

**NOTES ON THE ANISOPTERA FAUNA NEAR
MAZATLAN, MEXICO, INCLUDING DRY TO WET
SEASONAL CHANGES**

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Anisoptera were studied near Mazatlan, Sinaloa, Mexico during the period 22 June to 24 July 1975. The summer rains began on 5 July. The relative abundance of 19 species before and after 5 July was noted, with 6 species present in the dry season and increasing in numbers in the wet season, 5 species present and increasing only in the wet season, 4 species remaining at the same population level, and 3 species present in the dry season but decreasing as the wet season progressed. *Erythrodiplax funerea* (Hag.) was present in the forest in the dry season, rapidly gathered at newly formed temporary pools for a few days, then decreased in abundance.

Twenty-six species of anisoptera were collected in the vicinity of Mazatlan. Data on behaviour, coloration, and egg hatching times that seem especially noteworthy are given. The known range of *Libellula gaigei* Gloyd is extended 990 km to the northwest.

INTRODUCTION

The adjustments made by tropical odonates to dry-wet seasonal changes are not well known. The following report gives a broad view of the magnitude and nature of the changes produced by this feature of tropical climates on anisoptera communities.

The anisoptera in the vicinity of Mazatlan, Sinaloa, Mexico were studied from 22 June to 24 July 1975. Mazatlan lies in an area of tropical deciduous forest and scarce permanent water. The first soaking rain of the wet season arrived on 5 July 1975. Changes in available water and vegetation density after that date were spectacular. The major permanent aquatic localities studied included three ponds

on the El Cid Golf Course and a large freshwater beach lagoon near the ocean in northern Mazatlan.

The largest pond on the El Cid Golf Course covered about one hectare. It was very eutrophic, mud bottomed, and bordered with willows (*Salix*) on two sides. A blue crust in places on the shore suggested that copper compounds had been used for controlling algae, although the water was bright green. Before the rains began, most of the stems, etc. projecting from the water were encrusted with the exuviae of *Perithemis intensa* Kirby, *Orthemis ferruginea* (Fabricius), and smaller numbers of *Brachymesia furcata* (Hagen). Adults of these species and a few *Micrathyria aequalis* (Hagen) were the only anisoptera seen over this particular pond.

The beach lagoon approaches a lake in size. On the inland side, three successive vegetation zones exist, sedge with patches of *Typha*, low thorny trees, and pasture. The water is brown and the bottom mucky. The lagoon enlarged to extend 30 m into the pasture after the rains began.

RESULTS

DRY TO WET SEASON CHANGES

At Mazatlan, 22 species of anisoptera were collected. Nineteen of these could be categorized by their response to the advent of the rainy season. Six species seen in the dry season increased in number as the rainy season arrived and progressed. These were *Micrathyria aequalis*, *Brachymesia furcata*, *Erythemis plebeja* (Burmeister), *Miathyria marcella* (Selys), *Pantala hymenaea* (Say) and *P. flavescens* (Fabricius). Five species present only in the wet season and increasing as it progressed included *Anax junius* (Drury), *Leptemis vesiculosa* (Fabricius), *Dythemis nigrescens* Calvert, *Micrathyria didyma* (Selys), and *Tramea onusta* Hagen. *T. onusta* was the only species near Mazatlan I observed to carry mites. Four species remaining at constant population levels during the study were *Aphylla protracta* Selys, *Gynacantha nervosa* Rambur, *Orthemis ferruginea*, and *Pachydiplax longipennis* (Burmeister). Three species common in the dry season decreased in abundance as the wet season continued, including *Perithemis intensa*, *Erythrodiplax connata* (Burmeister), and *Micrathyria hageni* Kirby. In *P. intensa* especially, the decline in numbers may have been due to competition for space over water with larger species of anisoptera. *Erythrodiplax funerea* (Hagen) provided a special case in which only a few individuals were seen in the dry season, many gathered at the temporary ponds for a few days, and then the number steadily declined.

Three species at Mazatlan were not sufficiently observed to allow seasonal comparisons. The special habitats of *Libellula gaigei* Gloyd and *Pseudoleon superbus* (Hagen) were not discovered until after the wet season began and only one individual of *Tramea calverti* Muttkowski was collected.

The rare libelluline *Libellula gaigei* has been collected at only 3 other locations, summarized by GARRISON (1973), Dzadz Cenote, Yucatan, Mexico; 17.6 km S of Tecolutla, Veracruz, Mexico; and Tikal, Guatemala. The collection of this species at Mazatlan extends its range to the pacific coast and 990 km NW of the Tecolutla locality. The habitat at Mazatlan was an area of the pasture on the inland side of the beach lagoon where ground water seeped over muck among clumps of bunch grass. I first collected a fresh male and a soft female near this place on 26 June 1975 but did not discover the habitat until 9 July 1975 when several males were found, and several males were still present when I last visited the area on 19 July 1975. Males of *L. gaigei* perched from 1 to 5 m above ground generally in the sunlight but occasionally in the shade. They often left their perch and flew some distance but were not wary.

BEHAVIORAL NOTES

Adults of some species existing in the dry season appear to be stimulated to breed by rain. This was true especially of *E. funerea*, *P. hymenaea*, and *G. nervosa* and was probably also true for *A. junius*, *L. vesiculosus*, *P. flavescens*, and *T. onusta*. *Erythrodiplax funerea* provided the most spectacular example. Only a few individuals were seen in the forest during the dry season. Many more appeared in the forest 6 July after the first heavy rain. On 7 July the sky was clear and many males and some females were fluttering over the temporary pools and many others were travelling upwind. Very few were patrolling the adjacent permanent ponds. I did not experiment to see what factors the insects used to choose between temporary and permanent pools but the most likely factors are: (1) lack of tall shore vegetation, and (2) small reflecting water surfaces scattered among emergent plants, rather than (3) absolute water area, or (4) water color. By 9 July, mating pairs and ovipositing females were numerous at the temporary pools.

Pantala hymenaea reacted to the rains in a similar way. While only one *P. hymenaea* was seen in the dry season, a few appeared on 6 July, and many individuals including mating pairs were seen on 7 July. Males patrolled small water puddles and the females oviposited primarily at dawn. The first ovipositing females were seen on 8 July. This species also feeds early. For example, at 0700 on 16 July, a swarm was feeding in the lee of trees during a light rain and a strong wind. No mature adult *P. flavescens* were seen in the dry season, although a few specimens were emerging from a small pool. Mature adults were seen beginning 6 July, though they were not common.

Several ovipositing *Gynacantha nervosa* were observed at a small flood plain pool in the mountains east of Mazatlan on 22 July. A storm was approaching at 1600 and the sky was overcast. Each female hovered about 0.2 m above the edge of the pool for 10 seconds or more, then descended to 0.1 m to hover again for

the same length of time, and then perched on the soil facing away from the water with their wings vibrating gently. Descending in stages as described could cause a predator to make a premature strike and consequent miss. The eggs were inserted into the soil approximately 6-10 cm from the water line. Several males flew over the pool or clung to twigs at a height of 0.3 m nearby, but made no attempt to mate with the females.

The reproductive behavior of *Perithemis intensa* was particularly noted to see how it differed from *P. tenera* (Say). *Perithemis intensa* males occupied territories with oviposition sites as in *P. tenera*. The males of *P. intensa* pursued females but no copulation was ever seen. The female follows the male at a distance of about 0.2 m to the oviposition site and then hovers just above the water. She then makes many forward but not downward darts (88 in one case), flexing the abdomen downward at segment four each time to apply the eggs just above the water line of a stick, stone, or floating palm leaf. The male hovers a few cm away almost touching the water and facing the front or the side of the ovipositing female. Thus there are several differences from the behavior of *P. tenera* as described by JACOBS (1955).

Behavioral niche segregation was seen in the males of the three species of *Micrathyria* at the beach lagoon. *Micrathyria aequalis* males perched over the water, often near the edge of large open water areas. *M. hageni* males perched within the sight of the water surface but often back from the water's edge, and usually near small pools in the sedge marsh. *M. didyma* males perched over water in the shade under trees.

NOTES ON COLORATION

Orthemis ferruginea males were present in two color phases. One had a red thorax and bright red abdomen. The other was also red bodied but was pruinose, causing the thorax to appear blue and the abdomen pink. The pink phase is probably caused by a gene(s) for pruinosity and is not entirely an age change. The pink phase was more numerous in the dry season but gradually the red phase became more numerous than the pink phase as the wet season progressed.

The males of *Erythrodiplax funerea* had all black bodies and mostly black wings. They copulated with three color morphs of females. One female morph was similar to the male but was light brown within the interalar area. The second morph had body color like the first except that the eyes were brown above and grey below, and the face was dark brown above the anteclypeus. The wings were transparent with a round black spot at the base of the hindwing. The third morph had eyes brown above and grey below, face tan, thorax dark brown anteriorly and tan laterally and in the interalar area, and the abdomen brown, darker dorsally. The wings had brown tips and the hindwings a basal amber spot. The first morph was the least common and the third was the most common. The

morphs do not appear to be age changes, because only one intermediate female, between morphs one and two, was seen.

Pachydiplax longipennis was conspicuous by its rarity compared with its abundance in the U.S.A. Only two males were collected, and both are pruinose to the tip of the abdomen. In the U.S.A. segments 8-10 remain black. Both sexes of all the *Gynacantha nervosa* closely observed had blue reflecting areas anteriorly in the compound eyes.

One day was spent visiting five mountain streams east of Mazatlan. Four species of anisoptera were found here that were not seen in Mazatlan: *Gomphoides suasa* Selys, *Progomphus clendoni* Calvert, *Brechmorhoga postlobata* Calvert, and *Macrothemis inacuta* Calvert. The first three of these are colored remarkably alike and fly in the same manner with the abdomen slanted upward over riffles. All three species were not seen flying over the same riffle, but *P. clendoni* was flying with each of the other two species on different streams. Could this be a case of mimicry in which birds learn that it is a relative waste of energy to chase members of the mimic group?

EGG HATCHING TIME

Eggs were obtained from seven species of Libellulidae which were hatched in containers at a temperature of about 26°C. Most eggs were the usual pale yellow, but *Brachymesia furcata* had green eggs which turned yellow-brown within a day after deposition. Some eggs of *E. funerea* had a definite tendency to float. Hatching times are listed in Table I.

Table I
Egg hatching times of some Mexican *Libellulidae* at 26°C

Species	Number of ♀♀	Minimum days to hatching
<i>Perithemis intensa</i>	3	7
<i>Micrathyria hageni</i>	2	7,8
<i>M. didyma</i>	1	7
<i>Erythrodiplax connata</i>	1	7
<i>E. funerea</i>	2	6,7
<i>Brachymesia furcata</i>	2	7,8
<i>Leptthemis vesiculosus</i>	1	8

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