shore strata. It extends eastward under Doctor's Brook. It bifurcates and then trifurcates being divided by greenstones, its branches pass onward, eastward, the northern branch terminates in the *fort-like* rock at McNeil's Barn, near Malignant Cove. The middle branch passes on and is lost among brush, &c. The southern branch passes by not far from the *point* to which I brought the shale from McNeil's mountain, and proceeds onward and appears to terminate on the south side of Malignant Cove Sugar Loaf. Any continuation easterly must lie under the carboniferous areas which extend onward to St. George's Bay.

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## Art. II. Review of Nova Scotian Diurnal Lepidoptera.

By J. M. Jones, Esq., F. L. S.

(*Read, Nov.* 14, 1870.)

Nearly seven years ago, Mr. Thomas Belt read before this Institute a paper entitled "A list of Butterflies observed in the neighborhood of Halifax," in which he included no less than thirty species, the result of his observation and collection during the years 1862–3. Since that time I have been able to add a few new forms to the list, and also facts regarding the habits of the several species, and trust the same may be found of service in advancing our present knowledge of that interesting and beautiful class of insects.

### Swallow-tail, (*Papilio turnus*, Lin.)

This butterfly which is far more common during some seasons than others, generally makes its appearance about the first week in June. Mr. Belt says the 1st of June, but I have failed to note its presence before the 7th of the month. A pleasant sight it is to the eye of the entomologist to observe about the middle of that genial month a lilac (*Syringa vulgaris*,) covered with its purple masses of luxuriant bloom, on which may be seen many of these pretty insects revelling in their honied sweets. Flitting alternately from flower to flower, their delicate wings of lemon striped with black, contrasting with the more sober colour of the flower, presents

a scene of natural beauty, sufficient to attract the attention of the most heedless. That these insects have very acute olfactory organs, I have had frequent opportunities of observing, and I can safely say that they can scent the odour of lilac flowers when a moderate breeze is blowing, for I have stood and watched them, at a distance of 150 yards to leeward. Canadian entomologists state that there are two broods during the summer in that part of the Dominion, but in Nova Scotia, I think there is only one of this species. A perfect community of these gaudy butterflies may be seen occasionally hovering over and lighting upon wet spots on roadways during the month of June, and I have observed that they are by no means particular as to the nature of such moisture, for I have several times seen them congregate in manure where horses have lately staled. Gom in his very interesting work "*The Canadian Naturalist*," remarks their fondness for wet spots, and says that he has counted as many as fifty-two in one such situation, but no author that I am aware of has ever noted the circumstance of their fondness for urine.

This species is found, more or less abundantly over the N. A. continent as far south as Mexico, and as far north as Fort Simpson on the Mackenzie River—according to Gom it is also found in Newfoundland.

*Portia oleracea*, (Har.)

According to Mr. Belt we have two kinds of this common butterfly; the first at the end of May, and the other in July. In August abundant over potatoe patches.

This is one of the pests of the horticulturist, for it lays its eggs and the caterpillars are hatched, upon the cabbage cauliflower, and other oleraceous plants. In Nova Scotia we have however, but little reason to complain of its ravages, for it is not what naturalists would term abundant. It would have been a fortunate circumstance had we only this one species of cabbage butterfly to damage our crops, but as I shall show presently, we now possess a perfect demon in this respect, which far outvies our native insect in destructiveness.

It is distributed over the northern portion of the United States, and the British Provinces.

*Portia rapoe*, (Steph.)

Although an Englishman and justly proud of the productions of my native land, yet I must confess that in introducing to the notice of the farmers and gardeners of Nova Scotia, this the well known small cabbage butterfly of England, I am for once ashamed of my fellow-countrymen, for of all the persistent destroyers of cabbage, or cauliflower, perhaps this is the worst. All kinds of remedies may be applied but still their green caterpillar does its work, and whole beds of choice cauliflowers will become so leaf-eaten that they will barely show a head larger than a dahlia. In my own garden last summer I had a plot of some seventy or eighty cauliflowers entirely ruined by this insect, and I heard repeatedly from the country people in the market that they had suffered in a similar way. It has only been known in the North American continent within the last few years, having been introduced from Europe. It was observed in Canada Proper some years ago, and has been making its way eastward rapidly, until about three years ago it first became known about Halifax. That it will increase and finally overrun the Province, is very certain, and farmers and gardeners will now have to lament the destruction of their cabbage and cauliflower crops just as they do the red currants; and when they consider that in this country we do not possess the sparrow and tomtit, those inveterate enemies of insect life in all its forms, it is really a matter for the serious attention of agricultural and horticultural societies, whether it would not be advisable to introduce these birds in order to counteract such injurious effects. The citizens of New York, and I believe some of the Canadian towns, have already introduced the common house sparrow of England, and apart from its cheerful appearance and recall of home remembrances, the good it does in clearing away myriads of injurious insects might be a sufficient inducement to recommend it to our local authorities.

*Colias philodice*, (Godt.) "Clouded Sulphur."

This may be considered our commonest butterfly; at least in the neighbourhood of the Atlantic coast. They do not appear abundantly in wet seasons.

First appearance, June 4th, 1866.
Latest, " 1st week in November.

frequenting the flowers of the fall dandelion, (Leontodon autumnale) the only field plant left in bloom.

Although a field may appear covered with them, yet if a cloud overshadows the same for even a few minutes, not a *Colias* is to be seen. It is a happy circmstance that this species is not destructive to our garden crops, merely resorting to the plants of the field for nourishment in the caterpillar and *imago* states. It resembles greatly the clouded yellow (*Colias edusa*,) of England. There are two broods of this species, the first in May and the last in July or August. Mr. Belt says that there are probably three broods, but as in the case of some birds which breed earlier or later according to circumstances, I fancy the newly born specimens of this butterfly which we see in September, are late cases of a second brood.

*Danais archippus*, (Fabr.)

This may be considered a very rare species in Nova Scotia, only a few specimens being observed each summer. In the autumn of 1863, Mr. Belt took a few specimens on the Citadel hill, and about that time I saw a specimen in the hands of a child in the Dutch Village. Mr. Downs, however, informs me on the authority of Mr. John Winton, that it is not so rare in the valley of the Shubenacadie.. This large and handsome butterfly is very common in the Bermudas, where I have taken several specimens as well as the caterpillar which feeds upon the ipecachuan plant (*Asclepias curassavica*). It is also common in Lower Canada, United States, and I believe also the northern parts of South America, for I have specimens which were blown on board a vessel when off Cape St. Roque in Brazil, at which time perfect clouds composed of this and three or four other species of butterflies literally darkened the sky. These enormous gatherings of butterflies blown off the coasts of different countries, are alluded to by Darwin and the naturalists who have personally witnessed them. They are supposed to be migrating.

*Argynnis aphrodite*, Fab.
*A. cybele*, (Godt.)

This may rank second as a common species in our Province, being very abundant during the latter part of our short summer. It is in the month of August that the collector will find the most perfect specimens, as later on in the early part of September they are generally observed with damaged wings. They appear to be partial to the flowers of the blue michaelmas daisy, and occur more frequently in the depths of the forest far away from cultivation than any other species. It appears to be common in Canada, and the northern part of the United States.

*Argynnis myrina*, (Cramer) "*Myrina Butterfly*" "*American Pearl bordered Fritilla.*"

This is one of our commonest species, generally appearing in the neighbourhood of Halifax about the beginning of the second week in July. At the close of that month they are perhaps most numerous, frequenting the warmer and healthier spots, where on the blossoms of the white-weed (*Lucanthemum vulgare*,) they appear perfectly "at home." Another favorite locality is a log road in the forest not far from the settlements, where the sun pours down its hottest rays. Here in company with sundry "skippers" the pretty little Myrina flits from spot to spot, opening and closing its chequered wings unmolested save when a stray entomologist passes by. Mr. Belt reports two broods during the summer.

*Melitœa ismeria* (Boisd.)

Mr. Belt records the capture of this species at Lake Loon and Lake Thomas, Halifax county, in July, but puts it down as "scarce." Harris in his "Haunts of Man," states that he had only seen one specimen. It is not a northern species, but is chiefly confined to the southern United States.

*Melitœa Tharos*, (Cramer.)
*M. tharossa*, (Godt.)
*M. Pharos*, (Drury.)

Very common, generally observed in company with the former species and the skippers.

*Grapta interrogationis*, (Godt.)
*G. aureum* (Cramer.)
*G. calereum*, (Gom.)

Mr. Belt caught one of this species in the Horticultural Gardens in Aug. 1863. I have not heard of any other instance of its capture in the neighborhood of Halifax. It is common in the northern United States and Upper Canada.

*Grapta progne*, (Cramer.)
*Vanessa progne*, (Godt.)
*V. cargenteum*, (Kirby.)

It appears to be widely distributed over the northern parts of America, being found within the arctic circle and as far west as Fort Simpson on the Mackenzie.

This is a somewhat common species about Halifax, appearing in a damaged state early in the summer. These early broken winged specimens are those that have secreted themselves in some sheltered situation during the past winter, and perfect examples of the year's brood are not seen before the beginning of July.

*Grapta Comma*, (Harris.)

This species appears to be so variable in its markings that entomological authors are much divided in opinion as to whether there is more than one species. Mr. Belt showed me two well defined varieties, which he declared were persistent, as he had examined numbers of each, and the markings always exhibited the same difference. The commonest of England (*Grapta C. album*) which is very similar if not identical with our species, is also liable to variation of marking, so probably it is one of those forms several of which are known to zoologists, liable to variation according to external circumstances.

Two varieties are found near Halifax, yet they are very locally distributed.

*Grapta argenteum*, (Kirby.)

Under this name a species is included in the *Fauna Boreali-Americana*, and Mr. Belt places it in his list as one of our Nova Scotia forms. Harris considers it as a variety of *G. comma*. The shores of the Dartmouth Lakes and shore of Lake Loon are given on Mr. Belt's authority as its habitats. Mr. Belt observed it as numerous in spring and autumn near the Dartmouth Lakes and Lake Loon.

*Vanessa J. album*, (Boisd.)

This butterfly may be considered rare in the neighbourhood of Halifax, and as far as I have been able to ascertain, equally so throughout the Province. Two or three specimens are the most I have seen during a season. It sppears to be equally scarce in the northern United States and Canada.

*Vanessa milberti*, (Godt.)
*V. furcillata*, (Say.)

This species has not been observed in the neighborhood of Halifax, but has been taken in Truro and Windsor, or farther to the north. This small and prettily marked species is a true boreal form, being found as far north as lat. 63° in the Hudson's Bay Territory. In Newfoundland according to Gom it is the most abundant of all the species found there. It is also common in Canada but rare in the United States.

*Vanessa antiopa*, (Linn.)
*Papilio antiopa*, (How.)
*Engonia antiopa*, (Hubn.)

This species which is extremely rare in England is the very reverse with us, being found everywhere in abundance. (It is also found in Prince Edward Island, whence I have received a specimen captured at Charlottetown, and kindly forwarded by J. S. Carvell, Esq.) So early as the first week in April if the sun comes out bright and warm, isolated specimens, hibernated through the last winter, shew themselves in our gardens and flit through the streets, delighting the children with their presence, a pleasant sign of the coming summer.

*Pyrameis atalanta*, (Donb.)
*Vanessa atalanta*, (Fabr.)
*Papilio atalanta*, Linn.)
*Ammiralis atalanta*, (Renn.)

This is a rare butterfly in the neighborhood of our Atlantic coast. Harris thinks that this species which is common in Europe, was introduced into America with the common nettle. It is especially abundant in some parts of England and Wales, particularly the west of Shropshire and eastern part of Montgomeryshire, where I have seen numbers together on the purple flowers of the common scabious in the month of August. It is found very far north on the American continent, and as far south as Mexico, including some of the W. I. Islands. It occurs but rarely in the Bermudas.

*Pyrameis cardui*, (Donb.)
*Papilio cardui*, (Linn.)
*Cynthia cardui*, (Kirby.)
*Vanessa cardui*, (Godt.)
*Libythea cardui*, (Lam.)

This species which may be considered one of the most errant forms on the globe, being found in every part of Europe, Asia, Africa and America, Australia, Pacific Islands, is also common with us. It appears to be equally at home on the icy slopes of Hudson's Bay or the heated plains of Africa—in the centre of the European continent or on the small rocky islets of Bermuda. The only difference I have observed in the several insects from such localities in the British Museum collection, is in the depth of colour of the wings—those from northern climes being of a brighter and fresher colour than those of the tropics. Probably the heated rays of the equatorial sun tend to fade them.

*Pyrameis Huntera*, (Donb.)
*Papilio Huntera*, (Abb. et Smith.)
*P. Lole*, (Cram.)
*P. cardui Virginiensis*, (Drury.)
*Cynthia Huntera*, (Kirby.)
*Vanessa Huntera*, (Steph.)

This species is quite abundant some seasons, but equally scarce in others. It appears very late about the end of September, and may be seen on the blossoms of the Fall dandelion (*Leontodon autumnale*) as late as the third week in October. It is some years quite as common as the Painted Lady B. According to the synopsis of N. Am. Diurnal Lepidoptera, published by the Smithsonian Institution, the United States specimens are as large as P. cardui—with us they are perceptibly smaller. The Citadel Hill was a favorite resort of this as well as other desirable species, but unfortunately that excellent preserve during the last few years has been closed to this entomologist.

*Nymphalis arthemis*, (Drury.)
*Nymphalis artemis*, (White.)
*N. lamma*, (Fabr.)

This fine strong-winged butterfly is by no means common in the neighborhood of the Atlantic coast, nor do I think it is more abundant in the interior. It is difficult to capture from its rapid flight and habit of flying high, and it seems to be partial to the forest, where it loves to bask on some hardwood leaf, opening and shutting its wings to the sun. I have observed it has a habit of returning to the very same leaf it rested on, when first surprised, and if the collector remains perfectly still he will generally in a few minutes time have another chance of netting the specimen. They appear also to be partial to old roadways on the borders of the forest. It appears about the first or second week in July, and I have seen it still about on the 11th of August. It is a boreal form, being found on the American continent as far north as lat. 63° but seldom farther south than 43°.

*Nymphalis disippus*, (Gordy.)
*N. misippus*, (Fabr.)
*N. archippus*, (Cramer.)
*Limenitis ursula*.

Several species as a rule may be considered local in their distribution, being much influenced by the geological or botanical features of the country; several species found on our barren

Atlantic coast being unknown in the interior or on the Bay of Fundy shores, where the rich alluvial soil gives nourishment to a more luxuriant vegetation. In the valley of Annapolis, during the past summer, I had an opportunity of observing during a stay of only two days the very great dissimilarity of its insect fauna compared with that of the neighbourhood of Halifax. With the exception of *Lycœna Americana*, and one or two *Hesperians*, I did not observe about Annapolis itself, any of our more common species, where *Satyrus alope and Erebior nephile*, species never seen with us were extremely abundant. I feel certain that it only requires more thorough investigation to render this distinctive character more apparent. The North Mountain if traversed from Digby Neck to Blomidon, would probably afford many rare if not new species.

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## Art. III. On the Copper and Nickel Mines at Tilt Cove, Newfoundland. By Elias Marett, Esq., St. John's, Newfoundland.

*(Read December 12, 1870.)*

Tilt Cove, situated on the north side of Notre Dame Bay, and about ten miles south of Cape John, a mere notch in the sea wall, has nothing particular to distinguish it from any other similar indentation on the same coast line of rugged lofty cliffs capped with a growth of stunted spruce and fir trees. A wharf and a few fishermen's huts are alone visible on first approaching the landing place. A few paces, however, across a narrow neck of land, suddenly conduct the visitor into the midst of a busy thriving town, which until lately, was part of the unreclaimed wilderness. This is the now notable mining centre of the "Union Mining Company."

The almost sudden transition, from a wild rock-bound coast, to a neat, clean, and orderly town, is as pleasing as it is unexpected. The town is built on the sides of a bowl-shaped hollow, the centre of which is occupied by a lake, at the foot of lofty precipitous hills, which completely encircle the place and shut out all view of the sea