

***PANTALA FLAVESCENS* (FABRICIUS) IN NEW ZEALAND
(ANISOPTERA: LIBELLULIDAE)**

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On two occasions adults of the circumtropical migratory dragonfly, *P. flavescens*, have been recorded in New Zealand. From information about contemporary air movements, the transoceanic distances covered by these adults when coming to New Zealand have been inferred; on both occasions such inferred distances exceed 2000 km.

INTRODUCTION

In April 1977 I saw two living adults of the dragonfly, *Pantala flavescens* (Fabr.), in New Zealand, thus fulfilling, for me, an expectation and hope of several years' standing. At the time I was unaware that this was not the first recorded sighting of this species in New Zealand; but I learnt soon afterwards that it had been recorded also, presumably for the first time, in 1950 (cf. LIEFTINCK, 1975, p. 133). My aim in this paper is to place on record the available information relating to the circumstances in which each of the two sightings was made, and to the inferred origin of the adults that were seen.

P. flavescens has a circumtropical distribution (cf. BELYSHEV, 1968) and its powers of dispersal by flight are great: individuals not infrequently appear far from habitats where populations can breed continuously (cf. WALKER & CORBET, 1975, p. 277), presumably having been transported to their destinations by wind. Adults are known to be able to cover long distances over the sea (McLACHLAN, 1896; ASAHINA & TURUOKA, 1970; ASAHINA, 1971).

Because *P. flavescens* occurs widely in Australia (the continent closest to New Zealand), and because the prevailing winds blow from Australia

eastwards across the Tasman Sea to New Zealand (ROBERTSON, 1976), one could expect adults of this dragonfly to arrive in New Zealand from time to time, from this source. Because the arrival of insects in New Zealand from Australia has been a subject of interest for many years (cf. RAMSAY, 1954; RAMSAY & ORDISH, 1966; FOX, 1973b, 1978; TOMLINSON, 1973; CLOSE et al., 1978), one might have expected also that adults would have been encountered in New Zealand fairly often during that time. Yet, as far as I have been able to ascertain, *P. flavescens* has only been recorded in New Zealand twice: in 1950 in the north of the North Island, and in 1977 in the northwest of the South Island.

THE 1950 SIGHTING

The well known odonatologist, Professor B.E. Montgomery, visited New Zealand for about nine months during 1949 and 1950. On May 26, 1950, the day before he left New Zealand to return to North America, he saw adults of *P. flavescens* near Mangonui (173°32'E, 35°00'S), north of Auckland, in the northern tip of the North Island (Anonymous, 1950a). Montgomery has recorded his encounter thus (1978, pers. comm.): "My memory is that there were quite a number of individuals of this species in a small area of slope with meadow-like vegetation, but that they were not soaring or hawking. They were, however, very wary and the catch was made with considerable difficulty. My impression now is that this brood was reared in New Zealand as they seemed quite fresh and bright colored, and almost teneral. However, my retention of the clipping of the tropical front having moved into New Zealand on the previous day must have been inspired by the possibility that they had ridden in on this movement of air." The newspaper clipping that Montgomery alluded to (Anonymous, 1950b) recorded that warm tropical air, which had been carried 2500 miles by an extensive anticyclone, had covered New Zealand since May 25, 1950, and that the Wellington Meteorological Office had reported on May 31 that "a great mass of warm air had been brought down from the tropics, in the same latitude as Fiji, by an anticyclone 2000 miles wide and centred east of New Zealand."

Having regard to the fact that *P. flavescens* is known to disperse immediately after emergence (BYERS, 1941; CORBET, 1962), it seems probable that the adults seen by Montgomery had indeed come to New Zealand in association with this unusually large mass of air, and that accordingly their transoceanic journey may perhaps have extended to as much as 4000 km. The single specimen, a female, collected by Montgomery on this occasion is held in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., and carries this label: "Mangonui, North Auckland, New Zealand, May 25, 1950. Hawking over hill-side; 3 seen. NZ 268. Acc. p. 85"; the accession book adds no further

information, beyond confirming the specimen's sex (1978, pers. comm. by Dr. O.S. Flint, Jr.). Despite the date on the label, Montgomery confirms that he caught the insect on May 26. To my knowledge this is the only specimen of *P. flavescens* to have been caught in New Zealand.

THE 1977 SIGHTING

I saw two adults of *P. flavescens* near mid-day on April 11, 1977 on the southern, coastal part of the Heaphy Track (172°06'E), on the northwestern coast of the South Island. Both were hawking actively away from water, and both were readily identified on the basis of style of flight, colour, size and the tapering shape of the abdomen. (I am familiar with this species from many hours' observation of it in East Africa and North America.) Neither individual was captured.

I sighted the first adult at 12.20 hours New Zealand Standard Time (NZST) or 11.46 Solar Time (ST), namely 14 minutes before solar noon. It was on the southern side of the headland that marks the northern end of Twin Beaches (41°03'S) and was flying 3-7 m above the sand and vegetation (mainly New Zealand flax, *Phormium tenax* J.R. et G. Forster, and bracken fern, *Pteridium esculentum* (Forst. f.)) along a stretch of about 50 m where the sandy beach meets the steep, vegetated hillside. I watched this adult until I left at 11.56 hours ST. It appeared vigorous and fully mature, the abdomen being brownish orange. While I watched this adult there was negligible wind most of the time and occasionally perhaps a slight offshore wind.

I sighted the second adult at 12.26 hours ST just north of Crayfish Creek, on the headland that marks the southern end of Twin Beaches (41°04'S). It was flying 2-3 m above the ground, over the path, grass and low flax bushes in a clearing close to the beach. I obtained a better view of this adult because it was flying closer to the ground. It also was obviously mature, but was more reddish brown than the first one I saw.

At about 13.26 hours ST there was a brief shower, this being the first rain to fall on that part of the coast on that day. It is pertinent to record that at 13.31 hours ST, close to Scotts Beach (41°05'S), I disturbed a male of the Australian Blue Moon Butterfly, *Hypolimnys bolina nerina* (Fabricius), from the path, where it had alighted, and then observed it closely as it rested, opening and closing its wings, on a tree overhanging the path about 5 m above the ground. The occurrence of this tropical and subtropical butterfly in New Zealand has been reviewed by RAMSAY & ORDISH (1966) who concluded that the species probably cannot establish itself in New Zealand, and noted that most arrive in the country during March and April.

Weather conditions recorded by Mr. N. Stopforth (pers. comm., 1977) at Karamea (172°03'E, 41°15'S), on the coast about 18 km south of Scotts Beach, during April 1-11 were as follows. Rain fell on April 1 (15.6 mm) and 2

(2.5 mm) and during April 8-11 inclusive (22.7 mm). From April 4-8 the weather was fine and mild with light winds; during the afternoon on April 8 high cirrus cloud began building up from the southwest and the temperature fell. On April 9 rain started to fall soon after morning twilight and then showers became less frequent and cleared from the south by 1030-1100 hours NZST. At the Heaphy River (40°59'S) on April 10 showers fell in the morning, the sky cleared for a while at mid-day, and then from mid-afternoon through to the morning of April 11 heavy showers fell, accompanied during the night by thunder and lightning. The whole day of April 11 was exceptionally warm and humid, with the sun frequently breaking through cloud.

Two Australian Meadow Argus Butterflies, *Precis villida* (Fabricius) (cf. RAMSAY, 1954; FOX, 1978), were seen by Mrs. Stopforth at Karamea on April 15, 1977 and reported to Mr. R.G. Ordish, Curator of Entomology, National Museum, Wellington. In his reply (1977, pers. comm. by Mr. N. Stopforth), Mr. Ordish mentioned the finding of two Blue Moon Butterflies in the Wellington district on April 17 and remarked: "It would seem that the prevailing winds have recently brought more insect migrants across the Tasman [Sea]."

Hoping that it might be possible to infer when these adults of *P. flavescens* arrived and also where they had come from, I sought help from the New Zealand Meteorological Service regarding the nature of air movements which might have transported them to New Zealand. The information that I received (from Mr. A.I. Tomlinson) reveals that insect dispersal westwards across the Tasman Sea would have been possible on two occasions, such that the insects would have departed (from eastern Australia) and arrived (on the northwestern coast of the South Island of New Zealand) as shown in Table I; both cases imply passive transport by the wind and a low-level trajectory at a height of about 1000 m. On both occasions the time bracket during which weather conditions might have provided the necessary initial lift to start the insects on their way straddled the time of day when adults of *P. flavescens* normally fly; so both trajectories remain eligible for consideration in this respect. Both remain eligible also in respect of the known distribution of *P. flavescens* on the east coast of Australia; however, trajectory B has the greater eligibility because *P. flavescens* occurs more frequently, especially as reproductive populations, at lower latitudes. In this regard my colleague Dr. J.A.L. Watson writes (1977, pers. comm.): "I know of no records of *Pantala* from Victoria or Tasmania, but it occurs periodically in the Canberra region (35°S) and along the New South Wales south coast, where it may well breed; it certainly breeds as far south as Waroona (32°51'S) in Western Australia. I have the impression that local records are mostly in late summer, but this is an impression only; it would, however, correlate with the emergence of a summer generation from the shallow flood pans and plains in the summer rainfall

Table 1
Two trajectories by which insects might have travelled
from Australia to New Zealand in early April 1977

Trajectory	Inferred departure from east coast of Australia ^a	Inferred arrival on west coast of New Zealand near Heaphy Track (172°E, 41°S)	
	<i>Date and time</i>	<i>Position</i>	<i>Date and time</i>
A	March 31: 00.00 - 12.00 GMT; ¹ 10.00 - 22.00 LT ² (SR + 3.50 to SS + 4.05) ³	149°E 35-44°S. (Just N of Canberra S to S limit of Tasmania)	April 4: 00.00 - 12.00 GMT; 11.32 - 23.32 NZST ⁴ (SR + 4.40 to SS + 5.12)
	B		
	April 7-8: 18.00 - 06.00 GMT; April 8: 04.00 - 16.00 LT (SR -2.15 to SS -1.50) ⁵	153°E 28-32°S (Just S of Brisbane S to about Port Macquarie)	April 10: 00.00 - 12.00 GMT 11.16 - 23.16 NZST (SR + 4.19 to SS + 5.04)

¹Greenwich Mean Time. — ²Local Time. — ³From 3 hours 50 minutes after sunrise (SR) to 4 hours 5 minutes after sunset (SS). — ⁴New Zealand Standard Time. — ⁵From 2 hours 15 minutes before sunrise to 1 hour 50 minutes before sunset.

areas of northern Australia. I can see no reason why *Pantala* should not turn up in Victoria in due course, for *Trapezostigma loewi* [(Brauer)], a species with rather similar range and habits, has recently done so."

It is highly probable that the adults of *P. flavescens* seen by me on April 11 had crossed the Tasman Sea on the first or second of the air movements described in Table 1. If they did so, the shortest transoceanic distances which they would have covered were about 1922 and 2113 km, respectively, for trajectory A (from 37°S) and trajectory B (from 30°S). Mr. A.I. Tomlinson, who provided these estimates, added the comment that insects moving passively in the wind would have travelled a distance greater than these estimates (which refer to the constant heading course) by an amount unlikely to exceed 30%.

CONCLUSIONS

The sightings documented in this report offer presumptive evidence that *P. flavescens* can cover distances of 2000 to 4000 km over the sea and remain

capable of normal, active flight after making landfall. Whatever the origin of the adults seen in 1950, it is nearly certain that those seen in 1977 had covered a transoceanic distance of no less than 2000 km. It may be noted that this exceeds 1448 km (McLACHLAN, 1896) which, to my knowledge, is the greatest corresponding distance recorded hitherto. How often *P. flavescens* travels 2000 km or more over the sea must remain a matter for speculation: arriving adults are even less likely to be recognised or captured in New Zealand than are those of migrant Lepidoptera, for which existing records clearly do not provide a realistic measure of actual arrivals (FOX, 1973a).

As is to be expected of a tropical dragonfly that inhabits temporary pools, *P. flavescens* is an obligate migrant (CORBET, 1962) and its larva has a high thermal coefficient for growth (cf. WARREN, 1915). From this, and from the additional fact that it has been reported so rarely in New Zealand, even by odonatologists, it is reasonable to infer that *P. flavescens*, like the Australian Blue Moon Butterfly, cannot establish a resident population in New Zealand and that its status there will continue to be that of a rare (albeit welcome!) visitor.

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