Odonatologica 22(1): 71-76 *March 1, 1993*

BEHAVIOUR OF IMAGINAL *PANTALA FLAVESCENS* (FABR.) ON EASTER ISLAND (ANISOPTERA: LIBELLULIDAE)

N.W. MOORE
The Farm House, Swavesey, Cambridge, CB4 5RA, United Kingdom

Received July 7, 1992 / Accepted July 17, 1992

Despite the relatively constant climate of Easter Island the amount of available breeding habitat can vary as can the general activity of *P. flavescens*. On Easter Island it exhibits typical territorial behaviour at water; females oviposit both in tandem and when "guarded" by a male. Males on Easter Island also defend territories away from water. These appear to be feeding territories, a possible adaptation to the scarcity of suitable prey. Body and wing measurements of 6 Easter Island specimens are compared with those of specimens collected in other parts of the world. They do not suggest significant differences between the populations.

INTRODUCTION

Pantala flavescens is the only dragonfly recorded so far on the extremely remote volcanic Pacific island known as Easter Island or Rapa Nui (KEVAN, 1965; CAMPOS & PEÑA, 1973; BELLE, 1990; DUMONT & VERSCHUREN, 1991). DUMONT & VERSCHUREN (1991) visited the island in the spring of 1990 (15 August to 3 September). They found that *P. flavescens* was breeding both in crater lakes and in small pools and streams. They found dead larvae of different instars in some of the sites. They attributed death to starvation caused by the observed rarity of prey. They also observed that adults "hardly ever fly vigorously... Flight is so slow and hesitant that individuals may almost be captured by hand. Frequently, associations of large numbers of individuals (pseudoswarms) form on the leeward side of wood fringes and bushes." DUMONT & VERSCHUREN (1991) argue that this normally migrant species is prevented from migrating from Easter Island by natural selection, which strongly favours homozygosity for non-migrant behaviour, while poor larval nutrition physically prevents those which retain migratory behaviour from migrating.

I was able to visit Easter Island in the late summer of 1992 (29 January - 6 February) and to add some information to the interesting account given by DUMONT & VERSCHUREN (1991).

METHODS

I visited as many as possible of the localities shown as breeding places in August/September by DUMONT & VERSCHUREN (1991). I confined my observations to the behaviour of imaginal dragonflies both by and away from water. I collected a sample of six insects to compare with others obtained elsewhere in the world.

RESULTS

I was unable to discover any of the small water bodies mentioned by DUMONT & VERSCHUREN (1991). I found two or three places where water had clearly lain earlier but were now dry. Small water bodies are difficult to find in broken lava terrain and I may well have missed some, but it appears that the number of temporary waters was much less in late summer than in spring.

DISTRIBUTION AND GENERAL BEHAVIOUR OF ADULT INSECTS

Fully adult and immature insects were numerous and were found throughout the island. Aggregations were found in areas sheltered by trees, bushes, cliffs, ahus (the platforms of the stone statues), and houses. Individual insects were seen to hunt in the shelter of cliffs but none was ever seen flying over the sea. I watched one fly towards the sea and then fly back when it reached it, and also a pair in copula which flew inland as soon as they reached the cliff top at Orongo (see Fig. 1).

P. flavescens appeared less active than some I have seen elsewhere, but they were quite difficult to catch, and I did not observe the sluggish behaviour recorded by DUMONT & VERSCHUREN (1991). The insects were surprisingly active in rain, although they disappeared when it became torrential. The earliest I saw an insect on the wing was 0748 solar time and the latest 2040 solar time.

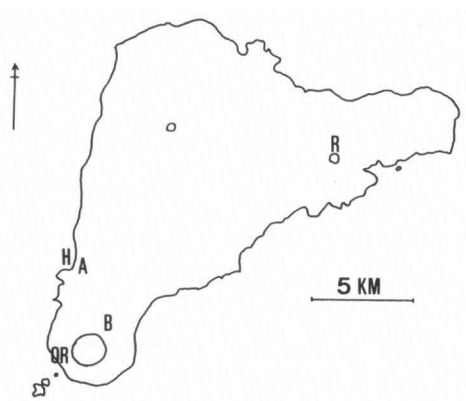

Fig. 1. Sketch map of Easter Island. – [A, B: sites where observations were made on territories of *P. flavescens* away from water; – H: Hanga Roa; – OP: Orongo by Rano Kau crater lake; – R: Rano Raraku crater lake].

SEXUAL BEHAVIOUR

At a pool on the edge of the Rano Raraku crater lake (see Fig. 1), which was bordered by the lake shore and a dense stand of *Scirpus totara*, I watched a male successfully chase another male out from the pool. I also observed a pair ovipositing in tandem there, and a teneral leaving the lake on its dispersal flight. These observations were made in the late morning of 30 January 1992. I revisited the site in the evening (1843 solar time) of 2 February and watched a female ovipositing in an area which was partly covered with floating rush stems. She was "guarded" by a male hovering over her.

On one occasion I saw a pair flying in tandem in a garden in the village of Hanga Roa (see Fig. 1) and another pair in copula (see above) flying on a cliff top at Orongo (see Fig. 1). In both instances the pairs were a considerable distance from freshwater.

TERRITORIAL BEHAVIOUR AWAY FROM WATER

On 31 January a male *P. flavescens* was watched from 1724-1730 solar time patrolling a triangular-shaped beat of c. 33 m in length in a sheltered garden, whose area was c. 364 m^2. The garden was enclosed by low buildings on three of its sides, and contained fruit trees, flowers, shrubs and often chickens and once pigs. It appeared to contain more small insects than much of its surroundings. The male successfully attacked other males entering its territory. Similar observations were made there between 1643 and 1755 solar time on 3 February. In a 25 minute period (1730-1755) that day, nine vigorous attacks were made on other males; two ended in serious fights. Three other males appeared to be holding similar territories in adjoining sheltered areas. Territorial behaviour in the garden was not seen at 1730 on 1 February nor between 1700 and 1925 solar time on 4 February, which was rather a windy day.

Earlier on 4 February I observed three aggregations in sheltered spots along the road between Hanga Roa and Orongo. The observations were made between 1200 and 1245 solar time. The weather was cloudy, rather windy and hot. The first aggregation, quite high up the Rano Kau volcano, consisted (entirely?) of immature insects. They were feeding and no aggressive behaviour was observed. The second aggregation, lower down the hill, consisted mainly of immature insects, but there were some mature males and females. On two or three occasions there were vigorous clashes between males. The third aggregation, still further down the hill, consisted largely of mature males, and again clashes were observed.

MEASUREMENTS OF EASTER ISLAND SPECIMENS

Measurements were taken of six (3 ♂, 3 ♀) specimens obtained on Easter

Island and were later compared with those of twelve specimens collected elsewhere. The latter consisted of six male and six female insects from the collection of the British Museum, London. They were selected in order to cover as wide a range of localities as possible. They came from Africa, Asia, Australia, Central and South America and islands in the Atlantic, Pacific and Indian Oceans. The results are given in Table I.

Table I

Measurements of specimens of *Pantala flavescens* from Easter Island compared with those from elsewhere – [Arithmetic means and ranges to nearest mm]

Locality	Body length	Abdomen length	Forewing length	Hindwing length	Width of forewing at node	Width of hindwing at node	Length between node and anal edge of wing
Easter Island (N=6)	49 (46-52)	33 (30-35)	42 (41-42)	39 (38-41)	9 (9-10)	12 (11-13)	21 (20-22)
World (N=12)	49 (46-54)	33 (30-36)	42 (40-44)	40 (38-41)	10 (9-10)	13 (12-14)	21 (20-22)

CONCLUSIONS

(1) Observations made in January/February differed from those made by DUMONT & VERSCHUREN (1991) in August/September. There was less available breeding habitat and *P. flavescens* was much more active in late summer than in spring.
(2) *P. flavescens* in Easter Island exhibits typical territorial behaviour at its breeding place. Females oviposit both in tandem and when "guarded" by a hovering male.
(3) The measurements of the six specimens collected on Easter Island did not suggest that there was a significant difference between them and twelve specimens collected throughout the world range of the species.

DISCUSSION

A FEEDING TERRITORY?

Nearly all territorial behaviour in dragonflies appears to have a reproductive function. BAIRD & MAY (1989) and BAIRD (1990) describe a situation in which males and females of the libellulid *Pachydiplax longipennis* (Burm.) appear to show territorial behaviour when concentrations of their prey are present. In England I have observed occasional aggressive behaviour away from water in the libellulids *Sympetrum striolatum* (Charp.) and *S. sanguineum* (Müll.) and in

Aeshna mixta Latr., *Enallagma cyathigerum* (Charp.) and *Erythromma najas* (Hans.), but nothing comparable to that observed on *P. flavescens* on Easter Island.

Is the function of territorial behaviour away from water on Easter Island reproductive or connected with maintaining a food supply? The arguments in favour of a reproductive function are:

(1) On one occasion a pair flying in tandem was observed in the area where territorial behaviour was observed away from water.
(2) No females were seen defending territories.

The arguments in favour of a feeding function are:

(1) Apart from the one record of the pair in tandem recorded above, no other attempts to mate or pairs in copula or tandem were seen in defended areas away from water, though females were present in the vicinity.
(2) The dragonflies were observed feeding in their territories.
(3) The areas where territorial behaviour was observed appeared to have larger prey populations than surrounding areas.

Normal territorial behaviour by water in Easter Island must ensure that only a very small proportion of the male population is successful in maintaining territories in the few breeding areas which remain by late summer. This conclusion is supported by the fact that large numbers of mature males were seen away from water throughout the day, including noon. There would be selective advantages for males which maintained a better than average food supply while waiting for new temporary waters to appear.

If the territories are indeed feeding ones, as appears, and if they only occur on Easter Island, they are likely to be another consequence of the general shortage of food noted by DUMONT & VERSCHUREN (1991). It would be of great interest to discover whether *P. flavescens* defends feeding territories elsewhere in its range.

COLONISATION OF EASTER ISLAND BY *P. FLAVESCENS*

It is not known when *P. flavescens* colonised Easter Island, nor how often new immigrants reinforce the resident population. If the population is an ancient one and has been isolated for a long time one would expect its members to show some physical divergence from the world population, which at least partially depends upon colonisation of temporary waters by emigration. In particular one would expect to see a diminution of the anal area of the hind wing, whose great width is presumably an adaptation for gliding flight on migration. The values in Table I do not suggest that the Easter Island population differs significantly, if at all, from that of the world population as regards body and wing measurements. In particular, there is no evidence whatever of a diminished anal area in Easter Island specimens. If there are differences between the populations they are likely to be very small and only demonstrable by examining large samples of insects.

If the apparent differences in behaviour between *P. flavescens* on Easter Island and those from elsewhere are genetically based, they would suggest that the Easter Island population has been isolated for some time. By contrast, the lack of difference in body and wing measurements suggests that either *P. flavescens* is a relatively recent colonist of Easter Island, or that the resident population is more often joined by new immigrants than might be thought likely.

REFERENCES

BAIRD, J.M., 1990. *Behavioral ecology of foraging in Pachydiplax longipennis (Odonata: Libellulidae)*. PhD thesis, Rutgers Univ., New Brunswick.

BAIRD, J.M. & M.L. MAY, 1989. Behavioral ecology of foraging by the Blue Dasher, Pachydiplax longipennis. *Abstr. Pap. 10th Int. Symp. Odonatol., Johnson City/TN*, p.2.

BELLE, J., 1990. A visit to the Easter Island. *Selysia* 19(1): 2.

CAMPOS, L. & L.E. PEÑA, 1973. Los insectos de Isla de Pasqua. *Revta chil. Ent.* 7: 217-229.

DUMONT, H.J. & D. VERSCHUREN, 1991. Atypical ecology of Pantala flavescens (Fabr.) on Easter Island (Anisoptera: Libellulidae). *Odonatologica* 20(1): 45-51.

KEVAN, McE.D.K., 1965. The orthopteroid insects of Easter Island. *Ent. Rec. J. Var.* 77: 283-286.