SOUTHWARD MIGRATION OF PAINTED LADIES IN ALBERTA AND BRITISH COLUMBIA

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"The present species is a highly elegant insect, well named the Painted Lady, and in France the 'Belle Dame'"[5]

The Painted Lady (*Vanessa cardui*) is the most widespread of all the butterflies, occurring in Africa, Europe, Asia, many islands, small parts of South America, and much of North America.[7 14] This species is able to persist indefinitely only in warm climates, although adults occasionally hibernate through the winter in Washington and may overwinter and colonize adjacent areas from Britain and parts of northern Europe.[13 1] Each year in North America some Painted Ladies migrate northward and eastward in the spring from their area of year-round residence in the Sonoran Desert and nearby deserts of western Mexico and southwestern California. Occasionally a spectacular migration occurs, apparently in response to heavy winter rains in the deserts.[8] As the Painted Ladies radiate outward across the continent they establish a network of colonies from which new butterflies emerge in summer. It is not clear whether some or all of these newly emerged butterflies continue farther northward or just reside in the area of their emergence. In any event, in peak migration years the species may be found from the Pacific to the Atlantic and as far north as the northeastern coast of Labrador, Fort Severn, Ontario, Churchill, Manitoba, Chesterfield Inlet and Fort Resolution, N.W.T.[15 10]

Some authors suggest that the migration of Painted Ladies is essentially one-way.[14] If so, the value to the species of this migration is extremely puzzling. If a significant number of the northern progeny of Painted Lady migrants were to make a return migration to the overwintering area, then we could hypothesize a genetic and survival advantage to the species as a consequence of northward movements and the resultant heavy mortality and selection. Perhaps the Painted Lady could be thought of as a smaller, occasionally (vs. annually) migrant, Monarch Butterfly (*Danaus plexippus*).

Northward migrations of Painted Ladies have received considerable exposure in the popular press and scientific literature.[15 2 4] In spring and early summer, observers may be looking for and recording "signs of spring", and an influx of butterflies, especially an influx which clogs car radiators and windshields and makes highway pavement hazardously slippery, is difficult to miss.[2 4 6] On the other hand, at the end of summer the gradual disappearance of butterflies, or the southward broad-front migration of a less impressive number of butterflies, may be easily overlooked.

Southward migrations of Painted Ladies have been reported in the literature relatively rarely. Williams summarized the literature to that date and noted southward migrations in late summer or autumn in Europe and North America.[15] From North

America he reported a dozen observations of migratory flights after the beginning of August, from California, Colorado, Minnesota, New Jersey, New York, Florida, Ontario and Manitoba, all but one of which had a southerly component. Eff summarized 1973 observations for the Rocky Mountain area and mentioned late July movements to the southwest and later in the fall movements mostly due south.[6]

The most recent major invasion of Alberta and British Columbia by Painted Ladies occurred in 1973 although the species occurs in the B.C. interior in small numbers in most years (R.P. Nelson, pers. comm.) and is perhaps less regular in Alberta.[2] [3] In that year I noted some evidence of a southward movement near Calgary. On 8 September, between 1410 and 1720 h (local times used throughout) while driving about 160 km looking for raptors with M.R. Lein in the area south and southeast of Calgary five Painted Ladies were sighted, all heading south into a 8-16 kmph south breeze.

In 1983 Painted Ladies migrated northward through the Denver area during late April, but no southward movement was noted (R.E. Standford, pers. comm.) A light migration was noted in Saskatchewan (R.R. Hooper, pers. comm.); the species was present in small or moderate numbers through the summer in all three western provinces; and no southward movement was noted in Saskatchewan or south-central B.C. in the fall (R.R. Hooper, C.D. Bird, R.P. Nelson, pers. comm.). In Alberta an autumn migration was recorded: M.T. Myres observed large numbers moving southward near Calgary (C.D. Bird, pers. comm.); D. Lawrie recorded large numbers in the city of Calgary 15-18 August and in the vicinity of Chester Lake near Fortress Mountain 21 and 22 August, all heading west-northwest;[11] on 21 August C.J. Anderson and family (pers. comm.) saw large numbers, not conspicuously migrating, near Banff townsite; and W.K. Hall and family (pers. comm.) observed large numbers of Painted Ladies, feeding on yarrow and fireweed, but not apparently migrating, at least up to 2400 m near Chester Lake and on the trail to Ribbon Creek Falls about 10 km north, in three days between 22 and 26 August.

This article puts on record the fortuituous (and somewhat casual) observations of a major southward (and westward) migration of Painted Ladies in mid-late August and early September 1983, at a number of locations in central and southern Alberta and southeastern B.C.

Camrose to Edmonton, 13-22 August

On Saturday 13 August, a warm sunny day, Dennis Pfeffer reported seeing numbers of butterflies flying southeast on a northwest breeze near noon between Camrose and Strome, 57 km to the east-southeast (Fig. 1). I first observed the migration late that afternoon just east of Camrose. In the early evening of 14 August, another warm and sunny day, the migration direction was almost due west when observed on the west edge of Camrose; some of the butterflies were identified as Painted Ladies.

From 15 to 19 August, and on the 22nd, while commuting at about 100 kmph the 80 km from Camrose to Edmonton via Highways 13, 21 and 14, I noted no butterflies moving during the morning trips (about 0640-0740 h; temp. 8-13°C), but I counted many migrating butterflies on several of the return trips in the evening (about 1650-1750 h). Table 1 summarizes the number of butterflies observed over

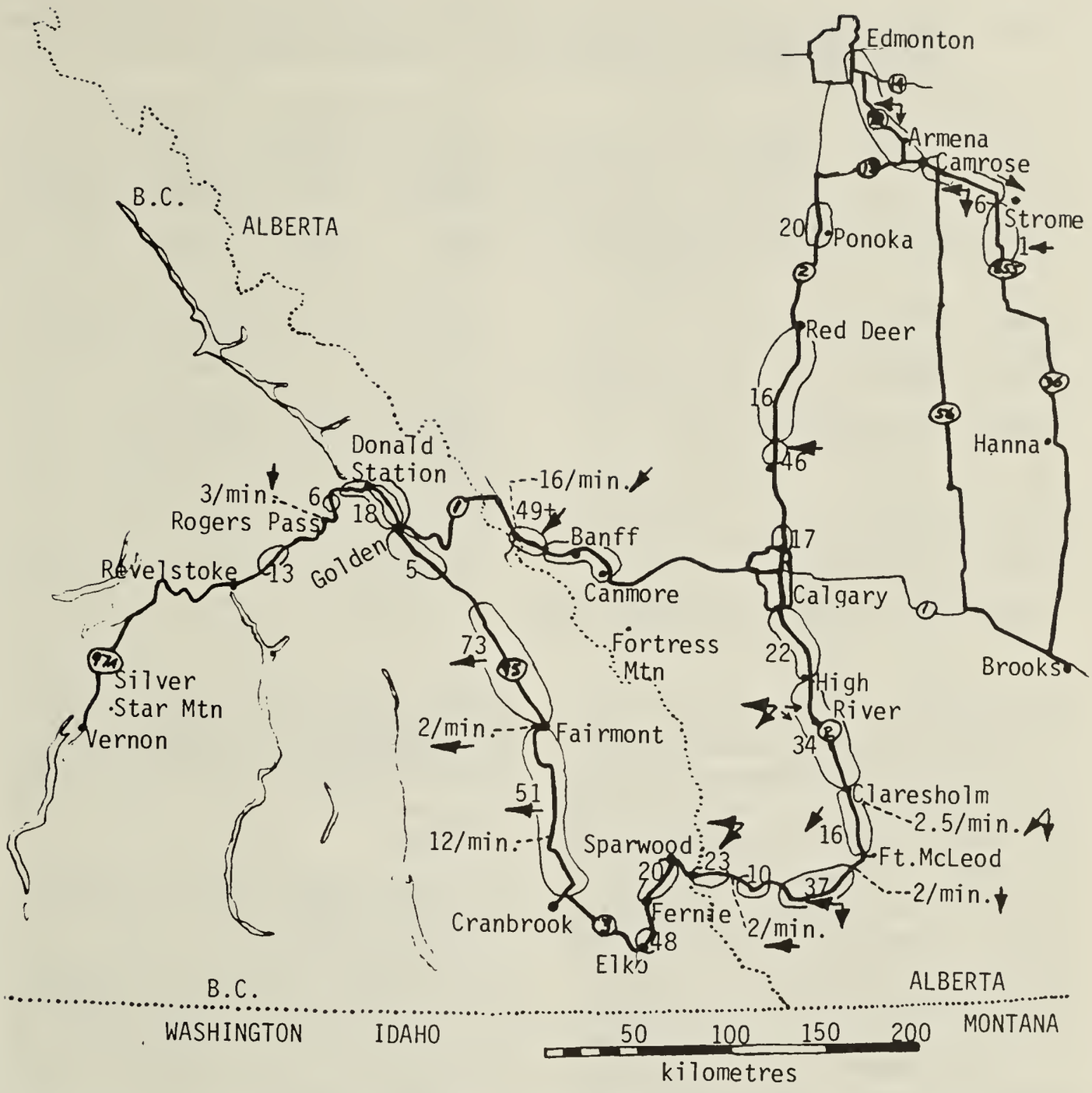


Figure 1. *Painted Lady migration observed during travels in central and southwestern Alberta and southeastern British Columbia, August 13 - September 11, 1983. Numbers indicate the butterflies recorded from a vehicle moving at highway speed through the circled areas. Arrows summarize the individual flight directions. In some areas the data were not obtained. See text for additional information.*

or immediately adjacent to the highway, and the environmental factors associated with these observations. Probably all of the butterflies were travelling at less than 4 m elevation, and most were about 1-2 m above the ground. The butterflies sometimes travelled across substantial breezes and sometimes with the breezes, but they did not migrate during west or northwest winds of 30-40 kmph. On these days virtually all of the movement was to the west, to the south, or between west and south.

On the 15th, when en route to Camrose, I finally awakened to the potential of automobile-counting of

Table 1. PAINTED LADY MIGRATION OBSERVED BETWEEN EDMONTON AND CAMROSE, ALBERTA, 15-22 AUGUST 1983.

Date	*Time*	*No. Painted Ladies*	*Migration Direction*	*Wind kmph**	*Temp. °C*	*Cloud Cover*	*Notes*
15 Aug.	1746-1754	93 in 12 km	92-W, 1-E	NW, 10-15	23	1/10	
16 Aug.	1950-2044	1	1-S	N, 5	?	6/10	Sunny
17 Aug.	1655-1747	7	mostly S	NW, 5	?	8/10	
18 Aug.	1706-1758	0	0	W, 30 & NW, 40	20	5/10 to clear	
19 Aug.	1624-1715	10	?	SSE, 25	18	clear	
22 Aug.	1710-1801	75±	?	SE, 10	?	1/10	

*Estimated using Beaufort Scale criteria.

the butterflies. The most dense movement was recorded immediately - 92 butterflies flying west over a north-south distance of 12 km (in approx. 8 min.) between Armena and the junction of -21 and -13, eight km west of Camrose. If the butterflies were observed within 50 m in front of the car and were flying at right angles to the highway, then the observations from the moving car would be similar to those made by a stationary observer noting butterflies crossing a 50 m line at right angles to the migration path. If this assumption is valid, then about 12 Painted Ladies crossed a 50 m north-south line each minute, and 14,400 crossed a one kilometre line in one hour. If the migration front stretched for 100 km at this density, and the migrants passed at this density over this line for only six hours, almost one billion butterflies would have been involved in the migration. In view of the observations of these butterflies migrating elsewhere in Alberta and southeastern B.C. during the last half of August, it is clear that extremely large numbers of Painted Ladies were involved in this particular migration, although this particular estimate based on a very small survey may be exaggerating the real scale of the movement.

Camrose, Calgary, Banff, Revelstoke, Vernon, 24 August

The migration was also evident on 24 August at a number of locations when I travelled from Camrose (0915 h) to Vernon, B.C. (2030 h) via Highways 13, 2, 1, and 97A (Fig. 1). At 1005 butterflies were first encountered west of Ponoka, 14 in two minutes, but only 6 in the following 13 minutes and none thereafter. The weather deteriorated, and light rain fell from Red Deer to Calgary.

At about 1430, midway between Canmore and the east gate of Banff National Park, with the sky cloudy bright (10/10) and the temperature about 18° C., we encountered throngs of Painted Ladies. Butterflies were in small groups on the roadsides, especially on thistle patches where three to five or more fed in a space of one square m. Almost continuously one or a few could be seen flying

southwest across the highway, but most were feeding or resting.

To the west their numbers thinned out, but then many were encountered at 1606 near the Eisenhower Junction (#1 & #93), heading about southwest at right angles across the Trans Canada Highway. Forty-nine were counted from the car in a 3 min. timed period while driving at 90 kmph. Here and for several km northwest there were dead butterflies conspicuously on the pavement at least every 7-10 m, and others flying across the road through and over the traffic. Their numbers decreased and then ceased a short distance further NW. At 1733 h, northwest of Golden in the Columbia River valley, Painted Ladies again were noted, but in low numbers. The weather deteriorated as we travelled to Revelstoke and Vernon, and no more butterflies were noted.

Vernon, 25-29 August

During 25-29 August, Robert P. Nelson showed me a Painted Lady colony he had been observing through the summer on Silver Star Mountain just northeast of Vernon. On a warm afternoon 6-10 individuals could be seen near the thistle patches at any one time. There was no evidence of a sudden migration of these individuals away from the colony, or of others into the colony, and the colony slowly diminished in size through September and early October (R.P. Nelson, pers. comm.). On several rural excursions during this period we saw no evidence of a Painted Lady migration in the vicinity of Vernon. R.P. Nelson, James Grant, David Threatful, and Cris Guppy, observing butterflies in the N. Okanagan or Revelstoke area during the summer and fall of 1983, noted no late summer or fall migration of this species.

Vernon, Revelstoke, Golden, Cranbrook, Sparwood, 30 August

On 30 August we travelled from Vernon (0835 h) to Revelstoke and Golden (1340 h), then up the Columbia and Kootenay River valleys to Cranbrook (1700-1740 h) and up the Elk River valley to Sparwood (1905 h), via Highways 97A, 1, 95, and 3. Painted Ladies were seen along much of this route (Fig. 1). The weather at Vernon was cloudy-bright; it soon became sunny for the rest of the trip. Painted Ladies were first encountered (1050 h) about 37 km southwest of the summit of Roger's Pass; no direction of migration was evident as we passed. At Glacier Park Centre in Roger's Pass (1120-1143 h) we noted a steady southward movement of three Painted Ladies per minute crossing a 30 m west-east line between the Centre and Highway 1; they were travelling in sunshine on a 10 kmph north breeze. None were observed while we descended from the Pass, but six were encountered in 1.5 km in the valley floor at Glacier Park East Gate. A few were seen during the descent to the Columbia River crossing at Donald Station, and 18 were counted in the 20 km of valley bottom from there to Golden.

While driving the 243 km from Golden (1340 h) to Cranbrook (1700 h) we counted 129 Painted Ladies, or about one every ½ km, mainly flying west across the highway. Just west of Fairmont at a service station, in 8 minutes (at 1540 h) we noted 15 Painted Ladies heading west across a 30 m north-south line; the weather was sunny and very warm with a south breeze of 20 kmph. About 5 km south of Skookumchuk Bridge, in a distance of only 1.6 km 12 butterflies were counted heading west. Beyond Elko (1830 h) 48 butterflies were seen in 5 km of mostly shaded valley floor. About one per km were sighted be-

tween Fernie (1845 h) and Sparwood (1905 h).

Sparwood, Harmer Ridge, 27 August

John Chala reported seeing "hundreds" of butterflies, identified from his description as Painted Ladies, in Sparwood 27 August, and the same day Mike Halko observed "hundreds" while at work just east of the town at 2300 m on Harmer Ridge, a very rocky area.

Sparwood, Crowsnest Pass, Ft. McLeod, Calgary, Camrose, 31 August

While in Sparwood we saw several Painted Ladies in flower gardens. We encountered the butterfly migration from Sparwood (1053 h) all along this route (via Highways 3 and 2) until sundown at 2021 h when we were west of Ponoka (Fig. 1).

At Coleman, about 35 km east of Sparwood, Painted Ladies were migrating southwest in a dead calm. While stopped for 3 min. amongst the boulder rubble of Frank Slide, 6 Painted Ladies were sighted flying west across a 5 kmph north breeze, straight at the bare face of Turtle Mountain. In the mountains and foothills the movement was all west or southwest.

In gently rolling rangeland about 6 km west of the junction of Highways 3 and 2, six Painted Ladies were counted in three min. crossing a 30 m east-west line, flying south into a southwest 10 kmph breeze; it was sunny, with clouds 7/10, about 25° C. To the north the sky gradually became more clear, with a south breeze at 5 kmph. On the prairies the migration was mainly west or southwest. Occasionally groups were sighted travelling south or

Painted Ladies feeding on thistle blossoms *R.W. Nelson*

southeast. Strangely, none were encountered in the southern and central part of Calgary nor along a stretch of Highway 2 north of Calgary, but suddenly (about 1900 h) in a 13.5 km stretch just north of Carstairs 46 were counted; these were almost all heading west (several were flying east) on an east 10 kmph breeze in sunshine. Between Red Deer and Ponoka we noted only 4 butterflies, the last at 2021 h just after the sun disappeared.

Camrose to Edmonton, 2-9 September

During this period I was again commuting the Camrose-Edmonton route. At least one day this period had weather comparable to that experienced earlier during the main migration. However, no Painted Ladies were detected here during this time or later in the fall.

Camrose to Brooks, return. 9-10 September

During the afternoon of 9 September we travelled Highways 13, 855, 12 and 36 to Hanna and Brooks. Conditions were sunny, clouds 3/10, 14°C, and a south breeze at 15 kmph. Two Painted Ladies were seen heading south just inside the east edge of Camrose; when stopped for several minutes about 23 km southeast of Camrose, we saw one Painted Lady heading south and three flying west. The last one of the season was observed south of Strome flying west.

Size of the Migration

Earlier I speculated on the number of butterflies involved in the migration as the result of only 8 minutes of particularly dense movement between Camrose and Edmonton.

From Golden to Cranbrook, in 3 hours of travelling on 30 August we saw 127 Painted Ladies along a (roughly) 250 km line, or 42 butterflies an hour. Assuming that we saw all the butterflies within 50 m in front of the car, this would represent 42 butterflies per hour crossing a 50 m piece of the highway, or 630,000 crossing the 250 km of highway in the 3 hours we were driving. Assuming the migration was at the same rate from about 0900 to 1900 h, more than 2 million butterflies crossed that highway that day.

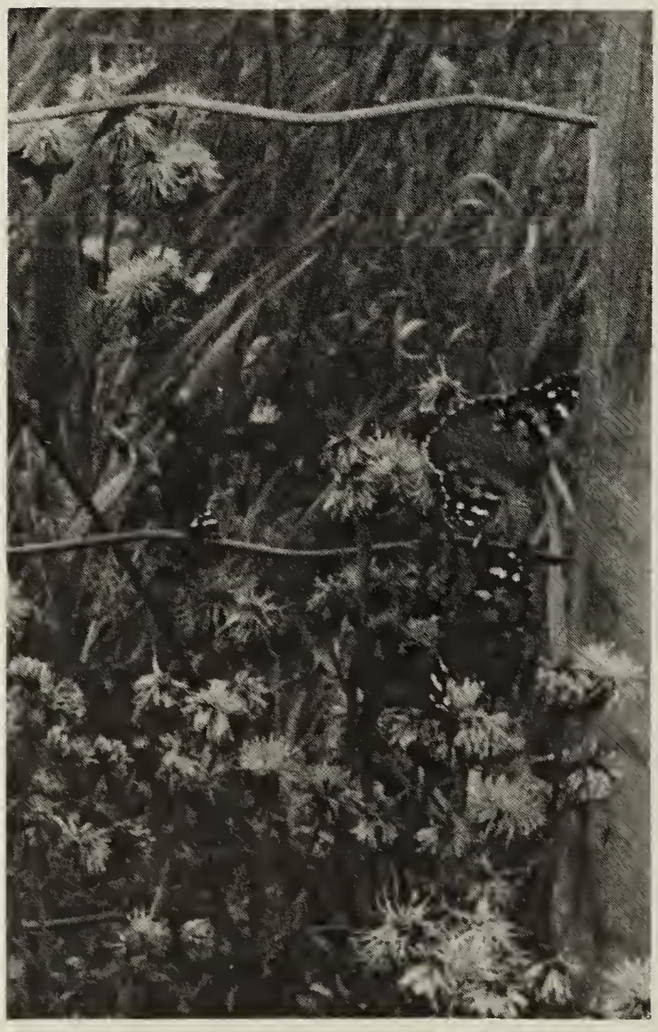
Similar calculations for the Ft. McLeod-Ponoka transect (330 km in 5 hrs of travelling) 31 August show 0.5 butterflies/km travelled, and over 3 million butterflies crossing that transect in a ten hour period that day.

The two transects are roughly parallel and are very roughly one day's travel apart for a butterfly travelling over or through the mountains at right angles to the transects at a ground speed of 19 kmph (12 mph[12]). (See Fig. 1) Consider three blocks of butterflies; the first block traversed the western transect 30 August and was surveyed; the second block traversed the eastern transect 30 August and crossed the western transect 31 August, uncounted; the third block crossed the eastern transect 31 August and was counted. If similar numbers were moving on both of these days, each block probably represented 3 million butterflies. Without a great deal of speculative analysis of weather data it is not possible to estimate how widespread this Painted Lady movement was, nor what total numbers of butterflies were involved during the last half of August and early September. From the observations of 30-31 August and the significant distances involved in those transects, it is probable that at least 10 million butterflies were involved in the movements of these two days in central and southwestern Alberta and southeastern B.C.

Origin, Destination, and Direction of Migration

Presumably the northward migrants were particularly successful in breeding in spring-summer 1983. (Were some weather conditions especially favorable for the production of large numbers of Painted Ladies in that year?) Because there was not a conspicuous, major build-up of Painted Ladies in the Canadian prairies during that summer (Hooper, Bird, pers. comm., pers. obs.), I presume that the bulk of the observed migrants originated in the aspen parkland, boreal forest, or farther north.

Although the butterflies' destination in northern Mexico and southwestern California is almost due south of southwestern Alberta and southeastern B.C., there was a major westerly component to many of the recorded flight directions; some were clearly flying south, but others were heading due west. By flying due south, however, a butterfly would encounter much mountainous terrain in the 2000 km between Alberta and the assumed overwintering area. Perhaps by flying more directly across the mountains, and then turning south or south-southeast, the butterflies have an easier trip and are more likely to arrive in their overwintering area. It remains to be shown that any of the northern Painted Ladies do, in fact, arrive in the autumn in the overwintering area.



Painted Ladies, August 1983
R.W. Nelson

Suggestions for Future Observations

In retrospect, there were many things which I should have done during the widespread southward migration of Painted Ladies in 1983. Some suggestions are offered in order that the dimensions of the migration and the migration biology of these creatures might be better studied when the relatively unique circumstances allow such a phenomenon to be repeated.

1. A telephone fan-out should have attempted to obtain simultaneous observations of the migration at a number of locations, to define the timing, dimensions, density, and direction of the migration over a large area.

2. When recording data on a butterfly migration full data should be collected on local weather conditions, especially temperature, wind direction and speed, per cent cloud cover, presence and direction of sun, and exact time of day.

3. In addition to counting migrant butterflies within a fixed distance of the observer (preferably at right angles to the main direction of travel), the observer should note the exact direction of the migration, the average and range of the height of

the migrants above the substrate, and the type of substrate over which the butterflies are travelling.

4. Ground speed of the migration should be sought under a variety of wind speeds and directions, and the direction of the migration should be investigated with regard to the present wind direction and speed, and with regard to weather systems and wind directions prior to and after the migration observations.

5. Observations on a migration through whole days at a fixed location would be useful in determining whether and how the time of day, presence of the sun, sun angle, wind speed, wind direction, and air temperature affect the numbers of migrants, their migration, resting, and feeding activity, and their direction of travel.

6. The responses of the migrants to different landforms should be investigated, (e.g. where plains meet mountains), to detect changes, if any, in the characteristics of the migration.

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