

NOTES AND DESCRIPTIONS OF WESTERN
CHRYSOPIDAE (NEUROPTERA)¹

By NATHAN BANKS
Holliston, Mass.

For some years Chrysopidae have been accumulating in the collection at the Museum of Comparative Zoology, and in recent years I have received, with other Neuropteroids, many specimens from Grace H. and John L. Sperry, especially from California and Arizona, from Prof. A. L. Melander also material from the same states, and from P. H. Arnaud specimens from California. During the summer of 1948 two students, F. Werner and W. Nutting, made an automobile trip to the southwest and to Mexico, and captured many hundreds more.

Most of the new species are from the western part of the United States and this paper is devoted to their description.

Many of the new forms are in the *Eremochrysa* section, so I have tabulated them, and made new descriptions of some of the old species.

Genus *Meleoma*

The males of the species of *Meleoma* can be recognized by the interantennal process. In the western States are four species, to these I add three more, two of them from California; another species occurs in Arizona, but the specimen has no antennae, so I leave it undescribed.

Meleoma comata sp. nov.

A species similar to *M. emuncta* with a different interantennal piece, the wings less coarsely haired.

Green; a medium white stripe from vertex back over the abdomen; in the female there is a faint trace of a reddish stripe before the side-margin; legs greenish, tarsi soiled whitish; antennae mostly pale, first joint green. Venation green, a few crossveins dark, mostly toward wing-base; several costals toward base, and some

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beyond dark at one end; gradates green. Cheeks with a narrow black line, interrupted near middle; palpi with a narrow black line above on one or two joints; in the male these lines more prominent, and the basal joint of antennae pale, with a reddish mark in front toward the tip, the basal joint extends laterally over the eye; the upper edge, seen from in front very concave; the second joint is much longer than broad, constricted below the middle, the lower part bearing minute erect hairs. The third joint is elongate, swollen mostly toward the inner base, the outer edge there concave, the inner edge has the row of white curved hairs which extends, somewhat obliquely upward. The interantennal process is much broader than long, concave in front (seen from above) each side at tip extending somewhat laterally and tipped by some short bristles. On the front, just before the anterior slope, is a group of erect hairs, pointing toward the process.

The wings are more slender than in *M. emuncta*, the tip almost in a point. The hairs on the costal fringe are very much shorter than in *M. emuncta*, and those elsewhere on the venation are much fewer. In the fore wing about twenty-four costals before stigma, the cells, except toward stigma, are plainly higher than broad; the costal area (at widest) hardly equal the radial area; the divisory cell two and a half times as long as broad, ending beyond cross-vein above; below there are seven cubital cross-veins. The hind marginal area is one and one-half times as broad as the cubital, but not quite twice as broad as costal area. Seven to nine inner gradates and eight to ten outer ones, in parallel rows; each gradate separated about its length from the next. In hind wings eight gradates in each row, about parallel. Beyond the end of medius (fore wing) there are five or six forks before wing tip. Length of fore wing, 14.5 mm.; width, 5 mm.

Male and female from Upper Santa Ana River, San Bernardino Co., California, 15 July, 6 Aug., 1948. (G. H. and J. L. Sperry). Also an old female from San Bernardino Mts., South Fork, 20 June, 6000 ft. (Grinnell).

Type: M. C. Z. no. 28348.

***Meleoma cavifrons* sp. nov.**

A small, slender-winged species, with few cross-veins, basal joint of antennae erect, and, seen from in front, each side convex, the

male with almost entire front forming a large heartshaped concavity.

Body and wings pale yellowish, female rather more green, a broad black stripe on cheek, scarcely interrupted; palpi lined with black; pronotum broadly reddish brown on each side; third antennal joint scarcely longer than second or fourth, not modified; second joint constricted below middle; vertex with the median raised area margined on sides and front by a dark line. Basal joints of antennae hardly one-half their diameter apart, erect, and sides convex, in both sexes alike. The interantennal process is slender between antennae, but widened and forked in front, each arm with bristles at tip; below there is a great, heart-shaped concavity occupying almost entire dorsal surface of face, each upper corner reaching to the eyes; its surface and margin bears erect, short hairs, and below tip of interantennal process are two tufts of long, erect hairs; pronotum narrowed in front, behind as broad as long.

Wings about three and one-half times as long as broad, tip nearly in a point; venation open, but eighteen to twenty costals, and only nine or ten radial cross-veins, mostly dark. Medius to tip of the second cubital cell is dark, also the basal part of the radial sector; branches of radial sector dark on basal part; also dark are the gradates, cubital cross-veins, and branches of anal vein near wing base; marginal veins pale. In hind wings not so many veins dark. The costal fringe is moderately long, but much shorter than in *M. emuncta*; hairs on cross-veins but few. Divisory cell ends at the cross-vein above.

The costal cells are higher than long, except near the stigma; radial cells about as long as high; the gradates in parallel rows, inner of three or four, outer of five, each widely separate from the next. Beyond the end of the medius but two and one-half forks before wing-tip. Length of fore wings, 11.8 mm.; width, 3.7 mm.

Male type from Pinecrest, Tuolumne Co., California, 10 July, 1948. P. H. Arnaud, Jr., collector.

A female taken at the same locality, but on 19 July, is apparently the same species. The head and a median stripe on the pronotum are whitish, elsewhere and wings green. Nine radial cross-veins as in male, and other venation similar; the costal fringe longer than the male, but six cubitals beyond the divisory cell; basal antennal joint as in male; of same size.

Type: M. C. Z. no. 28350.

Meleoma delicata sp. nov.

A small species, the third antennal joint not modified, the basal antennal joint, slender, enlarged at tip in usual manner, but with a flat area or scar at tip; nearly all of the cross-veins are dark.

Pale greenish, abdomen green, wings hyaline, cross-veins and branches of anal are dark. Basal antennal joints hardly diameter apart, cylindric, from in front outer side concave, somewhat shorter than usual, with a swelling near tip in front. Interantennal process broad, nearly truncate at tip, below it is a broad cavity, each side reaching to eyes, but not long, and reaching scarcely one-third way to tip of head; the margin is bordered with hairs, and a central group of hairs a little in front of it; from the side an erect process is seen, with an upcurved tip, pointing toward the front of the interantennal process. In certain views the upper outer corner of the basal antennal joint shows a short spur. Pronotum short, brown, with a pale median line.

Wings sparsely veined, but hardly as much so as *cavifrons*. Costal area quite broad, but the radial area broader, and about equal to marginal; cubital area almost as broad as costal; tip of wings almost in a point.

Practically all cross-veins, and the gradates dark, or at least partly so, also the anal branches. Divisory cell about two and one-half times as long as broad, ending beyond the cross-vein above. Twenty costals before stigma, the cells higher than broad, except those toward stigma; eleven radial cross-veins, three cells near middle higher than broad; gradates parallel, seven in each row, mostly about their length apart; six cubitals beyond the divisory; hind margins of fore wing with four forks beyond end of medius and before tip of wing. Costal fringe fairly long, hairs on cross-veins few and rather short.

In hind wings the costal cross-veins and the radials mostly dark, nearly all the other venation greenish; six inner gradates, seven outer rows parallel. Length of fore wing, 12 mm.; width, 4 mm.

A male from Ft. Wingate, New Mexico, 14 August 1908, John Woodgate.

Type: M. C. Z. no. 28349.

Another male from two miles southwest of Patagonia, Santa Cruz Co., Arizona, 30 July 1948 (Werner and Nutting).

***Chrysopa pinalena* sp. nov.**

Head rather short and broad, pale; directly below the antennal sockets is a transverse dark brown band from eye to eye, it bends upward in the middle, below it on the clypeal edge is another and similar band, almost as broad, reaching from eye to eye, and also bent up in the middle, a little more than the upper band; below this in the middle is a short, slightly down-curved brown band. At each end of both complete bands the dark is enlarged. In the specimen figured the antennae are strongly thrown back, in one with the antennae porrect, the upper band is almost hidden. Palpi black, with pale tips to the joints (except last); antennae (including second joint) pale, unmarked. Vertex rufous, and somewhat swollen in middle, leaving only a very narrow groove between it and the eyes. Pronotum narrowed in front, longer than broad, at least a little; pale in middle, dark on sides, broadly so behind; also the meso- and metanotum pale in middle, the lateral lobes dull black. Legs pale, unmarked.

Abdomen pale below, and mostly on the sides; above with several segments toward base with a large dark mark, sometimes the marks hardly distinct.

Fore wings with anals black, the subcostal vein toward, but not at base and the upper side of third cubital cell dark, other veins slightly darkened, but often only at bases of hairs; gradates no darker than others.

Stigmal area darkened for a long space, and with five to seven subcostal cross-veins; twenty-four or twenty-five costals, twelve radials, four or five inner, and six to eight outer gradates, subparallel, the inner as near radial sector as to outer, seven branches of radial sector reach outer margin. Divisory cell slender, ending much beyond the cross-vein above, seven cubitals beyond the cell. Hind wing very similar, with seven branches of radial sector to margin, and one or two fewer gradates. Length of fore wing, 13.5 mm.; width, 4 mm.

Two specimens from the Pinalis, Globe, Arizona, 18 July 1948. (Nutting and Werner).

Type: M. C. Z. no. 28345.

***Chrysopa yuma* sp. nov.**

Body green as also venation, legs and antennae. Face scarcely marked; there is a very faint reddish tinge under the base of each

antenna; there is no cheek mark, nor any spots on the clypeus; palpi wholly pale green. Antennae entirely pale greenish, no marks on basal nor second joint; in one specimen the vertex is faintly yellowish in front; the subtriangular elevated area is rather smaller than usual, the groove between it and the eye being quite broad.

Pronotum nearly twice as broad as long, sides parallel, but in front narrowed at the head. Legs short, pale, unmarked. Abdomen of female about as long as usual, in male not reaching half way to tip of wings, its tip rounded. The hairs on abdomen (and pronotum) are wholly white.

The wings of male are almost acute at tip, but more rounded in female. The venation is the usual *Chrysopa* type; the sub-costal cross-veins at stigma weak and few. Sixteen costals before stigma, eight radials; costal area only a little more than one-half the width of the radial area; marginal area much broader than cubital; discal vein ends beyond the cross-vein above, but five cubital cross-veins beyond; three or four outer gradates, and one inner, about the same in hind wing. The third cubital cell has two branches to the hind margin, and the next cell beyond but one branch (as normal *Chrysopa*).

The costal fringe is quite long, but not dense, the hairs on the veins are long, but not numerous. Length of fore wing, 8.5 mm.; width, 2.8 mm.

Male and female from Ft. Yuma, California, 6 June, 13 June, Andahl collector, from G. H. and J. L. Sperry.

This insect has no near relation to the *plorabunda* section of *Chrysopa*, which are almost wholly green. It has no sinuous costal cross-veins found in that section. The venation is more open than the usual *Chrysopa*. In the male the apical part of wing is more narrow and there are but three branches of the radial sector that reach the outer margin of wing.

Type: M. C. Z. no. 28346.

Chrysopa clarivena sp. nov.

Pale; no marks on face nor cheek; basal antennal joint unmarked, second joint black, beyond faintly darkened; basal joint rather short and broad at base, little separated from each other, palpi pale, last joint darkened. Vertex with a red mark each side by eye, middle area elevated.

Pronotum pale, with sides parallel, but in front narrowed; no distinct marks; meso- and metanotum dull, pale brownish; legs wholly pale, hind femora unmarked. Abdomen pale, dull gray to brown above with the apical three segments pale yellowish, below with only the apical segment pale.

Wings hyaline, with hyaline or whitish (perhaps greenish alive) venation, the base of the second cubital cell and the cross-vein below it in certain views dark; no sinuous costal cross-vein; the costal area, which, at broadest, is much more than one-half of radial area, has three long cells near base (fourth, fifth, and sixth) which are almost or fully as long as high and beyond are several cells longer than usual. The divisory cell very slender, narrowed at base, and ending beyond the cross-vein above, six cubitals beyond the divisory cell; two inner gradates and five outer, the inner much nearer to outer than to the radial sector. Three branches of radial sector reach to margin, tip of fore wing rounded, that of hind wing plainly acute; costal fringe fairly dense and of moderate length, hairs on veins rather few and quite long. Length of fore wing, 10.2 mm.; width, 3.7 mm.

One specimen from Ehrenberg, Yuma Co., Arizona, 11 July 1948, mesquite area (Nutting and Werner).

Type: M. C. Z. no. 28347.

This species is peculiar in the long costal cells, but not unique; this character is found in *Chrysopa apache* Bks., and in *Chrysopa yuma*, the small green species described in this paper. For them I make a new subgenus with *Chrysopa apache* the type. It is based on the character of having especially long cells at the widest part of the costal area, at least one of them being as long as high; the antennae beyond the second joint, tend to be darkened, and the inner gradates much reduced, sometimes none; the number of branches of radial sector to reach hind margin is reduced so that the wings tend to have the shape of *Eremochrysa*. The three species now known to belong to this subgenus *Yumachrysa*, are *apache* with venation almost wholly dark, longitudinal as well as cross-veins, and the hind femora have a black band. The others, *yuma* and *clarivena* (described in this paper) have almost wholly pale venation; *yuma* with the radial area but little broader than the costal, and *clarivena* with the radial area much broader than the costal, elsewhere also broader.

Genus *Eremochrysa*

This genus is represented in the western part of our country by many species. All have the cross-veins more or less darkened, and often the longitudinal veins dotted. As a rule the wings are less widened apically than in *Chrysopa*, and the tips more rounded. In *Chrysopa* the branches of the radial sector which reach the outer wing-marking are forked beyond the outer gradates, in *Eremochrysa* rarely more than one is forked beyond the outer gradates.

The males have an extension at the lower end of the abdomen, not present in *Chrysopa*; in one group this process is upcurved, and with simple hairs, in the other group the process is straight and provided with reclinate hairs or bristles.

Table of Species of *Eremochrysa*

1. Front and mid tibiae with a dark cross-band about one-third way from base, often also a dark spot at base of these tibiae; venation mostly dotted, vertex usually with reddish lines or spots*tibialis* sp. nov.
Front and mid tibiae without dark band.....2
2. Antennae just beyond second joint with several joints black or with a black band; face with a reddish stain under bases of antennae.....*rufina* sp. nov.
Antennae beyond second joint not at all black.....3
3. Veins and many of the cross-veins dotted with dark.....4
Veins not dotted, cross-veins mostly entirely dark.....5
4. Face often with yellowish or reddish marks (sometimes united) vertex with reddish lines or spots; fore wings rather broad so that four or five of the branches of radial sector reach the outer margin.....*punctinervis* McLach.
Face usually without marks, vertex mostly rufous, at least in front, and few if any lines or spots; the apical part of wing more narrow so that only two or three branches of radial sector reach outer margin.....*pumilis* sp. nov.
5. Four or five branches of radial sector reach margin; usually black or dark marks on face and vertex, and three stripes on the basal joints of antennae, and three on pronotum.
fraterna Bks.
But two or three branches of radial sector reach outer margin.
Not so heavily marked, few marks on face or pronotum.....6

6. Vertex at least in front rufous, no marks or few; cross-veins of fore wings rather fine, face with few or no marks.

rufifrons sp. nov.

Vertex mostly pale, with reddish or darker lines; face below antennae more or less plainly rufous, cross-veins of fore wing noticeably heavy.....*altilis* sp. nov.

Eremochrysa punctinervis McLach.

Female.—Head with line below each eye extending towards mouth; a row of three black spots (often connected) across clypeus; below antennal sockets usually a transverse band (yellowish to rufous); a black spot between the bases of the antennae, and extended behind on vertex as two slender divergent lines. Palpi partly dark. Basal antennal joint usually with one nearly complete dark line and one or two dark spots; second antennal joint with a dark ring.

Pronotum with two broad brown or reddish brown spots on each side, usually more or less connected, and sometimes with median extensions; usually a dark median line; meso- and metanotum usually with dark or black spots laterally.

Wings with both longitudinal and cross-veins dotted with black (dark), sometimes some of the cross-veins are wholly dark, especially the costals; the markings are more prominent on the fore wings, and sometimes venation of hind wings is almost wholly pale. The hairs on pronotum are short and black, on the abdomen often longer but mostly, at least, black.

The males are usually less completely marked; at the tip of the abdomen of the male there is a lower process, projecting more or less conical, and provided with short hairs among which are some reclinate stiff bristles, some almost spine-like.

The type is from Texas, but the species is widely distributed in the western states, most common in the southern ones; eastward it extends to Florida.

Eremochrysa fraterna Bks.

A long black streak on each cheek; three, usually elongate, dark spots form a line across clypeus; below antennal sockets sometimes a transverse dark line, or often broken in middle; between the antennae two dark (black) lines extend up and on the vertex and

diverge; often a dark line along inner edge of eyes. Palpi mostly black, including last joint. Basal antennal joint with two stripes nearly black, and very prominent, usually also a third shorter stripe; second joint with a black ring or more fully black; rest of antennae pale for some distance, but toward tip often a stretch of nearly black joints.

The pale legs nearly always have a dark spot on under side of the femur near tip, most prominent on hind legs; sometimes the tibiae show a cross-band of brown near base. Hairs on pronotum mostly black, and also most of those on the abdomen.

Fore wings with many of the cross-veins, and the gradates wholly black, especially costals and radials; longitudinal veins often also may be almost wholly dark, but in many cases they are dark at connections and elsewhere more or less dotted. Radial area plainly a little broader than costal area, marginal area plainly broader than cubital area, six cubitals beyond the divisory cell, latter not much narrowed at base, ending beyond the cross-vein above. About eighteen to twenty costal cross-veins; three or four subcostal cross-veins at stigma, and each dark and bordered with yellowish brown; gradates two to four inner; and about as many outer ones, well separated. Sometimes the cross-veins are not entirely black, especially in teneral specimens.

At the tip of the abdomen of the male the lower projecting piece is larger and less tapering than in *punctinervis*.

This species occurs over most of the western states, and often in mountainous areas, but not as common as *punctinervis*.

Eremochrysa rufina sp. nov.

Face with a reddish fan-shaped mark under antennae, broad below, ending on each side in three branches, other small reddish spots on lower face, palpi marked with dark; vertex with a narrow angulate line above antennae, another across the front margin of the elevated area, also somewhat irregular marks each side on the elevated area, and a reddish spot each side close to eye. Antennae not marked on basal joint, second joint faintly rufous, about three joints beyond are black, and four or five with a basal black ring.

Pronotum narrowed in front, each side broadly dark reddish; rest of thorax and abdomen above dark reddish-brown, the abdomen near tip with some white spots; pleura and venter pale; hairs white, as also on pronotum; legs pale, unmarked. Wings with dull brown

cross-veins and gradates, longitudinal veins pale, without dark dots; in hind wings the dark less distinct; stigma somewhat infusate, but the cross-veins not bordered. Tip of hind wing pointed, that of the fore wing more broadly rounded; venation very similar to the other species; the costal area rather narrow near base; three inner and four outer gradates. Hairs on veins about as in allied species. The divisory cell is shaped much as in *Nodita*, with a broad, oblique base.

The process at tip of abdomen is shorter than in the other species, and projects only a little; it is densely long-haired and I see no reclinate bristles, but there are raised conical processes tipped with a stiff hair (best seen on lower edge). The elliptical pale lobe on side of last segment is larger than in the other forms. Length of fore wing, 10 mm.; width, 3 mm.

One male from Grand Canyon, Arizona, 24 July.

Type: M. C. Z. no. 28351.

***Eremochrysa tibialis* sp. nov.**

Head, thorax, legs whitish; face with a reddish mark each side, divided inwardly; the upper, narrow part borders the antennal socket, the lower and broader reaching nearly to middle of face; clypeus with a dark median spot near lower edge, and a larger black spot at upper corner of clypeus, and extending a bit onto clypeus; cheek with a broad, dark brown (or rich brown) stripe, reaching to upper edge of clypeus; palpi dark, except tips of the joints. The basal antennal joint has a short black line or spot toward the inner tip; a black line on outer side and one above, and the second antennal joint dark (rich brown). The vertex has a dark spot each side on the raised area, with a short line extending forward, and a long dark spot close to the posterior part of eye; the collar (below the front of pronotum), has two dark brown marks on outer side.

The pronotum has a dark margin (formed of dark lines), broken near middle; there is a dark dot near the middle of front margin, another at middle before the cross-groove, and two behind the groove. The lateral lobes of meso- and metanotum have dark spots, and one on each lateral corner of the mid-lobe of mesonotum. Legs pale, all the tibiae have a dark dot near base, and a dark cross-line about one-third way down; the hind femur has a small dark spot near end.

The abdomen above is dull yellowish, with narrow dark hind

borders on the segments, broader on the fourth and fifth segments. Pleura and venter dull, with a broad pale border to the fourth and fifth segments; the last two segments wholly pale. Apical process of male straight and rather stout, but tapering, with reclinate bristles, and some long, simple hairs. The tip of upper part has long, slender hairs; elsewhere the numerous hairs are extremely minute and very short, shorter than in *E. fraterna*.

The venation is mostly pale, with numerous dots, a few of the costals wholly dark; gradates partly dark, three inner, four outer. The divisory cell, rather slender, ends on the cross-vein above. Fifteen costals; eight radials; gradates parallel, inner about as near to radial sector as to outer series. In this male there is but one cross-vein from the third cubital cell to margin, two from the fourth cubital cell. Length of fore wing, male 8.5 mm.; female 9.5 to 10 mm.

A male from Florence Jct., Arizona, 18 April 1935 (F. H. Parker) and many specimens from Watson, Utah, 22 July (F. M. Carpenter), also Vidal, California, 9 April (Sperry).

Type: M. C. Z. no. 28358.

***Eremochrysa atilis* sp. nov.**

Head pale, face below antennae to the clypeus almost entirely reddish brown; a pale spot between antennal bases, and a smaller one on middle of clypeal margin; three dark spots on clypeus, one each side, and a median one, higher up. Below each eye is the usual dark brown stripe on the cheek; palpi reddish-brown, tips of joints, and basal joint pale; basal joint of antennae has a dark stripe on outer side, and a much shorter one on inner side; second joint not darkened. Rest of antennae whitish, but toward tip some joints are partly dark.

Pronotum longer than broad, sides parallel, rather broadly dark, mesonotum and metanotum with dark spots; legs pale, hind femora with a rather broad red-brown band a little before the tip.

Abdomen grey, somewhat marked with darker above; tip pale; the lower piece of male is rather broad and tapering but little until near the tip; it bears many reclinate bristles, and below near base is a group of erect hairs, the upper tip of abdomen is thickly clothed with long white hair, much shorter white hairs elsewhere.

Wings shaped as in *E. fraterna*, a broadly rounded tip, no acute point; costal area quite narrow; thirteen costals, before stigma,

marginal area scarcely more narrow than the cubital, six radial cross-veins, four outer gradates, these close to wing-tip; no inner gradates. Cross-veins wholly dark brown, longitudinals pale, unmarked except at joinings. Three stigmal cross-veins dark, but scarcely bordered; hind wings also with the cross-veins dark, and the longitudinal pale, except at joinings.

A female is similar, but the mark below antennae does not occupy the whole area; pronotum as broad as long. Length fore wings, male 6.5 mm.; female 8 mm.

One male and several females from Stockton Pass, Pinaleno Mts., Graham Co., Arizona, 5440 ft. (Nutting and Werner).

Type: M. C. Z. no. 28357.

***Eremochrysa ruffrons* sp. nov.**

Face whitish or pale yellowish, usually the three clypeal dark spots and a slender cheek-mark; basal antennal joint with an outer black stripe, and one on the inner side, none above, second joint of antennae more or less darkened; palpi mostly black, with more or less distinct pale bands; vertex more or less rufous in front, shining. Legs pale, hind femur with a dark mark near tip.

Pronotum usually a little longer than broad and tapering slightly in front; pale, dull yellowish, no marks on side nor band across, but in front are two small dark spots, sometimes faint. Meso- and metanotum and pleurae also pale yellowish, without marks. Abdomen also pale, unmarked. Hairs on pronotum dark, those on abdomen mostly pale, but in females there are some black bristles on the dorsum of some segments near tip of abdomen; in the male the hair on abdomen is white and very short.

Fore wings with cross-veins wholly dark, some toward base are often more broadly dark; the longitudinal veins are pale, except at endings of the cross-veins, no dots. Stigma but little darkened, and the three cross-veins not strongly marked. The wings are not broadened before tip as much as in *E. fraterna*, there being but two or three branches of radial sector to reach the outer border.

Twelve or thirteen costals, six or seven radials, two or three inner gradates and three or four outer ones. The divisory cell is slender and ends well beyond the cross-vein above, six cubital cross-veins beyond. In the hind wing the median and cubitus are united for a long distance near base; no inner gradates. Length of fore wing, 8 mm.

From Globe, Arizona, 9 August 1933 (Parker 34), also Globe, Arizona, 19 July, at light (Werner and Nutting).

Type: M. C. Z. no. 28356.

In structure and color of veins, this species is close to *E. fraterna*, but readily separated by the absence of markings on pronotum and rest of thorax, and on the vertex, and absence of a stripe on the upper side of basal antennal joint.

***Eremochrysa pumilis* sp. nov.**

Face pale whitish or yellowish; usual black cheek-mark, clypeus with a dark spot each side, a larger median spot, no marks on face. Basal antennal joint with a black line on outer side, and one on inner side; second joint dark above. Vertex pale, with two more or less distinct dark spots on middle area, and a dark spot each side close to eye.

Pronotum with distinct dark border each side; in front at middle a short dark line, and behind usually some traces of its continuance; a black point each side near the middle on the transverse groove. Meso- and metanotum show dark marks on the lateral portions above, and also on sides. Legs pale, a small dark mark near tip of hind femur; palpi banded with dark.

Abdomen pale; hairs mostly pale, black and longer on the segments near tip, in male almost all very short and white. The wings are moderately slender; the costals (about fifteen), the radials (eight or nine), and gradates are dotted, all are fine, not bordered, a few cross-veins toward base wholly dark. Usually four in each row of gradates; but two or three branches of radial sector reach the outer margin. The stigmal area is colored, and the subcostal cross-veins darkened.

The lower process of the tip of abdomen of the male is rather large for the small insects, and rather blunt at tip with fine apical hairs, and before with recurved bristles. Length of fore wing, male 8 mm.

Type and two others from Garland, Colorado, July (Yarrow), other from Eureka, Utah, 17 July (Spalding); Chisos Mts., Texas, 9 to 12 July (Nutting and Werner).

Type: M. C. Z. no. 28355.

Lolochrysa subgen. n.

A species (male) I described in 1903 as *Eremochrysa hageni* from Texas was, I noted, different from the other forms. I now see that the male has the lower process at the tip of abdomen long, slender, upcurved, and at tip has only short fine hairs, none of the short, reclinate bristles of the normal *Eremochrysa*. The hairs on pronotum are longer and white and that on the abdomen is also long and chiefly white. The raised area on the vertex occupies almost the whole vertex. There is none of the dotting of the veins, these being dark only at connections; the tip of the wings is very broadly rounded. In the female there is no median spot on the clypeus.

For *E. hageni* and related forms I propose a new subgenus—*Lolochrysa*, with *E. hageni* as type.

Table of Species of *Lolochrysa*

1. Antennae without marks on first and second joints; no face marks, except a black dot between antennae, and faintly on sides of clypeus; palpi pale, unmarked.....*californica* Bks.
Antennae have the basal joints with lines on side or broad upper surface brown or darker, palpi mostly black (except *pima*)2
2. Upper surface of basal joint almost wholly brown.....4
Upper surface of basal joint largely pale, but a black line....3
3. Pronotum mostly white, a deep black spot (quite large) in middle of front margin, another at each hind corner; palpi mostly black.....*spilota* sp. nov.
Pronotum brown, with a black line across, connecting three small black spots; palpi mostly pale.....*pima* sp. nov.
4. Costal cross-vein almost wholly pale, dark only at sub-costal end; costa also very pale, unmarked; fourth and fifth segments above pale, with dark preapical band.....*hageni* Bks.
Costal cross-veins wholly dark, and costa also somewhat darkened5
5. Upper edge of the abdominal process bordered with black, many cross-veins bordered; but three branches of radial sector reach the outer border of wing; hair on abdomen white and rather short, pronotum narrowed in front..*yosemite* sp. nov.
No dark border to process; cross-veins not bordered, fine;

four branches of radial sector reach outer border; hair on abdomen white, and plainly longer; pronotum not narrowed in front.....*canadensis* Bks.

Eremochrysa (Lolochrysa) hageni Bks.

The type is a female from Austin, Texas; another female from the same locality agrees with it, as below.

Face white, a black spot on each outer side of clypeus; cheeks with a very broad black stripe, tip joining the clypeal black spot; palpi plainly black; a black spot between antennae, extending a little below on face, and above antennae spreads widely on the front of the elevated part of the vertex, and fades gradually behind; basal antennal joint has a broad brown mark covering the upper side of the joint; second joint with a dark ring at tip; beyond, the antennae are pale.

Pronotum with three dark spots on each side-margin, one in middle of front margin, and another opposite the second spot of the side, the two in middle may be united by a dark line. Lateral lobes of meso- and metanotum darker. Legs very slender and very pale. Hair on pronotum mostly white.

The abdomen is mostly pale, many clear white spots, the second and third segment dark above, and also the sixth and seventh. Venter wholly pale, with white hair.

Wings with broad, rounded tips as in allied species; venation as other species of this subgenus.

The costal area not nearly as broad as the radial, and the marginal very much broader than cubital area; two inner and four outer gradates; at the stigma the subcostal area is more than twice as broad as the costal area, and with three cross-veins not margined; fifteen costals before stigma, eight radials. The longitudinal veins are pale, dark only where touched by a cross-vein; the cross-veins are mostly dark, but the costals are almost entirely pale, only a few dark at the subcostal end; the costal vein is also pale. Length of fore wing 9 to 9.5 mm.

The types are from Texas; I have another from Austin, Tex.; two from Eureka, Utah, 26 July (Tom Spalding); one from St. Augustine, New Mexico (Cockerell 2102); and one from Globe, Arizona, 14 April (Parker). The head and antennae are much like eastern specimens of *E. canadensis*, but the markings of pronotum,

and abdomen, and the entirely dark costal cross-veins readily separate them.

***Eremochrysa (Lolochrysa) spilota* sp. nov.**

Pale yellowish to greenish white, almost white on thorax; a short black streak below each eye, a black spot on each lateral corner of clypeus (no middle spot), face below antennae unmarked; basal antennal joint with three black stripes; one on outer side, one on upper side, and one (often short) on inner edge; sometimes a pair of rufous streaks on raised area of vertex, and a prominent black spot each side near eye. Palpi mostly black. Pronotum white, with a large diamond-shaped spot on middle near front margin, toward anterior corner a small black spot, in the transverse groove near middle are two black dots, a fairly large black spot on hind margin each side; seen from side a black spot in front and another near middle of the edge. Mesonotum with a prominent black spot near base of wing, the cavity each side behind is black. Metanotum with a small black spot on each lateral lobe.

Legs very pale whitish, the tibia in front with a black dot near base, and lower, but before middle, is a narrow black line across. Abdomen a dull yellowish grey, no dark marks. Hair on pronotum and abdomen white, and rather longer than usual.

Wings clear; the veins marked with dark, outer end of costals dark, two subcostals in stigma broadly dark. The cross-veins and gradates rarely wholly dark, most cubitals and marginals only dotted; longitudinal veins unmarked except a dot at junction of a cross-vein. The fore wings are proportionally broader on outer part than in *punctinervis*. The divisory cell slender, ends at or near the cross-vein above; six cubitals beyond. Seventeen costals before stigma, eight or nine radials; three inner and four outer gradates. Costal area near base broader than in other species, almost or quite as broad as radial area; marginal area much broader than the cubital; tip of fore wings very broadly rounded. Length of fore wing, 9.5 mm. to 9.8 mm.

The four specimens are from Ft. Yuma, California, 6 to 13 June 1948 (Andahl coll.) from G. H. and J. L. Sperry; another from Brawley, 8 April, California (A. L. Melander), all are females.

Type: M. C. Z. no. 28852.

***Eremochrysa (Lolochrysa) pima* sp. nov.**

Face pale; a black streak on cheek from eye toward mouth;

clypeus with a black dot on each side, a deep black mark between antennae, below somewhat swollen, above spreading each side and connected to the broad, parallel marks on the raised area of the vertex; palpi mostly pale, basal antennal joint with a black spot on inner side above, and below an oblique mark more on upper side, no mark on outer side; second joint with a black ring, beyond, the antennae are more or less brown.

Pronotum grey, or with a little brown, with a narrow transverse black mark slightly behind middle, and with a short, blunt extension before tip in front and also one behind; the hairs short and at least mostly white, the lateral margins are narrowly black, and some black on front margin; the pronotum is almost twice as broad as long. Mesonotum grayish brown, a large black spot on the front of each lateral lobe, and extending onto the sides of the middle area. Legs pale, some black on coxae.

Abdomen beneath pale, with much white hair, above much mottled, a long black area before the tip, next to last segment above (in male) pale, with a narrow median black line.

Wings hyaline; cross-veins and gradates mostly black or very dark, cubitals sometimes pale in middle, some veins toward base may be slightly bordered with dark. The costals are usually pale on outer part. Divisory cell slender, ends beyond cross-vein above, six cubitals beyond, two to four inner gradates, three or four outer gradates. Twenty costals before stigma, eight or nine radials. Costal area at broadest much narrower than the radial area, latter about equal to cubital, the marginal area only toward base broader than cubital area. Fore wing not so broadly rounded at tip as *spilota*. Length of fore wing, 9.5 mm.

One from S. Fork Camp, White Mts., Arizona, 22 June 1947, G. H. and J. L. Sperry. The other from Santa Fe, New Mexico, Cockerell 4305.

Type: M. C. Z. no. 28354.

Eremochrysa (Lolochrysa) californica Bks.

Head yellowish; vertex somewhat reddish each side; no face marks, but the usual dark streak on cheek, and a dot between bases of antennae; a faint dark mark on extreme side of the clypeus; palpi pale, unmarked; basal antennal joint small, short, and rounded, unmarked, nor on second joint, the joints beyond are pale for about one-third way out, then becoming darker. The vertex with a short black spot each side, close to the eye.

Pronotum short and broad, roundedly narrowed in front; three small dark marks on front part, not plainly marked on sides. Rest of thorax not very plainly marked, pale above. Legs pale, unmarked, tarsi a little darker.

Abdomen pale brownish above, last two segments pale, the two before them plainly brown above.

Wings long and slender; fore wings with cross-veins, costals, and gradates brown, the veins dark only at joining; divisory vein dark and ending at or just beyond the cross-vein above. Costal area slender; some cells toward base are twice as long as broad; twelve or thirteen costals, six radials, and six cubitals, beyond the divisory cell. Between end of medius and end of radial sector but two branches reach outer margin. One or two inner and one to four outer gradates, rather far apart. In hind wing the veins are paler, but none dotted. Length of fore wing, 8 to 9 mm.

Described from Santa Clara Co., California; I have seen but one other specimen, it is from Globe, Arizona, 14 April 1935 (Parker).

***Eremochrysa (Lolochrysa) yosemite* sp. nov.**

Face white; a broad black cheek-mark reaching to the side of clypeus; a black dot between bases of antennae; basal antennal joint dark brown on whole of upper side; second joint black. Elevated area of vertex a broad dark stripe on each side, connected in front, and a dark spot each side in the lateral groove, close to eye. Pronotum plainly narrowed in front, a little longer than broad behind; two dark spots near front margin, with a streak reaching back, a spot in middle of each side margin, a spot near each side connecting through the middle spot; another larger dark spot covering each hind corner. Thorax pale but with large dark spots on the lateral lobes; and on the sides, of the anterior lobe, and on its hind border.

Abdomen above black; a broad white mark on first segment above, a smaller one on second; fourth and fifth white above, with dark spots at each end, and traces of a median line; sixth and seventh black; eighth mostly black but with a pale spot over most of apical part; ninth pale. The hairs mostly white and rather short. Legs pale, the hind femur with a dark mark above near middle of length.

Wings with all cross-veins wholly dark, those on disc of fore wings plainly bordered, and a dark spot covering the origin of the radial sector. But three branches of radial sector reaching hind border;

also in the hind wing, and two much curved toward base to do it. Divisory cell ends just beyond the cross-vein above; about fifteen costals, and seven radials; two inner gradates and four outer ones, the latter fairly close to outer margin; the three stigmal cross-veins hardly bordered. Length of fore wing, 9 mm.

A male from Yosemite, California, 12 June 1931, Essig. In wing appearance it is much like *Eremochrysa attilis*.

Type: M. C. Z. no. 28353.

Eremochrysa (Lolochrysa) canadensis Bks.

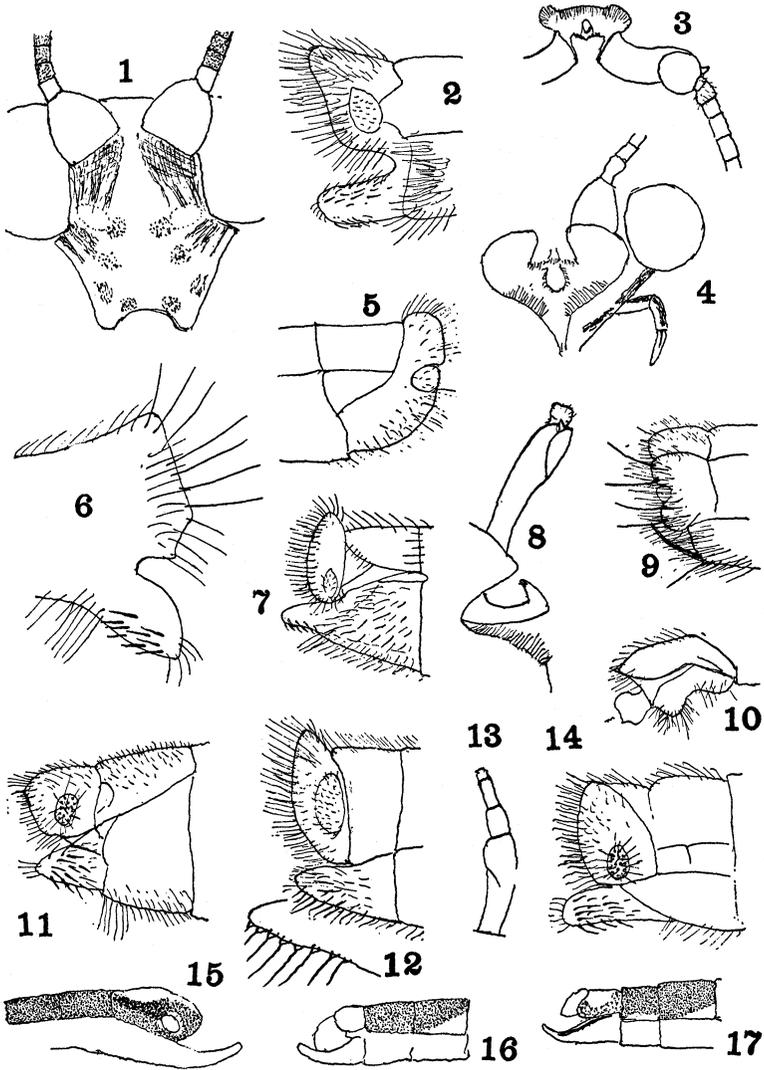
Face white to slightly yellowish, no marks; clypeus with a small dark mark on each side margin; the usual black cheek mark, broader than usual; palpi mostly black; a black spot between bases of antennae, connected to the double black mark on the front of the raised part of the vertex, sometimes with two streaks tapering behind. Basal joint of antennae with a large brown spot covering the upper side (as in *E. hageni*), no other mark; the second joint is black both in front and behind.

Pronotum is much broader than long, sides parallel, generally pale brownish, two black spots in front part, and a more or less definite row of spots across near the groove, rear corners usually black. Lateral lobes of meso- and metanotum with brown spots, legs very pale, unmarked.

Abdomen gray to yellowish below; above the first two or three segments black, then three segments mostly white, with a median black line, sometimes broadened behind, next segment black above, then the last two more or less pale, and with much long, pale hair.

EXPLANATION OF PLATE 3

Fig. 1. *Eremochrysa rufina*, face. Fig. 2. *Eremochrysa fraterna*, tip of male abdomen. Fig. 3. *Meleoma delicata*, basal part of antennae, and interantennal process. Fig. 4. *Meleoma cavifrons*, face and interantennal process. Fig. 5. *Eremochrysa punctinervis*, tip of female abdomen. Fig. 6. *Eremochrysa attilis*, tip of male abdomen. Fig. 7. *Eremochrysa punctinervis*, tip of male abdomen. Fig. 8. *Meleoma delicata*, side of antennae, and lower piece of process. Fig. 9. *Chrysopa yuma*, tip of male abdomen. Fig. 10. *Meleoma delicata*, tip of male abdomen. Fig. 11. *Eremochrysa rufifrons*, tip of male abdomen. Fig. 12. *Eremochrysa rufina*, tip of male abdomen, and lower edge more enlarged. Fig. 13. *Meleoma cavifrons*, basal part of antenna. Fig. 14. *Eremochrysa pumilis*, tip of male abdomen. Fig. 15. *Lolochrysa canadensis*, abdomen of male from side. Fig. 16. *Lolochrysa hageni*, abdomen of male from side. Fig. 17. *Lolochrysa yosemite*, abdomen of male from side.



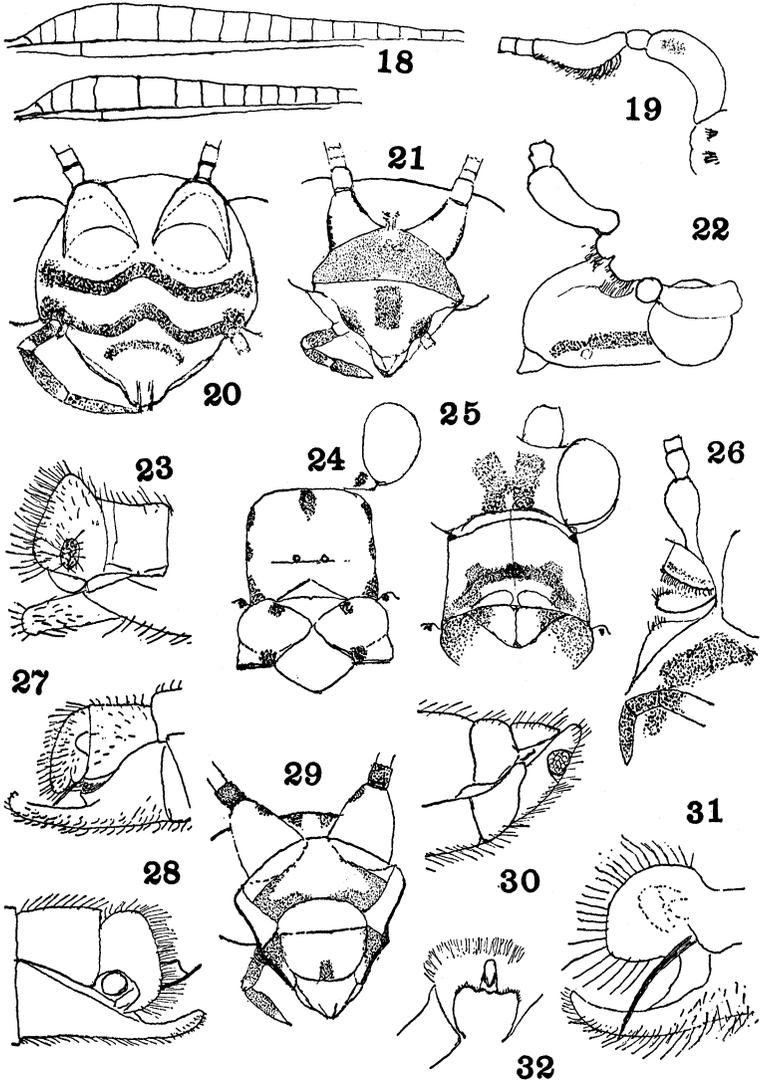
The lower edge of all the dorsal segments has a jet black stripe, which continues in a curve on the last segment; over all the segments are scattered snow-white hairs. The apical process of the male is very long and quite slender, extending more than usual beyond the tip of abdomen.

The wings are not very broad; usually but three branches of the radial sector reach the outer margin. Costal area near base is moderately broad; the costals, cross-veins, and gradates wholly brown, a cloud covers the base of radial sector; longitudinal veins pale, except at joinings, thirteen costals, seven or eight radials, and six cubitals beyond the divisory cell; the divisory vein ends a little beyond the cross-vein above; there are three to five inner gradates, about four outer ones. The inner series is nearly parallel to the radial sector, the first being about as near to the sector as the last; the three or four outer gradates are very short, and not far from the outer margin. The hind marginal area is broad so that the first few marginal cells are much more than twice as high as broad. Length of fore wing, 10 mm.

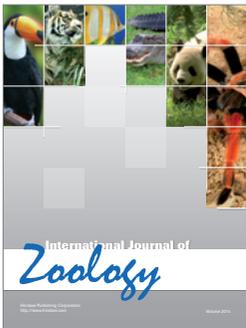
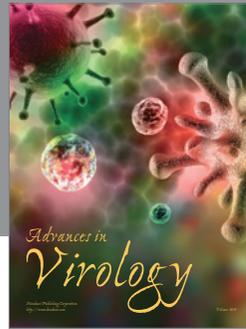
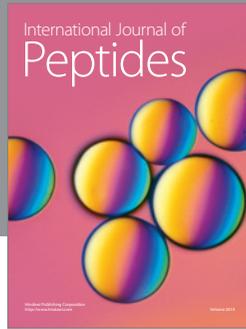
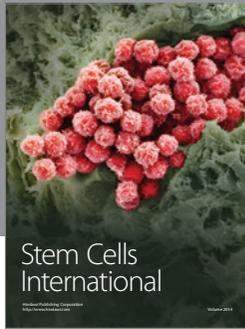
The type is from Go Home Bay, Lake Huron, Canada, 12 July; others are from Provincetown, Mass., July 1877 (Sanborn), Princeton, Mass., 16 Aug. (Johnson), Durham, N.H. (Fiske) and Mt. Desert, Me. (Proctor).

EXPLANATION OF PLATE 4

Fig. 18. Costal area of fore wing of *Chrysopa clarivena* (top) and *Chrysopa azteca* (below). Fig. 19. *Meleoma comata*, basal part of antenna. Fig. 20. *Chrysopa pinalena*, face. Fig. 21. *Eremochrysa altilis*, face. Fig. 22. *Meleoma comata*, face from side, obliquely. Fig. 23. *Eremochrysa pumilis*, tip of male abdomen. Fig. 24. *Lolochrysa spilota*, pronotum and mesonotum. Fig. 25. *Lolochrysa pima*, vertex, pronotum, and mesonotum. Fig. 26. *Meleoma cavifrons*, face from side. Fig. 27. *Lolochrysa canadensis*, tip of male abdomen. Fig. 28. *Lolochrysa pima*, tip of male abdomen. Fig. 29. *Eremochrysa tibialis*, face. Fig. 30. *Lolochrysa spilota*, tip of female abdomen. Fig. 31. *Lolochrysa californica*, tip of male abdomen (type). Fig. 32. *Meleoma delicata*, interantennal process.



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