Article XIII. — Revision of the Species of Euchloe Inhabiting America, North of Mexico.

By William Beutenmüller.

Plates XIII and XIV.

The present paper is based upon the material contained in the collections of the Museum, W. H. Edwards (in possession of Dr. Holland), Dr. Ottolengui, Dr. Skinner, Dr. Strecker, J. Doll, and also that of the late B. Neumoegen. I am also under obligation to Dr. Scudder for bringing to me his type of A. thoosa.

The Butterflies of this country very much need revision, especially the genera Argyinnis, Melitea, Lycæa and Colias, in fact nearly all of the larger genera contain too many 'so-called species.' I expect to publish, from time to time, the results of my studies on the Butterflies, and I would earnestly appeal to those who are also studying these insects to do likewise, so as to enable us to get a clearer and more definite understanding of the species.

The name Euchloe was erected by Hübner (Verz. Bekant. Schmett., 1816, p. 94) for the European species ausonia, tagis, cardamines and eupheno; the Indian euchiaris (coeneos) and the North American genutia (midea).

Boisduval (Spec. Gen., i, 1836) used Anthocharis in the same sense as Hübner, for a mixed lot of species, including those mentioned by Hübner.

Doubleday (Gen. Diurn. Lepid., 1847) placed ten species in Anthocharis (sens. restrict.) and many other species in Callosune, to which genus he also refers eucharis (coeneos Hüb.).

Herrich-Schaeffer (Corr.-Blatt. Zoöl.-Min. Verein, Regensburg, Vol. XXI, 1867, p. 105) established the genus Midea for genutia, which consequently is the type of the genus. The name Midea is based on one of the synonyms of genutia, and is perfectly tenable.

Scudder (Generic Names for Butterflies, 1875, p. 113) considered
genutia the type of Anthocharis, but this view cannot hold since Herrich-Schaeffer had already used Midea for it.

Hübner's name Euchloë has been employed for cardamines only, by Westwood (Brit. Butt., 1841, p. 30), Stephens (1850) and Kirby (1858), and therefore must be considered as the type of the genus. This has been pointed out by Kirby (Zool. Record, 1872, p. 339) and Scudder (I. c., p. 169) also specifies cardamines as the type of Euchloë.

From the above it will be seen that Midea may be used for genutia; Euchloe for cardamines and allied species. And I would here propose that Anthocharis be used for ausonia Hüb. and allied species.

The genus Euchloe may be divided into three groups, which may be separated as follows:

**Euchloe** Hübner.

Fore wings with 12 veins; veins 6–9 on a short stalk, sometimes with vein 6 free.
Costa straight, apex rounded .......... sara (and varieties), cardamines, gruneri, pyrothoe, and eupheno (euphenoides).

**Anthocharis** Boisduval.

Fore wings with 12 veins; veins 6–9 on a long stalk, sometimes with vein 10 also on a stalk.
Costa slightly sinuate (especially in the male); apex pointed—ausonides, creusa, lotta, olympia, ausonia, bellemia, tagis, charlonia and levellandii.

**Midea** Merrich-Schaeffer.

Fore wings with 11 veins; veins 6–8 on a stalk; vein 9 absent; more or less falcate .......... genutia, pima, cethura, lanceolata and bieti (Asia).
Fore wings with 12 veins; strongly falcate .................. scolymus (Japan).

The venation is subject to variation. In the many specimens of cardamines, sara, reakirtii and allies which I have examined, veins 6–9 are usually on a short stalk, but in many individuals of the same species vein 6 is free from apex of cell and is not stalked, thus leaving only veins 7–9 on a stalk. The same is also the case with ausonia, ausonides, etc. In these veins 6–9 are usually on a long stalk, with vein 10 from cell or on a short stalk. Little or no dependence can therefore be placed on
the movements of veins 6 and 10, from a generic point of view, in the genus *Euchloe*, and I consider all the species mentioned in this paper congeneric, *Anthocharis* and *Midea* being nothing more than subdivisions of *Euchloe* not entitled to generic rank.

**Synopsis of Species.**

Fore wings with a large red apical patch in both sexes.
- Color white or yellow. Size large. Sexes dissimilar. Hind wings beneath with loose clusters of scales .......................... *sara*.
- Color white; size medium. Hind wings beneath heavily marked with clusters of scales—var. *reakirtii*.
- Hind wings beneath with markings confluent. ...................... var. *julia*.
- Color yellow. Markings on hind wings beneath as in *reakirtii*.. .......................... *stella*.

Hind wings beneath with markings confluent.
- var. *morrisonii*.

**Euchloe sara** (Bdv.).

**Plate XIII, Figs. 4 and 5.**


**Male.**—Upper side white or pale yellow, bases scaled with black. Fore wings with a large bright red sub-apical patch, bordered within by a broad black oblique band running from the middle of the costa to a little above the
hind angle. This band shows a tendency to become disconnected at the middle. Outwardly, at the apex and margin, bordered with black, serrated within and becoming broken into two spots about the middle of the margin. Hind wings with the nervures more or less tipped with black at the outer margin. Under side: Fore wings with patch bright orange and smaller than above. At end of cell is a double black spot, the transverse band absent. Apex white, instead of black, sprinkled with olive green; extreme outer margin narrowly yellow, with small black dots. Hind wings with veins yellow and marbled with olive green patches. Expanse 40-44 mm.

Female.—Upper side white or yellow. Apical patch smaller, orange, transverse black band absent. At end of cell is an elongate, black discal bar; outwardly the patch is edged by a sinuous black stripe, which is sometimes more or less distinct and broken. Outer margin of wing bordered by a series of black dashes, in form of spots, pointed inwardly. The space between the stripe and spots is yellow. Hind wings and under side same as in the male. Expanse, 40-50 mm.

Habitat.—California to Vancouver.

**Euchloë sara** var. *reakirtii* (*Edw.*).


Male and Female.—Upper sides white and marked as in *sara*, but the black band on fore wing in the male as a rule much heavier and more continuous. On the under side the apex and outer margin of the fore wings is more heavily sprinkled with dark olive green, and the hind wings are uniformly and densely covered with dark olive green patches, much more so than in *sara*. Expanse, 28-40 mm.

Habitat.—California, Oregon and Washington to Vancouver, Arizona.

**Euchloë sara** var. *stella* (*Edw.*).


Marked like *reakirtii*, but both male and female are yellow instead of white. Expanse, 35 mm.

Habitat.—Nevada, California, Oregon, Vancouver, Arizona, Idaho.
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Euchloe sara var. julia (Edw.).

Plate XIII, Fig. 7.


Male.—White and marked like reakirtii, but the oblique band on the fore wings is disconnected, or nearly so, at the middle. On the under side of the hind wings the patches are confluent. Expanse, 30 mm.

Female.—Yellow and resembles stella on the upper side.

Habitat.—Colorado, Utah, Montana, New Mexico, Arizona.

Sara may be readily known by its large size and by having the marbling on the underside of the hind wings less heavily marked, while in individuals it is merely a sprinkling of small patches. It is the summer brood of reakirtii, as has been proven by Mr. Koebele (W. H. Edwards, Can. Ent., XXIV, p. 52) who states that sara of May and June proceeds from the eggs laid by reakirtii in March, and that some pupæ go over the winter to produce reakirtii in early spring, and that the product of sara was reakirtii of next spring.

With this conclusive evidence there can be no question as to the identity of sara and reakirtii. I have examined four specimens of flora, and they are the same as sara, with the black marginal spots on the hind wings somewhat heavier. It is not even worthy of a varietal name.

Reakirtii may be known from sara by being smaller and by having the markings on the hind wings beneath much heavier, though in a large series of specimens there is considerable variation as to the intensity of the patches. There are also examples which have the disc of the wings above yellow, but the majority of specimens are white. Dr. Skinner considers julia and stella slight modifications of reakirtii, and I fully agree with him. Reakirtii varies from white to yellow, and in large series of specimens it is quite difficult to separate stella and julia. Julia, how-
ever, has the markings on the hind wings beneath confluent, the marbling being in large patches, and in the male the black bar on the 
fore wings is angulate and broken in the middle. The 
females are either yellow or white. Scudder's *thoosa* was 
described from a single female example, and is the same as *julia*. 
The specimens described as *thoosa* by W. H. Edwards (Can. Ent., 
XI, 1879, p. 87) are the same as *reakirtii*. In *stella* both the male 
and female are yellow, but the markings on the hind wings 
beneath are like those of *reakirtii* in pattern.

**Euchloë ausonides** *(Boisd.)*.

**PLATE XIV, FIG. 1.**

N. Amer. Vol. II, 1874, pl. I; Can. Ent. Vol. XXIV, 1889, pp. 52 and 
1897, p. 208.

**Male.**—Upper side white, bases black. Fore wings with a black apical 
patch, broken on the costa by a white spot and on the outer margin by two or 
three white streaks. At end of cell is a discal bar of variable breadth. Costa 
speckled with black. Hind wings uniform white. Under side: Fore wings 
white, spot on disc repeated. Apical patch olive green instead of black. Hind 
wings mottled with green, in form of three irregular, wavy, connected trans-
verse bands, the outer one throwing out forked branches to the margin. 
Expanse, 30-40 mm.

**Female.**—Similar to the male, but as a rule the hind wings above are suffused 
with a creamy white, especially so in the Californian specimens. Discal bar on 
fore wings heavier and the apical patch is usually more broken, the inner part 
forming a sinuous line. Expanse, 32-47 mm.

**Larva.**—Head small, round, green speckled with black; body covered with 
minute black granules from each of which springs a short hair. On each side are two longitudinal lead-colored stripes and one along the dorsum. The 
intervening spaces are yellow; lateral stripes edged below with white shading 
into yellow. Legs black; thoracic feet greenish yellow. Length, 28 mm.

**Chrysalis.**—Slender, cylindrical, thickest in the middle, tapering therefrom 
evenly, the ends being of nearly equal size. Triangular at the middle beneath. 
and the thorax above slightly waved. Color gray-brown, covered with fine 
longitudinal darker streaks. Length, 23 mm.

**Food-plants.**—Cruciferous plants.
Habitat.—California to Alaska, British America, Arizona, Utah, Montana, Colorado.

**Euchloe ausonides** var. **coloradensis** *(Hy. Edwards).*


Like *ausonides*, but the discal bar on the fore wings is in form of a small, black, lunate spot instead of a broad bar. The under side of the hind wings have the markings of a somewhat deeper green.

**Habitat.**—Rocky Mountains, Colorado, Montana.

This is a common species wherever it occurs. In California it makes its appearance at the end of February, if the weather is moderately warm, and is on the wing until May. In Colorado it makes its appearance in May and June. It is single brooded, and the larva very much resembles that of *Pieris protodice*. The insect is closely allied to, if not the same as, the European *Euchloe ausonia*. The European species is double brooded, and as far as I can learn the larva is also different from our species. It is supposed by some collectors that *ausonides* is the spring form of *creusa* (*hyantis*), but W. H. Edwards (Can. Ent., XXIV, 109) contradicts this by stating that he had, in different years, bred from pupae four examples of typical *ausonides*, all in the month of March.

**Euchloe creusa** *(Doubl.-Hew.)*

PLATE XIV, FIG. 2.


**Male.**—Similar to *ausonides*, pure white and of a different shade. The discal mark almost always uniform in size and shape. Apical marks as in *ausonides*. Markings of hind wings beneath as in *ausonides*, but the white spaces are more shining. It is also much smaller on an average. Expanse, 35 mm.

**Female.**—Similar to the male, but the black markings on the fore wings are a little more prominent.

*July, 1898.*
Larva.—Head and body apple green, very minutely dotted with black, and with a pure white stigmatal stripe or line.

Food-plant.—Various species of cruciferous plants.

Habitat.—California, Colorado, British America.

Hy. Edwards (Pacific Coast Lepid., No. 22, 1876) states that after an examination of a figure of creusa, from Dr. Butler, hyantis is the same species. W. H. Edwards, in his list of Butterflies of 1877 makes hyantis a synonym of creusa, and in his list of 1879 (Append. Bull. N. Am.) hyantis is entirely omitted. In 1878 Hy. Edwards changed his former opinion (Pacific Coast Lepid., No. 28, June 17) and re-established hyantis as a valid species, and it is so placed at the present time. I have recently had the opportunity of consulting Doubleday & Hewitson's work on 'Genera of Diurnal Lepidoptera,' in the library of the American Entomological Society, and find that the figure of creusa agrees very well with the insect described by W. H. Edwards as hyantis, the types of which I examined in Dr. Holland's collection. The upper side only of creusa is figured, and no description is given, but there can hardly be any doubt as to its identity with hyantis or possibly ausonides. At any rate it is not what we at present know as creusa, as it is labeled in collections. Found in June and July.

Euchloë creusa var. elsa, var. nov.

PLATE XIV, FIG. 3.

Male and Female.—Upper sides like creusa, but the hind wings beneath have the bands confluent, with small clear spaces and streaks. Expanse, 32 mm.

Habitat.—Laggan, British Columbia.

This is undoubtedly a variety of creusa, and it bears the same relationship to this species that morrisonii does to cethura, and it is closely allied to orientalis of Asia. It may be known by the almost uniform green markings on the hind wings beneath. Two examples are in the collection of Dr. Holland and Dr. Strecker; one specimen in each of the collections of Dr. Ottolengui and Mr. Doll.
Euchloe lotta, sp. nov.

PLATE XIV, Fig. 4.


Male and Female.—Like creusa, but the discal spot is always much larger, broader and in form of a cloud-like patch above and below. Hind wings beneath, with the marbled surface darker and the spaces between somewhat glistening white. Expanse, 32 mm.

Habitat.—Colorado, Arizona, Utah, Southern California.

This is the species which heretofore was known as creusa. I am of the opinion that it may be a variety of creusa (hyantis), from which it differs only in the larger size of the black spot on the fore wings.

Euchloe olympia (Edw.).

PLATE XIV, Fig. 5.


Male.—Pure white, blackish at base. Fore wings with a grayish black discal bar and a black apical patch enclosing a white spot on the costa. Under side: Fore wings with discal bar much reduced, lunate, white centrally; a green sub-apical mark on the costa and one on the outer margin. Hind wings white, beneath with a rosy tint along the costa and crossed by three bands; the first band is near the base, forming a circle; the second is a little in front of the middle, with irregular edges, and sends a branch into the third band on the submedian vein; the third band begins on the inner margin and curves towards the outer margin, which it strikes in three branches. A short dash on the outer angle, between the second and third bands. Female similar to the male. Expanse, 33–37 mm.

Euchloe olympia var. rosa (Edw.).

Like *olympia*, but the apical patch is fainter in color and much broken, being indicated by a grayish black shade or scales at the extreme apex and a subapical spot on the costa and outer margin. These two spots are sometimes connected by grayish-black scales and form an oblique sinuous line.

**Habitat.**—West Virginia to Texas and Nebraska.

**Euchloë cethura** (*Felder*).

PLATE XIII, Figs. 1, 2.


**Male.**—Upper side white, sometimes tinged with pale yellow; base of wings black. Fore wings with an orange subapical patch, as in the female of *reakirtii*, bordered outwardly by a row of connected or disconnected wedge-shaped spots. At the end of the cell is a prominent black discal bar. Costa streaked with black. Hind wings with a minute black spot on each nervure on the margin. Under side: Fore wings with subapical patch canary yellow, shaded and irrorated with greenish yellow beyond. Fringes spotted with black. Discal mark reduced or obsolete. Hind wings white with green or greenish yellow patches or confluent irregular bands, with clear white spaces between and a row of clear spaces at the margin. Expanse, 28–35 mm.

**Female.**—Similar to the male, but has the orange patch on the fore wings much smaller, and in some specimens it is more or less wanting. The outer streaks connect with a black line at the end of the orange patch. Otherwise like the male. Expanse, 28–35 mm.

**Habitat.**—Southern California (San Diego, Kern River).

**Euchloë cethura** var. *morrisonii* (*Edw.*).

PLATE XIII, Fig. 3.


**Male.**—Upper sides and under side of fore wings same as *cethura*. Hind wings beneath densely covered with green or yellowish green, with only a few small, clear white openings about the middle and a series of clear openings around the edges, those on the outer margin triangular. Size same as *cethura*.

**Habitat.**—Southern California.
Cethura, as far as we know at present, is found only in southern California. It occurs in barren mesa lands, particularly on the summits of small hills, in March. I have examined the types of morrisonii, and they are without much doubt a variety or seasonal form of cethura. It only differs from cethura by the intensity of the green color on the hind wings beneath. We possess a female of morrisonii in which the orange subapical patch is absent, thus making it superficially resemble the female of hyantis.

**Euchloë pima (Edw.).**

*Plate XIII, Fig. 8.*


**Male.**—Bright lemon with a bright orange subapical area, broadly bordered outwardly by black, the outer and costal parts of which are alternately pale yellow and black. In the orange space, at the end of the cell, is a conspicuous black bar. The lower part of the outer border sends a shoot inwards which shows a tendency to connect with the lower end of the discal bar. Hind wings uniform yellow, with a minute black dot at the end of each nervure. Under side: Fore wings lemon yellow; orange area much reduced. Apical region marked with green. Costa very pale yellow, with black points. Discal spot smaller than above. Hind wings heavily marbled with green in form of irregular confluent bands; spaces between yellow. Expanse, 40 mm.

**Female.**—Similar to the male.

**Habitat.**—Arizona.

This is the only species known in this country in which both sexes are of the same color and with the marking similar. Dr. Richard Kunze writes me as follows about the habits of the insect: “It flies in Pima and Maricopa Counties, Arizona, principally during March. It affects the desert near mountains, and during the heat of mid-day ascends loftier surroundings, either for purpose of assembling or to enjoy cool breezes. On the north side of the mountains are found herbaceous plants and annuals, which thrive best where the palo verde tree, a prickly *Parkinsonia microphylla*, affords a little shade to tender annuals. *A. pima* rifles the flowers of a hirsute plant called *Amsinckia spectabilis*, a foot high, bearing very small, yellow, funnel-shaped flowers.
never observed *pima* feeding on other flowers. I have followed and watched this insect flying along arroyos or dried-up channels, which carry the surface water to lower levels, and where one finds the greatest number of herbaceous plants during March and April, or the spring of the Arizona desert. I have noticed *pima* hovering over a yellow flowered composite two feet high, and examined its leaves and branches, yet I did not find eggs or larvae, as often as I had opportunity to investigate. *Pima* on that occasion may have been looking for its mate, because the few I took there were all males, and if any such which I failed to net were females, it would have been difficult to differentiate between the sexes on the wing, as both are exactly alike in color. Besides the female is very rare, in proportion as 1 to 20. *Pima* is single brooded."

**Euchloe genutia** *(Fabr.)*

**Plate XIV, Fig. 7.**


**Male.**—White. Fore wings falcate, apex orange edged with yellow and black dots at the margin. At the end of the discal cell is a small rounded spot. Costa sprinkled with black. Hind wings with a small black dot on the edge of each vein. Under side white with the apex scaled with olive brown and the orange patch absent, or very slightly indicated. Discal spot present, also a marginal row of small black dots. Hind wings uniformly and densely marbled with olive brown patches and spots on a yellowish ground. Expanse, 34 mm.
Female.—Differs from the male by the absence of the apical orange patch, which is rarely indicated by a pale orange shade. Discal and marginal dots somewhat larger than in the male. Expanse, 34 mm.

Habitat.—Massachusetts to Texas.

Larva.—Dark yellow green, glossy under side, feet and legs lighter. Along the back is a yellow stripe and a broader, white one along each side. On each segment above are six shining black tubercles, each of which has a short black hair, which thickens at the end. On the second and third segments the tubercles are arranged straight across, those on the first and fourth to last segments are placed in triangle. From the third to last segments below the band is also a row of tubercles, one to each segment. Last segment with a blackish plate. Head white and green, with a small black spot on each lobe and one below crossing the triangle, covered with small white tubercles. Length about 24 mm.

Food-plants.—Sisymbrium thaliana, Arabis perfoliata and Cardamine.

The species may be known by the strongly falcate wings, by means of which it differs from all the other species of the group. It is single brooded. In the North it appears in April and May and in the South in April. It is found in open woods and is not difficult to capture.

Euchloē lanceolata (Boisd.).

Plate XIV, Fig. 6.


Euchloē edwardsii Kirby, Cat. Diurn. Lepid. 1871, p. 508. 


Male.—Upper side white. Fore wings with a small discal spot at the end of the cell. Apex more or less shaded with black and the fringes are also black. Hind wings with a few black points around the apex. Under side: Fore wings very pale yellowish white, apex pure white with brownish scales in form of streaks. Discal spot curved, fringes yellow at base and edged with black. Hind wings white and thickly covered with transverse, broken streaks, which become confluent on the costal region to about the middle of the wing; on the
costa is a short white dash directed downwards, veins marked with brown. Expanse, 45 mm.

Female similar to the male. Expanse, 50 mm.

Larva.—Upper side apple green, shading off laterally with pale blue, which is bordered by a distinct bright stripe just above the spiracles; next to this line is a slightly broader one, pure white. Under side and legs apple green, the former Bluish along the middle. Each segment is covered with fine black points, arranged in transverse rows, each with a fine black bristle. Head rounded, pale green, thickly dotted with black. Length about 30 mm.

Habitat.—Nevada, California, Yukon River, Alaska.

EXPLANATION OF PLATES.

PLATE XIII.

Fig. 1.—Euchloe cethura (male).
Fig. 2.—“ “ (female).
Fig. 3.—“ var. morrisonii (female).
Fig. 4.—“ sara (male).
Fig. 5.—“ (female).
Fig. 6.—“ var. roakirtii (male).
Fig. 7.—“ var. julia (male).
Fig. 8.—“ pima (male).

PLATE XIV.

Fig. 1.—Euchloe ausonides (male).
Fig. 2.—“ creusa (male).
Fig. 3.—“ var. elsa (male).
Fig. 4.—“ lotta (male).
Fig. 5.—“ olympia var. rosa (male).
Fig. 6.—“ lanceolata (male).
Fig. 7.—“ genutia (male).

The detached wings on the right hand sides represent the under sides.
1. Euchloe cethura (male).
2. " " (female).
3. " var. morrisonii.
4. " sara (male).
5. Euchloe sara (female).
6. " var. reakirtii.
7. " var. julia.
8. " pima.
1. Euchloe ausonides.
2. " creusa.
3. " var. elsa.
4. " lotta.
5. Euchloe olympia var. rosa.
7. " genutia.