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MIGRATION AND METEOROLOGY: A SYNECOLOGICAL NOTE

by

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The spring of 1962 brought to the Near East its most widespread invasion of the Desert Locust (*Schistocerca gregaria* Forsk.) for many years, penetrating even, in March as far as the Soviet Union, for the first time for more than thirty years, and with the western flank of the invasion just reaching Israel. In May the writer had an opportunity of seeing some of the most heavily infested areas, in western Iran, in company with entomologists from visiting Russian and American anti-locust missions as well as from the Iranian Ministry of Agriculture. On 8 May the party also noted an impressive sheet of altostratus and altocumulus cloud extending rapidly from the west over the Mahidasht valley, across a previously cloudless sky, with the surface wind still from the south-east. The same evening, in Kermanshah, we had a thunderstorm; and I was reminded of how in similar latitudes in Libya, eleven years previously, the main wave of swarms invading Tripolitania had arrived with the warm winds from a southerly quarter which had preceded the cold front of one of the deepest and most active barometric depressions of that season (Rainey 1951). The association of this Libyan swarm movement with this temporary spell of warm southerly winds, interrupting the cooler prevailing northerlies, had provided the answer to the previously puzzling paradox of major swarm movements apparently against the prevailing wind, repeatedly recorded in a number of countries in these latitudes at this time of year. No evidence of such an explanation was yet on record for Iran, but I suggested to my colleagues in Kermanshah that the weather sequence we had seen might be similarly associated with a further northward spread of the swarms. Next day it was clear that such a move had in fact occurred, with a series of fresh swarm reports to the north-west of previous sightings along a front of 170 km, and another 20,000 hectares of new egg-fields reported from the Mahidasht to be dealt with by our hard-pressed hosts of the Iranian locust control organisation. Moreover, back in Teheran a week later, we found that the passage of a cold front through Kermanshah on the night of 8/9 May had been deduced and displayed, at the time and completely independently, by the analyses of the Iranian Meteorological Department, on the corresponding synoptic charts of the aviation forecast

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office at Teheran airport (Rainey 1962): The charts showed that this front had advanced eastwards across Iraq and western Iran at some 700 km per day, and evidence of its passage across north-western Arabia also was subsequently found in the meteorological observations of an FAO Ecological Survey party at Sakaka on 8 May.

Some years later I was visiting Israel, at the invitation of Professor Rivnay. Having also been invited (together with Professor Wright, another contributor to this volume) to address the Israel Entomological Society, I had brought among my slides one as an illustration of this incident (fig. 1) to show how the passage of a weather system, with important and previously unrealised effects on day-to-day problems of locust control, could be recognised independently both by a national meteorological service and by an observer in the field without instruments and new to the country. Discussing this point, Professor Rivnay and I discovered that this same weather system, whose effects, entomological and meteorological, our party had observed in Kermanshah in 1962, had also been associated with a serious incursion into Israel of another notorious insect pest. Some 120 moths of Agrotis ypsilon Rott., the Greasy Cutworm, had been caught at Elat on 7 May, and earlier major incursions of this species at Elat, during the third week of April, had likewise occurred during periods of major northward locust movements, under the influence of similar meteorological situations, in which the first locust swarms had been reported reaching Syria and Turkey (Rivnay 1964, Rainey 1967). Most damaging species of the genus in Israel (Rivnay & Yathom 1964), A. ypsilon was formerly considered a local resident, but the light trap records of Professor Rivnay and his colleagues have provided evidence of important seasonal migrations, substantiating a tentative suggestion made long ago by Williams (1924) from his early observations in Egypt.

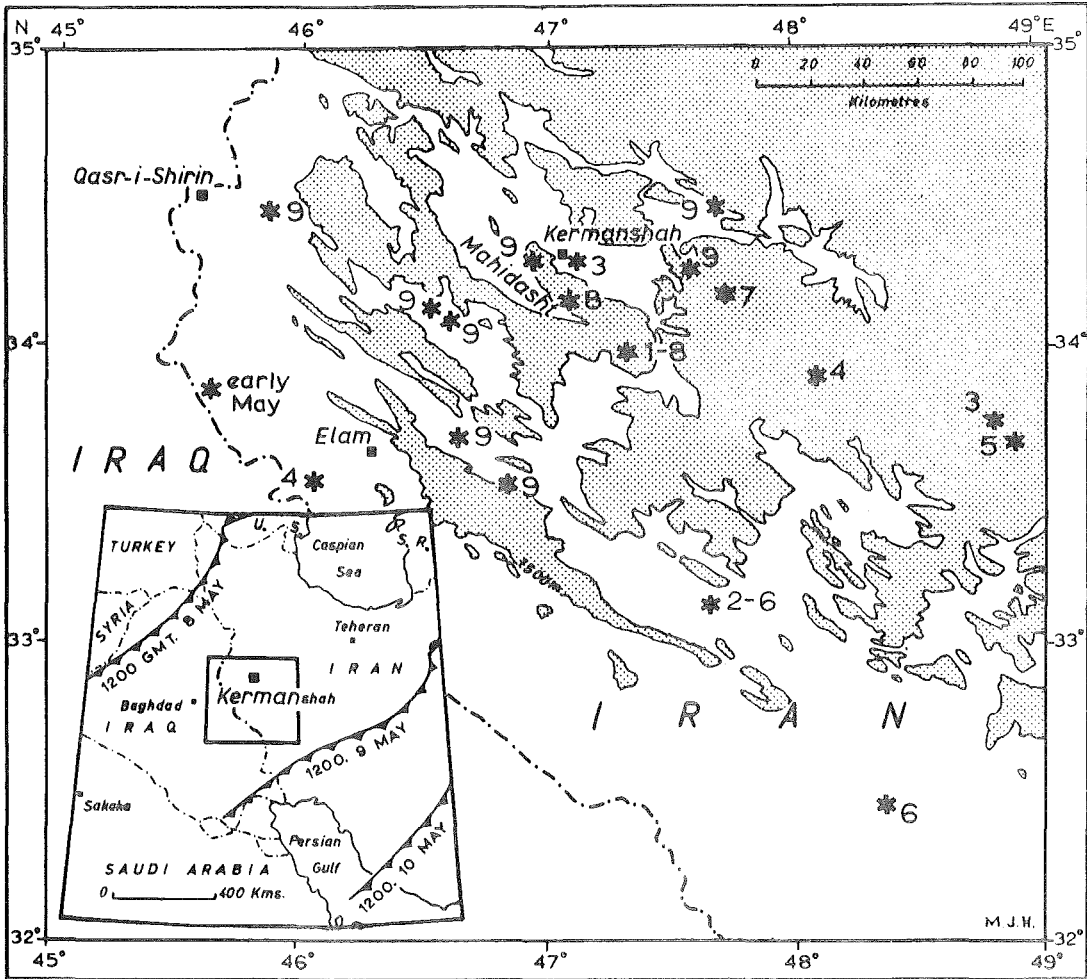
Other early entomological experience in the Near East, such as that of Buxton, (1923 etc.), Uvarov (1931 etc.) and Bodenheimer (1935 etc.) also did much to stimulate general recognition of the significance of physical factors, particularly temperature and humidity, in the life of insects. With more recent recognition of the importance of the motion of the atmosphere for the flying insect, increasing attention is now being given (e.g. in Johnson 1969) to ecologically significant features of the atmospheric environment, such as those already characterised by synoptic meteorologists as fronts and other zones of wind-convergence. In lower latitudes, the intertropical convergence zone, meeting place of the trade-winds and monsoons, has been found to show associations with several changes in distribution of migrant lepidoptera such as Spodoptera exempta Wlk., the African Armyworm (Brown, Betts & Rainey 1969), analogous in a number of respects with those already established with Desert Locust migrations in the same area and at the same time of year (Rainey 1951, 1963). In this case, studies of the detailed relationship of each species to particular features of the atmospheric environment are beginning to throw light on the distribution and movements of the other, including points of differences as well as of similarity. Professor Rivnay has made important contributions to many other aspects of

Near East entomology; it is a pleasure to express appreciation of the stimulus which he also provided at an early stage in the development of what may be termed this synecological approach to studies of insect migration.

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# DESERT LOCUST SWARMS IN WESTERN IRAN EARLY MAY 1962



\* Swarm report with date

Fig. 1

Inset: successive positions of cold front 8-10 May