenish or even brownish.

Professor Herrick records a very black specimen, only 6 or 7 inches long, found among eel-grass in three-fathom shallows off the Maine coast, and the captor, a fisherman, thought at first that it was coated with coal-tar. It was regarded as a melanic specimen, and it may be mentioned that melanism has been noticed also in crabs. Abnormally colored lobsters have been reported of a red or reddish-yellow color, when alive; others are cream colored, i.e., color is practically absent, but mottled specimens, blue-green and yellow, are not rare, while pied examples, showing bold green and light yellow spots, are less common. The specimen secured by me was, in the main, of a yellowish-white, as already stated, but small blue-black spots occurred here and there, on the highest parts of the back. No doubt the example was a pathological or "abnormally physiological" specimen and a near approach to the typical albino.

The third case of albinism recently brought to my notice is that of an albino porpoise (*Phocæna phocæna, L.*), which was captured in Scotland, and a photograph of which was sent to me by my friend Professor McIntosh, F.R.S., of St. Andrews. The *London Globe*, some years ago, gave an account of an English specimen obtained near Ventnor, Isle of Wight, which was described as white, but of a reddish color on the under side. It was shipped alive to the famous Brighton aquarium and exhibited there, according to a correspondent, Mr. R. Blake, of Ventnor.

The normal color of the porpoise, as is well known, is a deep, shining black, but the breast and under surface is dirty white; but this albino specimen, studied at the Gatty Marine Biological Station, St. Andrews, Scotland, was a female of a dull yellowish color, with a faint longitudinal band, somewhat dusky, along the upper lateral region on each side, while a band of the same dusky appearance curved in a crescentic course round the front of each eye, reaching to the corner of the mouth. It measured 2 feet 10 inches in length and was rather more than half grown. Professor McIntosh notes that it seemed to retain the coloration of the very young porpoise, for a specimen 6 inches long, secured at St. Andrews, on Nov. 18th, 1911, was dusky over the dorso-lateral region, the head very dark above as far as the neck and the breast flippers, dorsal fin and horizontal tail-flukes were blackish, the under surface of the last being very

dark. An older specimen, also before birth, and obtained on Feb. 6th, 1912, was 17 inches long and the color of the young specimen was now replaced by deep black, but becoming paler down the sides. Adult specimens of various whales show at times increase in white coloration. Thus the Humpback (*Megaptera*) is black above, but white beneath, varied with black spots, but sometimes the black underneath decreases to an indefinite marbled arrangement, or, in some cases, the black disappears and the under surface is white. The huge rorquals or fin-back whales show similar variations, and Mr. Lyddeker surmises that age or special food causes this tendency to albinism. The Right whale of the Arctic is very black above, but white beneath and where the two tints meet there occur irregular patches of white extending into the black color. The Killer whale or Grampus is black above, but in one specimen I observed a white patch above each eye, or there may be a white patch below the eye and a transverse crescentic patch of white behind the huge erect dorsal fin.

It is hardly necessary to point out that the albino porpoise above described recalls the small beluga or white-whale (*Delphinapterus leucas*, Pallas), which is creamy white all over and abounds in the mouth of the River St. Lawrence and round Hudson's Straits into Hudson's Bay, and along Baffin's Land and as far north as Barrow Straits.*

Mr. A. P. Low expressed the view that the white-whale industry might become an important one in many places in Hudson Bay and Straits owing to its abundance, and the Hudson Bay Company, as well as the Eskimo, have long taken considerable numbers for oil and leather, while the boiled skin is a native dainty and the dark colored meat is also used as food.

It is impossible in this place to enter into the somewhat profound and complicated subject of the origin of albinos, and to define the essential differences which divide them from merely pale examples, or seasonal varieties. Melanism can be explained partly at any rate, as due to environment, but albinism is no doubt due to causes which are congenital, possibly pathological. Merely white varieties are not albinos, and the so-called albino skunk, reported as seen last year in Delaware Park, near Buffalo, was not an albino.

Curator Crandall, who saw it, described it as blue, with apparently no black or white hairs intermingled and it may be compared to the blue variety of Arctic fox, which is blue, or rather slate grey, all the year round, and less numerous in the more northerly regions than in the more southerly. In the

*Lilljeborg states that the young beluga is greyish-brown in color.

litters of this blue variety of the Arctic fox there frequently occur pure white specimens, but a whole litter of white cubs has not been recorded. Some interesting figures in a recent report of the Conservation Commission may be here referred to. Thus on St. George Island (Pribyloff Islands), in a total of 772 so-called blue foxes killed in 1897, no less than 40 were white. In 1898, 18 were white in a total of 885 foxes, but in 1903 only 15 were white, out of 1,061 foxes taken, and in 1907-8, out of a total of 1,005 only 8 were white, indeed, only 3 were pure white, the others were bluish white. These pale or white specimens are not valued, and every effort is made to exterminate them and prevent the increase of a white variety. The ordinary variety of dirty brownish colored Arctic fox, which turns pure snow-white in winter, though recently fashionable, was not many years ago regarded with contempt by fur dealers, and Indian trappers were usually "called down" severely for taking the trouble to bring such little-valued pelts to Edmonton and other fur-receiving centres in the North-west.

White deer, like white house-sparrows, have not unfrequently been reported, but whether such are true albinos with pink eyes is not recorded. A red deer of almost snowy whiteness was reported up the Gatineau region some years ago. A white form of the Scottish red deer has been established as a distinct variety, and in Welbeck Park, Langley Park, near Slough, Windsor, and Woburn Castle, in England, there are herds of cream-colored or white deer, believed to be originally of German origin, though the Duke of Portland has regarded them as a Danish variety. It is interesting to note that a creamy or white colored variety of the black bear was discovered not many years since in British Columbia, north of Rivers Inlet, and at the head-waters of the Skeena River and at other points. This small bear has been called "*Ursus Kermodei*" by Hornaday, who first described it.

The whole subject of albinism is deserving of investigation, but it may be clearly stated that white animals, whose eyes are dark, or the tips of the ears, the tail, tip of the nose, etc., are black, are really not albinos, for albinism in mammals involves pink eyes, pink nose, and a general absence of pigment.

MEETING OF THE BOTANICAL BRANCH.

November 8th, 1913, at the residence of Mr. R. B. Whyte. Owing to the rainy weather only a small number of members were present.

After a short discussion it was decided that, for the meetings of the approaching winter, the members should bring to each meeting specimens of botanical interest for exhibition and discussion. It was thought that the adoption of this suggestion would make the meetings more interesting and educative. It is hoped, therefore, that the members will respond heartily in bringing material for each meeting's discussion.

It was then decided that those present, who had made interesting observations during the summer, should give the others present brief accounts of them. Mr. H. T. Gussow very entertainingly described some broom-growths he had seen on trees in British Columbia and some experiences he has had with the seeds of a certain mistletoe growing in the same part of the country. A little later in the evening he also referred to bacteria of the soil in their relations to soil fertility, and to the disease potato scab. Mr. L. H. Newman gave a short account of the recent activities of the Canadian Seed Growers' Association, referring chiefly to the efforts which are being made to produce corn and potatoes of a high standard quality and in quantities large enough for wide distribution.

J.R.F.

BOOK NOTICE.

FORTY-THIRD ANNUAL REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO. This publication has recently made its appearance and we are glad to see fully maintains its previous reputation. It contains no less than 23 papers contributed by the leading entomologists of Canada. These contributions cover a wide field of research and on account of their economic value should be in the hands of every Agriculturist and Horticulturist not alone in Ontario, but throughout the whole Dominion, for, while the papers deal more particularly with Ontario pests, the insects discussed recognize no boundaries and are often as injurious without as within. This, too, applies with equal reason to pests discussed from other provinces which, though comparatively harmless in Ontario to-day, may at any time become troublesome. Thus we find articles wisely included from various provinces, all of which add to the value of the report. It is, as usual, profusely illustrated, and contains as a frontispiece a portrait of the Society's President for 1912, Dr. E. M. Walker.

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