described in some degree above, the greatest change occurring at the fourth moult.

Boisduval, in *Lep. de l'Amer.*, gives a Plate of *Caesonia*, with larva and pupa, copied from one of Abbot's unpublished sheets. This larva is roughly done, but shows the phase which has a yellow and a black stripe on each segment. The text says the larva feeds on many kinds of *Trifolium* and *Glycine*, and also *Tagetes papposa*.

In the latter part of the summer and in the fall the females of this species are apt to be more or less suffused with rose-pink on under side of hind wing, and about apex of fore wing, and occasionally the male shows something of this at base of hind wing, and around the margins of both wings. Mr. Rowley writes: "The females with red under the wings do not occur at all in the early summer broods. I took scores of butterflies this season in late April, all through May, June and July, and discovered not a streak on one of them. The first examples with red were taken in August. In September they were more numerous, while nearly every female of late October and November were either heavily streaked or solidly red below. I have yet to see a red under-wing of earlier date than August. The feature is surely a seasonal one."

NOTES ON THE GENUS *COLIAS*.

BY H. H. LYMAN, M. A., MONTREAL.

The discovery by Mr. W. H. Edwards that *Colias Hagenii* is only a form of *C. Eurytheme*, as detailed in the CANADIAN ENTOMOLOGIST for September, while very interesting in itself, serves also to show that this genus is still in a very unsatisfactory state. That a form which so closely resembles *Philodice* that nine entomologists out of ten would take it for that species, should turn out to be a variety of *Eurytheme*, emphasizes Dr. Hagen's statement "that reliable differences between these two well known forms are still a want." Mr. Edwards has also come to the conclusion that *Hagenii* is the same as the form previously named *C. Eriphyle* by him, as detailed in the November number of the CANADIAN ENTOMOLOGIST. A glance at the history of this form will be found interesting.

In 1873, Mr. G. R. Crotch collected a number of butterflies at Lake Labache, in British Columbia, among which were a number of specimens which Mr. Edwards seems to have regarded as *Colias Philodice*, as mentioned in Trans. Amer. Ent. Soc., v., p. 15. Subsequently on page 202 of the same volume, he described these specimens as a new species under the name of *C. Eriphyle*.

In the same place he said that a *Colias* similar to this had been taken by Mr. Mead, in Colorado, and by Dr. E. Coues, in Montana, and had been referred to by Mr. Reakirt as *Philodice*, but was, he thought, nearer to *Eriphyle* than to *Philodice*. The question now arises as to how these discoveries affect the standing of other so-called species of *Colias*, for it would seem that some of these forms are like children's tin soldiers set near together, in which if you knock down one, a whole row is laid low.

In But. N. A., vol I., plate 15, *C. Eurytheme* var. *Keewaydin* is excellently illustrated as a distinct species, as it was then believed to be by a number of eminent entomologists, and one figure—No. 7—depicts a greenish-yellow form with rather pale margins, which is certainly strikingly unlike the ordinary type of *Keewaydin*, but which was believed by Mr. Edwards to be merely a variety of that form. In the text, page 50, it is described as follows :

“Variety A. ♂. Upper side pale yellow with a very slight tinge of orange on disk of primaries ; sometimes wholly without orange and then uniform lemon yellow ; the marginal borders also very pale (Fig. 7.)”

On page 51 the following extract from a letter of Mr. Henry Edwards is given : “I may notice that the flight of the new species is much more rapid and varied than that of *Eurytheme* ; * * * that the only variety which appears in the latter is in the case of the albino female, while the male of the new species is constantly subject to run into the lemon yellow variety, which, however, is rarely so well defined as in the specimen I send you.” [Figured in plate.]

Subsequently Mr. Edwards ascertained that *Keewaydin* was only a form of *Eurytheme*, as was also *Ariadne*, which had been described as a distinct species in 1870, and he accordingly published in Part vii. of second volume of But. N. A. (pl. 21, pp. 103-116) a very full account of *Eurytheme* and its forms *Keewaydin* and *Ariadne*.

In the course of this most interesting account he said : “It (*Eurytheme*) occupies with *Philodice* the whole of the United States and

much of British America, and like that species, which it resembles in every respect but in color, it is subject to great and extreme variation, there being no feature whether of size or ornamentation that is not unstable."

At the close of this notice he said (page 116): "The butterfly figured on Plate of *Keewaydin*, in vol. i., as No. 7, supposed to be a variety of that species, is regarded by Mr. Henry Edwards as distinct, and has recently been described by him as *C. Harfordii*."

C. Harfordii was described from seven males by Mr. Henry Edwards, in 1877, in Proc. Cal. Acad. Nat. Sci., and at the same time *C. Barbara* was described from two females, but subsequently he came to the conclusion that they belonged to the same species, in which opinion Mr. W. H. Edwards acquiesced. In "Papilio," iii., p. 160 (1883) Mr. W. H. Edwards described *Colias Hagenii*, and said of it that it was close to *Eriphyle* and lay between *Philodice* and *Eurytheme*, "the four species making a sub-group."

In CAN. ENT., xix., p. 174, Mr. Edwards said: "*Hagenii* is known to fly throughout the Rocky Mountain region, from Colorado to British America. * * * and I think it probable the yellow form accompanies the orange over much of the territory occupied by the latter. On the plains to the east of the mountains these would have been regarded as *Philodice* by collectors. The yellow male figured in But. N. A., vol. i., on plate of *Colias Keewaydin*, fig. 7, is *Hagenii*, a very small example."

Now if this same much abused butterfly, known as fig. 7, is both *Harfordii*, of which, as I have mentioned, *Barbara* is a variety, and also *Hagenii*, and if taken east of the mountains would be regarded as *Philodice*, and that *Hagenii* is *Eurytheme* and also *Eriphyle*, it must follow not only that *Eurytheme*, *Eriphyle*, *Hagenii*, *Harfordii* and *Barbara* are one and the same species, but also that it becomes extremely difficult to separate *Philodice* from the same group. In connection with this it should be remembered that at least two well marked specimens of *Eurytheme* have been taken in this Province, one, a female, at Quebec, by the late Mr. Bowles, and another, a male, at Montreal, by Mr. C. W. Pearson, and that specimens of *Philodice* slightly suffused with orange do occasionally occur.

I am, however, not prepared to follow Dr. C. V. Riley in his suggestion that these two forms should be united.

The December number of the CANADIAN ENTOMOLOGIST contains another paper by Mr. Edwards announcing a further reduction of species in this genus by the recognition of *C. Edwardsii* as a variety of *C. Alexandra*. This reduction will, I venture to think, be followed by others, which will considerably curtail our list of species in this genus, for in view of all these discoveries it becomes impossible to believe that *Occidentalis*, *Chrysomelas*, *Emilia*, *Interior*, *Scudderii*, *Pelidne*, *Palæno*, *Chippewa* and *Boothii* are all distinct species.

It would of course be rash to try and indicate in what way the reduction is likely to take place, but I am inclined to believe with Dr. Hagen that *Emilia* will prove to be a variety of *Alexandra*, and that *Chippewa* will be united with *Palæno*.

There are, of course, several well-marked forms other than those above mentioned which will probably maintain their positions as distinct species, as for instance *Meadii*, unless it should prove to be a variety of *Hecla*, as Strecker has suggested; *Christina*, which I believe to be thoroughly distinct, but I do not think that the name *Astræa* should be retained at all, as I have a ♀ supposed to be that form which I obtained from Mr. Gamble Geddes, whose specimens were determined by Mr. Edwards, and which agrees exactly with what I consider the typical orange female of *Christina*; *Nastes*, from which *Moina* seems to be distinct, but may probably prove to be a variety, and *Behrii*, which is certainly distinct from any other American species.

Unfortunately some of these species are only found in very remote localities, and it will, I fear, be many a long day before their life histories are worked out, if indeed, of the arctic ones, they ever can be. Let us, however, hope that the enterprising and hardy race which will result from the colonization of our mighty Northwest Territories may produce scientists who will yet push their way into the arctic regions of this continent in their search after knowledge, and succeed in wresting nature's secrets from her.