HYALOMMA ASIATICUM ASIATICUM SCHÜLZE AND SCHLOTTKE, 1929. ITS DISTRIBUTION, HOSTS, SEASONAL ACTIVITY, LIFE CYCLE, AND ROLE IN TRANSMISSION OF BOVINE THEILERIOSIS IN IRAN

BY

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SUMMARY.

Hyalomma a. asiaticum is confirmed to be a distinct species which occurs in many parts of Iran except near the Caspian Sea. The main hosts of adults are sheep; cattle, horses, goats, and camels are also infested. Adults were collected in each season but their activity was found to be in spring, especially in May. This is strictly a three-host tick and a vector of *Theileria annulata*.

RÉSUMÉ.

Il est confirmé que *Hyalomma a. asiaticum* est bien une espèce distincte, présente dans de nombreuses localités de l'Iran, les parages de la Mer Caspienne exceptés. Les moutons sont les hôtes principaux des adultes ; sont également infestés, le bétail, les chevaux, les chèvres, et les chameaux. Cette tique est strictement du type à trois hôtes ; elle est vectrice de *Theileria annulata*.

Non-Soviet workers have generally synonymised *Hyalomma asiaticum* under *H. dromedarii* Koch, 1844 (DELPY, 1949 ; HOOGSTRAAL, 1956 ; ANASTOS, 1957). Persons who followed the keys of these workers have also identified it as *H. anatolicum* subspp. (*H. a. anatolicum* Koch, 1844 and *H. a. excavatum* Koch, 1844). Recent exchange of numerous specimens between Russian workers and KAISER and HOOGSTRAAL (1963) has confirmed that *H. asiaticum* is a distinct species. ABBASSIAN-LINTZEN (1961) reported a single female specimen from southeastern Iran, near the Pakistan border. POMERANTZEV (1950) and SERDYUKOVA (1956) stated that this species is common in Iran. KAISER and HOOGSTRAAL have determined this tick from Iraq, Afghanistan (1963), and Pakistan (1964). Soviet workers (POMERANTZEV, 1950 ; SERDYUKOVA, 1956) consider that *H. asiaticum* consists of three subspecies (*H. a. asiaticum*, *H. a. caucasicum*, and *H. a. kolzovi*). The sub-

species *asiaticum* occurs in Iran and also in Kazakhstan, Turkmenia, Uzbekistan, Tadjikistan, Iraq, and Afghanistan.

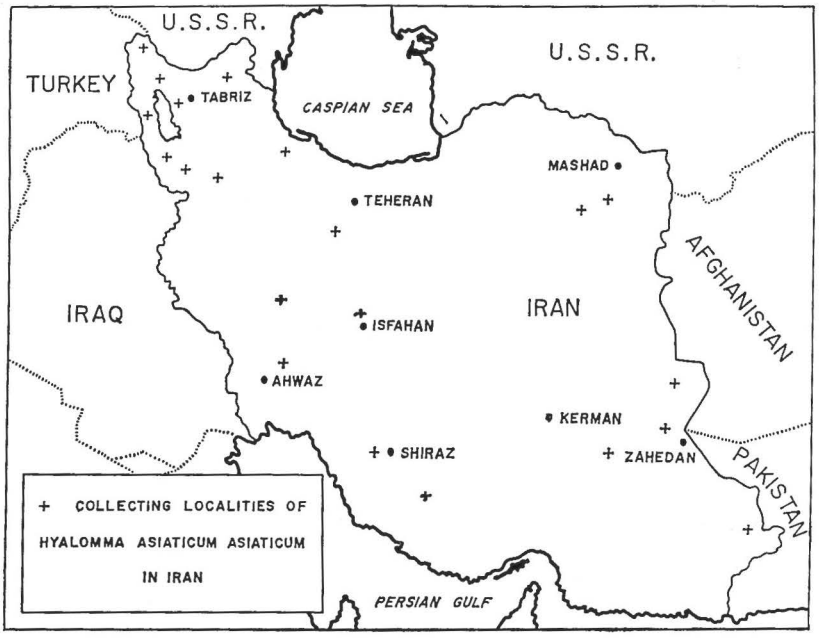
In 1964, the writer first identified *H. a. asiaticum* in a batch of ticks from Zabol and, thenceforth, from several other areas of Iran. In this paper, findings on identification, distribution, hosts, seasonal activity and life cycle of *H. a. asiaticum* and on transmission of *Theileria annulata* are presented.

Identification.

H. a. asiaticum has been described by Kaiser and Hoogstraal (1963), Serdyukova (1956), and Pomerantzev (1950). Because of the previous confusion in identification, comparative features to permit differentiation among *H. anatolicum* subspp., *H. dromedarii*, and *H. a. asiaticum* are presented in Table 1.

Distribution in Iran.

Between 27 June 1964 and 9 July 1967, 102 collections (indicated in parantheses below) of *H. a. asiaticum* [318 ♂♂, 396 ♀♀, 1N (reared to adult)] were made from



the following localities : Kerman : Bam (1), 9 ♀♀, 1 ♂. Sistan and Baluchistan : Zabol, Zahidan, and Iranshahr (35), 60 ♀♀, 55 ♂♂, 1N. Khorassan : Torbat-Heidarieh and Kashmar (8), 22 ♀♀, 34 ♂♂. Teheran : Menjil and Mahallat (2), 22 ♀♀, 20 ♂♂. Azarbaijan : Maku, Ahar, Rezaieh, Khoy, Tabriz and Mahabad (15),

TABLE 1 : COMPARISION BETWEEN
Hyalomma a. asiaticum, H. dromedarii and *H. anatolicum* subspp.

		H. a. asiaticum	*H. anatolicum* subspp.		*H. dromedarii*
			H. a. anatolicum	*H. a. excavatum*	
MALE	Average length of scutum	medium, 4.1 mm. [1]	small, 3.5 mm.	medium, 4.2 mm.	large, 5.7 mm.
	Color	yellowish brown	light to reddish brown	reddish brown to brown	yellowish brown
	Subanal shields	in line with axis of adanal shields	in line with axis of adanal shields		exterior of axis of adanal shields
	Posteromedian groove	does not reach parma	does not reach parma		reaches parma
	Shape of parma	subtriangular	suboval		subrectangular
	Cervical grooves	deep, long, furrow-like	shallow, short, not furrowlike		deep, long, furrow-like
	Posterior margin of basis capituli	deeply concave, usually angular	slightly concave		deeply concave, usually angular
FEMALE	Genital apron (operculum)	longitudinally oval, not bordered by an elevated fold, bulging in profile	knoblike or transversally oval, bulging in profile		V-shaped, bordered by a narrow elevated integumental fold, not bulging in profile
	Scutum	longer than wide	longer than or at least as long as wide		usually wider than or at least as wide as long
BIOLOGY	Number of hosts of the offspring of a single female on rabbit	strictly three	three and two		three, two and a few even one

1. POMERANTZEV (1950) gives 6 to 7 mm. as the size range of male. Iranian specimens, like those of Afghanistan (KAISER and HOOGSTRAAL, 1963), are smaller ; average length 4.1 mm., range 3.6 mm. to 4.6 mm.

117 ♀♀, 109 ♂♂. KORDISTAN : Bijar and Saghez (24), 80 ♀♀, 55 ♂♂. FARS : Shiraz and Jahrom (14), 61 ♀♀, 37 ♂♂. KHOUZISTAN : Masjid-Soleiman (1), 7 ♀♀, 3 ♂♂. LORISTAN : Aligoodarz(1), 17 ♀♀, 5 ♂♂. ISFAHAN : Isfahan (1), 1 ♀.

Thus, *H. a. asiaticum* is present in many parts of Iran except along the Caspian Sea [1]. Collections were not received from the Persian Gulf littoral, where this tick may also occur.

HOSTS.

Of 715 (100 %) specimens of *H. a. asiaticum* collected during the survey period, 530 (74 %) were from sheep, 89 (12.5 %) from goats, 54 (7.5 %) from cattle, 41 (6 %) from camels, and 1 from horse. Percentages according to host of specimens of *Hyalomma* ticks, other than *H. a. asiaticum*, sent to us from all parts of Iran during the surveying period were : 44 % sheep, 7 % goats, 46 % cattle, 1.5 % camels and 1.5 % horses, it can be concluded that the main host of *H. a. asiaticum* in Iran is the sheep.

SEASONAL ACTIVITY.

H. a. asiaticum was collected during each season but its activity was found to be mainly in spring, especially in May, as 61 % of the specimens were collected in spring and 77 % of the specimens received in spring were those collected in May. The percentages of the collected material during the other seasons were : summer, 10 % ; autumn, 14 % ; and winter, 15 %.

LIFE CYCLE.

Reared, several times, in the laboratory on rabbits, *H. a. asiaticum* completed its life cycle strictly as a three host tick. Whereas the offspring of a single female of *H. dromedarii*, *H. a. anatolicum*, and *H. a.* exc*avatum i. e.* the three species and subspecies which were in confusion previously with *H. a. asiaticum*, undergo either a two-host or three-host type of life cycle. Although not encountered by the writer, some of the workers such as FELDMAN-MUHSAM and MUHSAM (1966) in their experiments on *H. dromedarii* have even noticed one-host type life cycle among a few of the offspring obtained from single *H. dromedarii* female.

The developmental periods of *H. a. asiaticum* are summerised in Table 2.

1. In the distribution map, one collection site appears to be quite close to the Caspian Sea. It might be necessary to call the attention of the reader to this point that the marked place on the map is called Menjil which actually is separated, by the Alborz Mountains range, from the Caspian Sea area.

TABLE 2 :
LIFE CYCLE OF *H. a. asiaticum*, REARED ON RABBITS AT 32°C AND 75-80 % R. H.

PERIOD	DAYS
Preoviposition	2-74
Beginning of oviposition to beginning of hatching	16-21
Larval prefeeding period	more than 4
Larva feeds	3-5
Premolting period of larva	5-7
Nymphal prefeeding period	more than 3
Nymph feeds	6-7
Premolting period of nymph	13-14
Adult prefeeding period	5-7
Adult (female) feeds	7-9

TRANSMISSION OF THEILERIOSIS.

To determine the transmissibility of *Theileria annulata* (Dschunkowsky and Luhs, 1904) by this tick, the following experiment was conducted in cooperation with Drs. P. HOOSHMAND and R. FESHARKY.

We allowed 150 nymphs of *H. a. asiaticum* to engorge on a calf infected with *T. annulata* (strain No. 11) in which the rate of gametocyte-infected red blood cells was 5 per 1000. The adult ticks, obtained after moulting, were put on a healthy calf to feed. After an incubation period of 9 days, this calf showed pyrexia and *T. annulata* schizonts could be detected in lymph nodes and liver biopsy smears. Blood smears also showed gametocytes. This case became very grave, to the point that 600 per 1000 of red blood cells were infected with *T. annulata* gametocytes.

Although it was shown, experimentally, that *H. a. asiaticum* can transmit *T. annulata*, but in nature due to the tendency of this tick to feed mainly on sheep its role in transmission of bovine theileriosis is negligible in Iran.

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