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COMPARATIVE TABLES FOR THE FAMILIES OF BUTTERFLIES.

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The need of a better knowledge of the actual structure of butterflies among those in this country who follow their study, is shown by the persistence with which an antiquated classification is adhered to,—a classification whose only value is historical, which conceals affinities and takes no account of the progress of investigation. In the hope of stimulating the examination of objects and not of books, the following Table for the determination of the four families of butterflies, originally prepared for my forthcoming work on the New England species, is here published. As will be seen, it includes in the analysis every stage of life, and while it intentionally oversteps the boundaries of New England in some respects, it does not, for the earlier stages, pretend to cover the outer field, excepting where it seemed important for some special purpose. Many of the characters here tabulated have never before been pointed out; others are the common property of science; that all characters are exhausted, or that some, and especially those drawn from the earlier stages, may not with increase of information require modification, is by no means maintained.

A. *Imago* of variable size, usually rather slender, with ample wings. Head in a vertical plane, the tongue being inserted opposite the lower half of the eye. Antennae approximate at the base, the space between them not equalling half the vertical diameter of the eye, the tip of the club rarely curved and never produced to a distinct point. Eyes with no overhanging pencil of bristly hairs, though in rare cases (some *Lycaeninae*) a small tuft of hairs occurs at the base of the antennæ; cornea of eyes not extending over the posterior fourth of the ocellar globe. Front tibiæ rarely (*Papilioninae*) with any epiphysis, and hind tibiæ with only terminal spurs. Inner edge of hind wings rarely (*Papilioninae*) plaited, but

extending beneath and partially embracing the abdomen; fore and hind wings in repose resting in the same plane. *Egg* either distinctly higher than broad and then vertically ribbed; or sub-globular and then smooth or reticulate; or broader than high and then usually echinoid or tiarate. *Larva at birth*.—Head usually broader and higher than the body; the latter either with ranged appendages (of various shapes) generally longer, often much longer, than the segments; or with fleshy tubercles, especially on the thoracic segments. First thoracic segment with no distinct corneous dorsal shield. *Mature larva* variable in form, but generally cylindrical, often spinous, never with a strongly contracted and distinct neck, and without distinct thoracic shield. Generally constructing no place of concealment. *Chrysalis* generally (excl. Lycaenidæ) more or less angulate or with projecting shoulders, very rarely (in our species never) enclosed in a cocoon.

1. *Imago*.—Clypeus not only occupying the face, but extending also over half the crown of the head, and separated from the epicranium by a distinct (in Danais, slight) transverse furrow between the antennæ. Base of the antennæ wholly separate from the inner edges of the eye. Prothoracic lobes tolerably large and above tumid. Wings with the outer margins usually crenulate, dentate, sinuate, or angulate; front pair with two inferior subcostal nervules, originating at the extremity of the cell; inner margin of hind wing always embracing the abdomen. Tetrapod, the fore legs being unused and atrophied, especially in the ♂, but in both sexes the terminal appendages of the last tarsal joint absent (excepting in Libythea, where the claws are present in the ♀), and both spines and spurs of tibiae obsolete. *Egg* either reticulate and then sub-globular, or else vertically ribbed over at least the upper half of the egg, and then never more than one half as high again as broad. *Larva at birth*.—Head generally larger, never smaller, than the thoracic segments and generally scabrous; when of the same size, the corneous crown of the head is never encroached upon by the integument of the first thoracic segment, and the body is covered either with series of very long hairs (in which case most of them are acicular and not clubbed at the tip) or with extremely short and distant acicular hairs. *Mature larva* generally cylindrical, the head usually held in a vertical position, larger than the segments behind it, free and posteriorly contracted. Body

furnished with continuous rows of spines or smooth lenticular warts, or with discontinuous rows of fleshy tubercles, or with short pile; in the last case either the head is tuberculate or the last abdominal segment is furcate, or both. *Chrysalis* generally angulate, often strongly angulate, or if rounded, with shouldered prominences. It always hangs in a reversed position by its tail alone, except in the rare case of a few *Satyrinæ*, which are rounded, without special prominences, have no cremastral hooks, and undergo their changes in a crevice or a cell in the ground. Fam. I.—*Nymphalidæ*.

2. *Imago*.—Clypeus occupying but little more than the face and separated from the epicranium by a slight suture between the antennæ. Bases of antennæ inserted in distinct sockets, which either clearly infringe on the inner edge of the eye, or are open next that edge. Prothoracic lobes minute, generally appressed to a mere lamina. Wings with the outer margin generally entire, especially in the fore wing, but the hind wing often tailed; fore wings with only one inferior subcostal nervule arising at the extremity of the cell; inner margin of hind wings generally but not always embracing the abdomen. Hexapod, the front legs being employed in walking, and not atrophied excepting in some males (*Lycaenidæ*, esp. *Erycininæ*), where they are partially atrophied, and sometimes have the tarsi reduced to a single unarmed joint. *Egg* either smooth, or else reticulate (and then tiarate or hemispherical), or else vertically ribbed (and then greatly elongated, nearly or quite twice as high as broad). *Larva at birth*.—Head always smaller or no larger than the thoracic segments and usually smooth; when of the same size, either the corneous portion of the crown is partially covered by the integument of the first thoracic segment, or the body is furnished with very long or very short hairs, almost all of which are clubbed at the tip. *Mature larva* cylindrical, or anteriorly enlarged, or onisciform. Head usually held in an oblique position, generally small, contractile and not free. Body never furnished with spines, but either naked, or furnished with discontinuous rows of tubercles (in which case the head is always smaller than the succeeding segments), or with short pile (when the head is uniform and the last abdominal segment entire), or with fascicles of longer hairs. *Chrysalis* angulate or rounded, often

with no prominences whatever. It hangs in various positions, but is always attached not only by its tail, but also by a silken girth around the middle, and in rare cases is also enclosed in a feeble silken cocoon. Some few tropical Erycininae are said to lack the transverse girth.

a. Imago of small size and delicate structure. Front of head between the eyes much narrower than high. Eyes not projecting beyond the general contour of the head, notched on the inner margin, to give room for the antennal sockets. Antennae including the club straight. Metathorax only slightly separated from the mesothorax. Median cell of fore wings closed by a weak vein; median nervure of hind wings with three branches; the inner margin never plaited. Fore legs with no tibial epiphysis, sexually heteromorphous, the tarsi of the ♂ being more or less atrophied. Dorsal margin of the eighth abdominal segment of ♂ entire. Upper organ of ♂ genitalia with long, slender, strongly curved lateral appendages. *Egg* tiarate or hemispherical, and more or less deeply reticulate. *Larva at birth*, so far as known, furnished with numerous long, tapering hairs arranged in longitudinal series. *Mature larva*, so far as known, either onisciform or cylindrical; in the latter case the body is furnished with longitudinal series of fasciated hairs. *Chrysalis* usually short and stout, always bluntly rounded in front, the body rarely furnished with projections, and these invariably rounded. Median girth always close to the body at all points, the ventral surface of the body lying in a nearly uniform plane. Cremaster not at all or but slightly protuberant, the hooks inferior or apical. Fam. II. *Lycaenidae* (Erycininae + Lycaeninae).

b. Imago of medium or large size. Front of head between the eyes as broad as high. Eyes prominent, not infringed upon by the antennal sockets. Antennae straight, or, especially the club, sinuate. Metathorax markedly separate from the mesothorax. Median cell of fore wings closed by a strong vein; median nervure of hind wing with three or four branches, the inner margin sometimes plaited. Fore legs of both sexes as complete as the other pairs, sometimes with an epiphysis on

the inner side of the tibiae. Dorsal margin of the eighth abdominal segment of ♂ notched or produced to a hook. Upper organ of ♂ genitalia with no lateral processes. *Egg* subglobular and smooth, or very much elevated and longitudinally ribbed; (one known exception occurs in *Parnassius*, in which it is tiarate, but where, in contradistinction to the *Lycaenidae*, it appears to be overlaid with raised polygonal plates). *Larva at birth*, so far as known, furnished with longitudinal series of clubbed or forked hairs or with prickly tubercles. *Mature larva* cylindrical or enlarged anteriorly, covered with very short pile (in some exotic forms with long hairs), mostly arranged in transverse rows, or with rather infrequent and irregularly distributed minute hairs, and often also with series of fleshy tubercles or filaments or glabrous scarcely elevated warts. *Chrysalis* elongate, unimucronate or bimucronate in front, generally with numerous angular projections. Median girth frequently free from the body for a considerable part of its course by the ventral extension of the wing sheaths, the ventral surface of the body being generally bent near the middle. Cremaster strongly protuberant and free, the hooks apical. Fam. III. *Papilionidae* (*Pierinae* + *Papilioninae*).

B. *Imago* of small or medium size, usually robust, with rather small wings. Head in a horizontal plane, the tongue being inserted opposite the middle of the eye or even higher. Antennae widely separated at the base, the space between them more than equalling half the vertical diameter of the eye, the tip of the club more or less distinctly pointed and recurved. Eyes usually overhung at the outer base of the antennae by a curving pencil of bristly hairs, the cornea extending over almost the entire ocellar globe. Almost invariably the front tibiae have a foliate epiphysis on the inner side, and the hind tibiae a middle pair of spurs in addition to the terminal pair. Inner edge of hind wings plaited, the fore and hind wings in repose often resting in different planes. *Egg* never noticeably higher than broad, hemispherical and smooth or domed and vertically ribbed. *Larva at birth*.—Head always broader and higher than the body, the latter with ranged fungiform appendages, never, excepting on the seventh and eighth abdominal segments, so long as the segments. First thoracic segment with a distinct corneous dorsal shield. *Mature larva* cylindrical but slightly flattened beneath and stoutest in the middle,

never spinous, generally minutely and coarsely pilose, with a large head, slender neck, and a transverse corneous shield on the upper surface of the first thoracic segment. Always living in concealment. *Chrysalis* smooth and uniform, rarely with a mucronate head, always enclosed in some sort of a cocoon. Fam. IV. *Hesperidae*.

THE NUPTIALS OF THALESSA.

BY W. HAGUE HARRINGTON, OTTAWA.

For several years I have observed with much interest the oviposition of our large and handsome "long-stings," but not until this summer have I been able to witness their actions preparatory to this duty. Although the males are frequently numerous when the females are ovipositing, the sexes pay no attention to one another, and this fact led me frequently to wonder at what time mating occurs. Last year I had, in company with Mr. Fletcher, observed the males in strange positions, with the tip of the abdomen applied to the bark, or inserted in a crevice, and had suggested that they were awaiting the emergence of the female. The supposition was, however, not proven, and the actions observed were still a matter of conjecture, and for further observation.

On the afternoon of the 7th June last, I visited some old maples (*Acer saccharinum*) for the special purpose of making observations on *Oryssus*. The trees are in different stages of disease and decay, and are correspondingly infested by such borers as *Dicerca divaricata*, *Tremex columba*, *Xiphydria albicornis*, *Oryssus Sayi*, etc., while they attract naturally numbers of our larger Pimplidæ, such as *Thalessa*, *Xorides*, *Ephialtes* and *Xylonomus*. Upon these trees during their season could generally be found many specimens of *Thalessa*, but I had never seen one emerge from its prison into the warmth and light of its adult existence. Upon a tree which for years had been much bored by *Tremex*, etc., I, upon the above date, saw several specimens of *T. atrata* and *T. lunator* ovipositing, and at some distance below them a group of males in an evident state of excitement. Three of these had their abdomens inserted more than half way under a flake of bark. Here, I congratulated myself, was an opportunity to ascertain whether a female was about to emerge. With my knife I pried off the piece of bark, and beheld the head of an