or with very little yellow showing. Length of body, .80 mm. to 1 mm.; vertex rather sharply rounded; length of wing, 1.60 mm.; length of antennæ, .80 mm.; joint 3 longest, joints 4 and 5 equal; joint 6, with unguis, of the same length as the two preceding joints; joint 3 with about seven and joint 4 with about one transverse sensoria.

DESCRIPTION OF PLATE.

Phyllaphis Coweni, Ckll.—1, stem-mother; 2, male; 3, oviparous female; 4, antenna of adult stem-mother; 5, antenna of male; 6, antenna of oviparous female. M. A. Palmer, artist.

Figures 1, 2 and 3 are enlarged 30 diameters, and figures 4, 5 and 6 80 diameters.

THE PREPARATORY STAGES OF *EUCHLOË SARA*, BOISD.

BY KARL R. COOLIDGE AND ERVAL J. NEWCOMER, PALO ALTO, CALIF.

Euchloë sara, with its variety *Reakirtii*, Edwards, is a common and early butterfly in California, flying in the open fields about wild mustard (*Brassica*) and other crucifers. *Reakirtii* may sometimes be seen as early as February, and later, in April and May, *sara* appears, continuing on the wing until October. *Sara* is one of the early Californian pioneers, having been described by Dr. Boisduval in 1852.¹ In 1869 W. H. Edwards² described *Reakirtii*.

Synonymy and Distribution.—*Sara*, with its so-called varieties, is distributed almost everywhere west of the Rocky Mountains, from Arizona to Vancouver. As shown by Edwards (CAN. ENT., XXIV, p. 52), *sara* proceeds from eggs of *Reakirtii*, although some of the pupæ may go over and produce *Reakirtii* in the spring, the dimorphism being that of *Papilio ajax*. *Thoosa*, Scudder, is a synonym of *julia*, Edwards, and *flora*, Wright, and *mollis*, Wright, are but slight modifications of *sara*. *Brown-ingii*, Skinner; *stella*, Edwards, and *julia*, Edwards, we would consider but geographical forms of *Reakirtii*. Both *Sara* and *Reakirtii* are dimorphic, some females being white and others yellow, with all intergradations. The males are only occasionally slightly yellowed. *Reakirtii* may be distinguished from *sara* by its smaller size, and the discal band on primaries is blacker and more waved. Beneath, on the secondaries, the greenish tinge is more pronounced than in *sara*, and the apex and external margin of fore wings is heavier. Henry Edwards, in a letter to W. H.

1. Ann. Soc. Ent. Fr., 2, 10, 285, 1852.

2. Trans. Am. Ent. Soc., 2, 369, 1869.

February, 1909

Edwards (Butt. Vol. 1), writes: "As to *sara*, I first met with it two years ago in Santa Clara County, and was at once struck by its larger size, the yellow colour of most of the females, and the absence of the irrorated line along the anterior margin, as well as by the much fainter green markings on the under side of lower wings. Unlike *Reakirtii*, the species seems to prefer the open fields, flies much more slowly, and alights often upon flowers of *Brassica*, *Nasturtium*, etc. I am so accustomed to the two forms, that I can now distinguish them by the flight alone."

Preparatory Stages.—Scarcely anything is known of these. Edwards³ refers to the relationship of *sara* and *Reakirtii*, as shown by records of the pupæ. Again, in his supplement to the Butterflies of the United States (v., 3, p. 2, 1897), he refers to this. G. R. Minot, in a note in Entom. News (p. 158, 1902), briefly describes the egg, and records the oviposition on the "common mustard."

Food-plants.—Lembert⁴ reports the oviposition of *sara* and *Reakirtii* in the Yosemite National Park on the stalk of *Thysanocarpus pusillus*. In this locality *sara* has the same food-plants as *ausonides*, viz., *Brassica campestris*, L., and *nigra*, L. But there must be others also, as *sara* is found abundantly in the higher hills, where *Brassica* is very rarely met with.

Oviposition.—For the past several years we have observed numerous instances of oviposition. As a rule the eggs are tucked between the young sepals, but there is a great irregularity in this. Sometimes the eggs are placed on the peduncles, and quite often on the under side of the leaves, upon which the larvæ readily feed. On June 27, '07, a ♀ was observed ovipositing. Eight eggs were seen to be laid, one on a leaf, two on peduncles, and the others on the buds. She was then captured, and by the next afternoon she had deposited forty-five more eggs in the pill box in which she was confined.

Egg.—Length almost 1 mm.; fusiform, laterally marked with raised vertical ridges not quite so prominent as in *ausonides*, between which are finer cross-veinlets; base flattened. Colour light lemon-yellow when first laid, changing to orange in from twenty to thirty hours, and this colour is quite uniform until just before hatching, when the colour is duller.

First Instar.—Length, 1.5 at rest; in motion nearly 2 mm. Colour dirty yellow, sparsely covered with black hairs. Head rather large, black. The duration of the egg stage to the emergence of the young larvæ varies

3. CAN. ENT., XXIV, p. 52, 1892.

4. Entom. News, 6, 137, 1895.

considerably, according to the condition of the weather. Our records show from four to eight days.

Second Instar.—Much as in preceding; a little over 3 mm. in length; colour generally lighter.

Third Instar.—Length about 6 mm. Colour greenish, with a yellow lateral stripe and a light dorsal line, sparsely hirsute; head black or dark green.

Fourth Instar.—Length about 15 mm.; uniformly dull grassy green; head rather darker, large, bilobed, with many ferruginous coloured short hairs; body also covered with same clothing, and also more scattered long black bristles. A whitish lateral stripe edged below with darker; ventral stripe very faint.

Fifth Instar.—Average length about 27 mm.; colour slightly darker than in preceding stage, head concolorous. A rather wide lateral band on the line of the spiracles, and continuing on the side of the head; dorsal line obscure. Head small, more so than the body, distinctly bilobed; head and body covered with many short black tubercles or hairs.

Pupation.—The method of pupation and spinning the girdle is so similar to various well-known species of *Pontia*, that we do not repeat it here. We have never been able to find the pupa in nature, but Mr. F. X. Williams tells us he has found several pupæ of both *sara* and *ausonides* suspended at the base of the food-plant.

Pupa.—Colour very light silvery-gray, the ventral area lighter; pronotum bluntly produced, the wing-cases thereon marked in white; ventral line and ridges dark; outline curved, more so than *ausonides*, but not so much as in *lanceolata* or *pima*; spiracles indicated by blackish points. Considerable variation occurs in the curvature of the profile; one pupa we had was very straight, more so than in any of the other species; palpi case more or less recurved, sometimes quite noticeably so. Normal length 22 mm.

We are much indebted to Prof. Chas. A. Shull for copying for us the text in this genus from Edwards's Butterflies of North America.

ENTOMOLOGICAL SOCIETY OF AMERICA.

The fourth meeting of the Entomological Society of America was held in Baltimore, Dec. 30 and 31, in affiliation with the American Association for the Advancement of Science and other Societies. The number in attendance was exceptionally large.

The sessions were called to order on Wednesday morning by the