A PRELIMINARY LIST OF TICKS (ACARINA : IXODOIDEA) OCCURRING IN IRAN AND THEIR DISTRIBUTIONAL DATA [1]

BY

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INTRODUCTION.

In respect of the increasing interest in ticks, as vectors of various pathogenic organisms to human and animals, the following list of species, occurring in Iran, is herewith given. This work stipulates a three-years-study of 41644 specimens collected and identified by the Institute of Parasitology and Malariology of Iran. Previous publications of DELPY (1938) and BALTAZARD *et al.* (1952) and verbal information received from the Pasteur Institute of Iran have been digested for the completion of the list in hand (distributional data on *Haemaphysalis inermis, H. punctata, H. sulcata, Ornithodoros tartakovskyi* and *O. erraticus*). Furthermore the Pasteur Institute and Razi Institute of Iran have kindly arranged facilities to refer to their tick collections.

MATERIALS AND METHODS.

The materials mostly collected by the entomological teams of the Institute of Parasitology and Malariology have been furnished by the subject teams during their entomological surveys for Malaria mosquitoes in all Iranian provinces. Nearly all ticks have been collected from stables, human dwellings and domestic animals. In 29 cases ticks have been taken from wild animals or their resting places. Except otherwise stated, dates of collection of ticks in our material mentioned in each

1. This study is supported in part by the Arthropod-borne Diseases Project of the Ministry of Health, financed from Plan Organisation funds, and in part by the Institute of Parasitology of Tehran School of Medicine.

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case in the text, refer only to the months, where surveys were performed and do not exclude the possibility of their occurrence in other months of the year. We believe, that in order to complete the subject list, further material from domestic and wild animals has to be collected during every month of the year.

The collected specimens were put in test tubes with filter paper inside and closed with cotton. The labelled tubes were then sent to the Institute for further identification. Most of the ticks, specially the Ixodidae, are kept in 70 % alcohol in our collections.

Following keys and descriptions have been used for identifications : COOLEY and KOHLS 1944 (*Argas* species) ; MOFIDI 1952 (*Ornithodoros* species) ; HOOGSTRAAL 1956 (*Boophilus* species) ; POMERANTZEV 1950 (*Dermacentor* and *Rhipicephalus* species) ; NUTTALL *et al.* 1915, DELPY 1938, HOOGSTRAAL 1955 (*Haemaphysalis* species) ; DELPY 1949 *a*, HOOGSTRAAL 1956 (*Hyalomma* species) ; NUTTALL *et al.* 1911, POMERANTZEV 1950 (*Ixodes* species).

Earlier records of Iranian ticks were published by : BRUMPT 1935 ; DELPY 1936, 1937 *a*, 1938, 1946 *a*, 1947 *b* & *c*, 1949 *a* & *c*, 1952 ; BALTAZARD *et al.* 1950, 1952, 1955 ; POMERANTZEV 1950, NEMENZ 1953, RAFYI 1955, DJANBAKHSH 1956.

RESULTS.

In the list of Iranian ticks 8 genera and 26 species are included.

Argasidae	Quantity
1) *Argas persicus*	7951
2) *Argas reflexus*	514
3) *Ornithodoros canestrinii*	444
4) *Ornithodoros erraticus*	—[1]
5) *Ornithodoros lahorensis*	7439
6) *Ornithodoros tartakovskyi*	34
7) *Ornithodoros tholozani*	16401
Ixodidae	
8) *Boophilus annulatus*	780
9) *Dermacentor marginatus*	26
10) *Haemaphysalis concinna*	15
11) *Haemaphysalis erinacei*	56
12) *Haemaphysalis inermis*	—[1]
13) *Haemaphysalis punctata*	1
14) *Haemaphysalis sulcata*	23
15) *Hyalomma aegyptium*	52
16) *Hyalomma detritum*	156
17) *Hyalomma dromedarii*	1022
18) *Hyalomma excavatum*	4833
19) *Hyalomma rufipes glabrum*	3

1. No records by the Institute of Parasitology and Malariology.

20)	*Hyalomma savignyi*	165
21)	*Hyalomma schulzei*	61
	Hyalomma spp. (females after oviposition and nymphs)	1214
22)	*Ixodes crenulatus*	11
23)	*Ixodes ricinus*	119
24)	*Ixodes* ? sp	2
25)	*Rhipicephalus bursa*	92
26)	*Rhipicephalus sanguineus*	230
	TOTAL	41644

Family Argasidae.

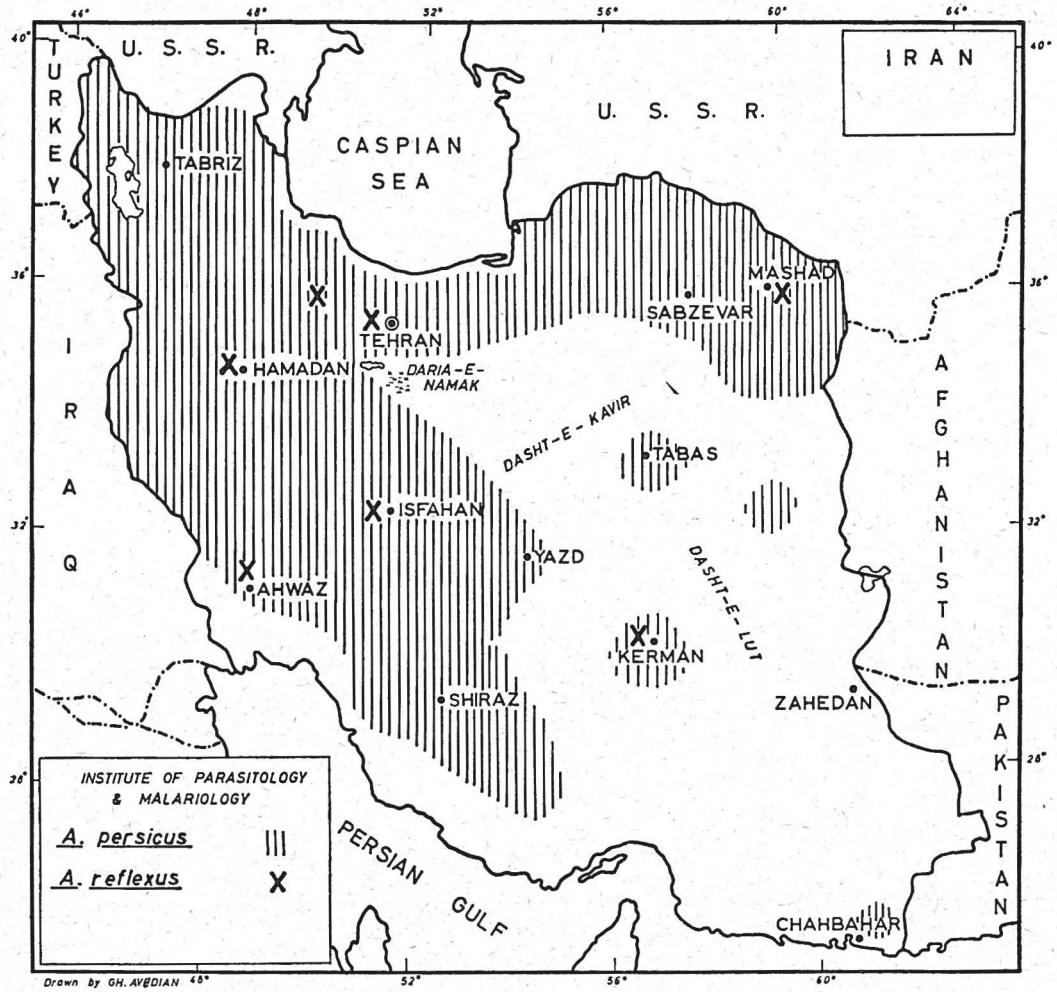

FIG. 1. — Approximate range of distribution of *Argas persicus* and collecting localities of *Argas reflexus* in Iran.

1. *Argas persicus* (Oken, 1818) is spread all over Iran except the deserts and the coastal districts of the Persian Gulf and Caspian Sea [1]. These ticks are more frequent in the highlands (ticks are recorded up to 2286 m above sea level), than in the lowlands. They prefer dry air and soil and seem not to exist in zones with high percentage of air and soil humidity. Our records do not show specimens from the range of appr. 40 km along the Persian Gulf and 40-50 km along the Caspian Sea, where in summertime the air and soil humidity is high. Behind these ranges still the air humidity is high but the soil relatively dry. This proves, that *Argas persicus* prefers dry climate conditions and still tolerates high air humidity if the soil moisture is low. These ticks are very common in chicken houses and infrequently attack pigeons. They have been found in human habitations, too. In 1955 the author observed a single nymphal stage attacking a technician in the laboratory. Specimens of *Argas persicus* were collected almost during all the year except from the middle of December to the middle of January.

2. *Argas reflexus* (Fabricius, 1794) has been collected from all examined pigeon houses. Sometimes this tick infests human habitations being a pest to men. Most probably the roofs of these houses are deserted resting places of pigeons. It is understood, that the " bite " of *Argas reflexus* causes nodules but is painless.

3. *Ornithodoros canestrinii* (Birula, 1895) is a xerophilic tick, which prefers the dry semidesert and steppe zones of central Iran : Yazd, Kashan, Isfahan and, as evidenced by Dr. DJANBAKHSH (verbal information), Nain. This region appears to be the distribution center of this species. Records from Yazd show, that 80 % of the ticks collected in stables were *Ornithodoros canestrinii* and 20 % *Ornithodoros lahorensis*. Both species are often associated. In the other dry parts of Iran, except the above mentioned region, *Ornithodoros canestrinii* is not as frequent as *Ornithodoros lahorensis*. Generally *Ornithodoros canestrinii* evades colder mountain areas, but still is recorded up to 2286 m altitude. The ticks have been collected mostly from sheep and in stables during all the four seasons except December and January.

4. *Ornithodoros erraticus* (Lucas, 1849) (small race) occurs in scattered foci in burrows of rodents, on tortoises, hedgehogs and toads. It is not recorded on domestic animals in Iran. Until to-day this species has not been collected by the Institute of Parasitology and Malariology.

5. *Ornithodoros lahorensis* Neumann, 1908 is widely distributed throughout nearly all parts of Iran except the Caspian Sea and Persian Gulf littoral, the great salt desert, the southern plains and the southeastern part of the country. This tick infests the villages of dry mountain areas and highlands of Iran (semideserts, steppes and limited cultivated zones), but two records are made from lowland places being 40-50 km away from the Caspian Sea, where the air humidity is high

1. Southeastern part of Iran is not truely investigated. Only few records of *A. persicus* were made from one district of Chahbahar.

in summertime. This species is recorded up to 2286 m altitude. *Ornithodoros lahorensis* is often found in large quantities in cracks and crevices of the mud walls in sheep stables. Sheep and cattle are the most common hosts. The ticks have been collected from goats, too, and one nymphal stage was found on a moutain goat. This species is active during all the year.

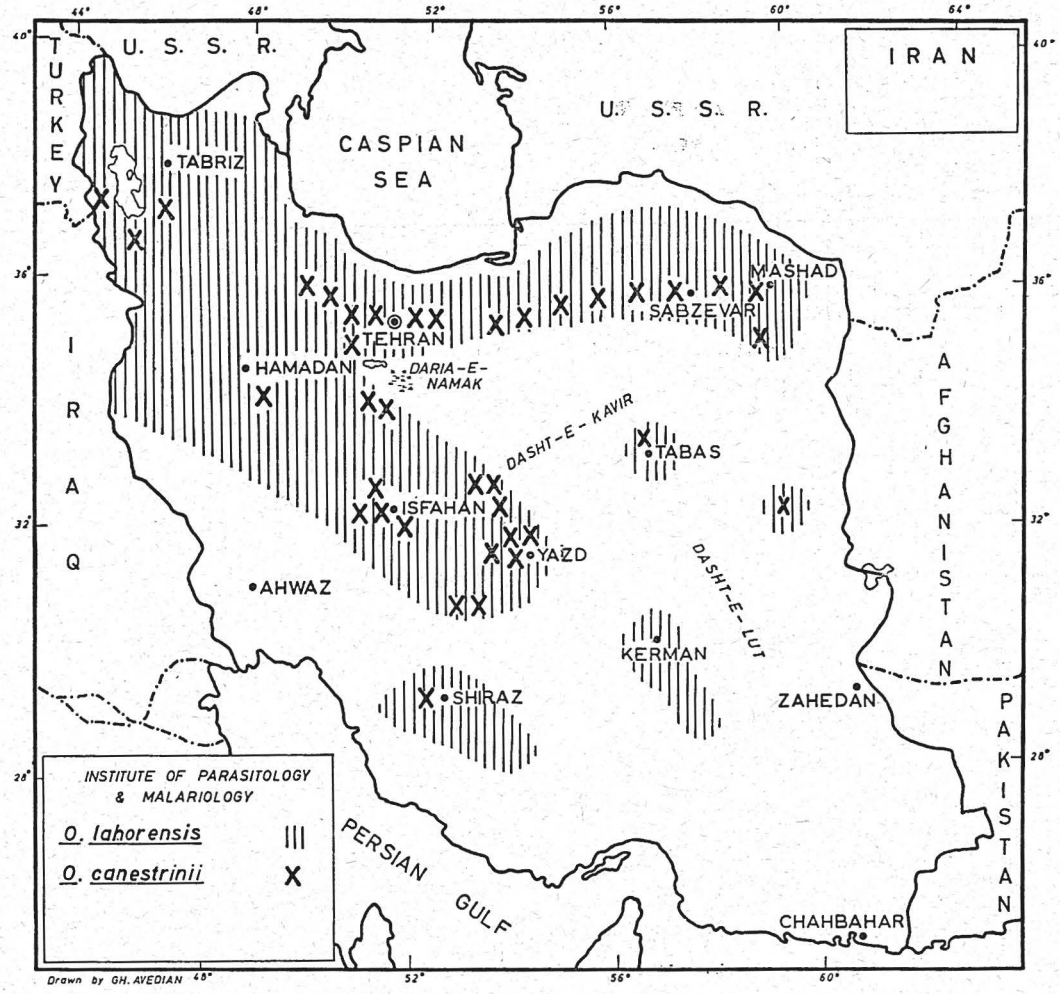

FIG. 2. — Approximate range of distribution of *Ornithodoros lahorensis* and collecting localities of *Ornithodoros canestrinii* in Iran.

6. *Ornithodoros tartakovskyi* Olenev, 1931 has been collected only in northeastern Iran and is according to BALTAZARD *et al.* (1952) a parasite of rodents, hedgehogs and tortoises. We found this species in burrows of ground squirrels in the Sabzevar region.

7. *Ornithodoros tholozani* (Laboulbène and Mégnin, 1882) is very frequent in stables, but only common in peasant houses in northern and western Iran except of the humid subtropical areas along the Caspian Sea. It inhabits arid zones like mountain areas and the Iranian high plateau, which includes semideserts,

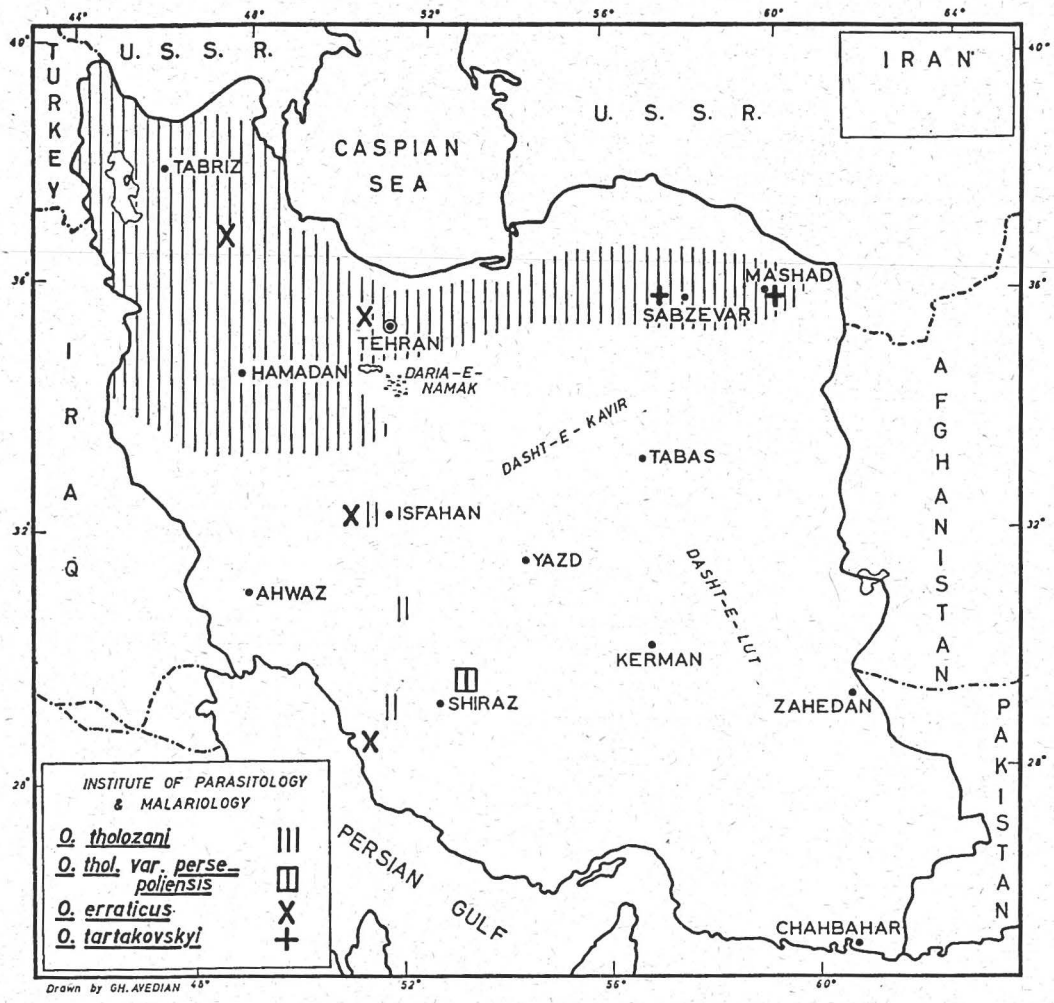

FIG. 3. — Approximate range of distribution of *Ornithodoros tholozani* and collecting localities of *Ornithodoros tholozani* var. *persepoliensis*, *Ornithodoros erraticus* and *Ornithodoros tartakovskyi* in Iran.

steppes and limited cultivated places, where the climate is mild or hot in summertime and cold in wintertime. *Ornithodoros tholozani* is recorded up to 2286 m above sea level. Only 2 collections are in our records from southern localities (Abadeh and Kazerun), where this tick normally does not occur. More detailed examinations should be made in these regions in order to correct the geographical range of this

species. In connection herewith it is referred to DELPY's report (1947 *c*) about *Ornithodoros tholozani* var. *persepoliensis*, which has been collected outside the normal geographical range of *Ornithodoros tholozani* in Iran.

Human is frequently attacked. This fact is of great importance, because

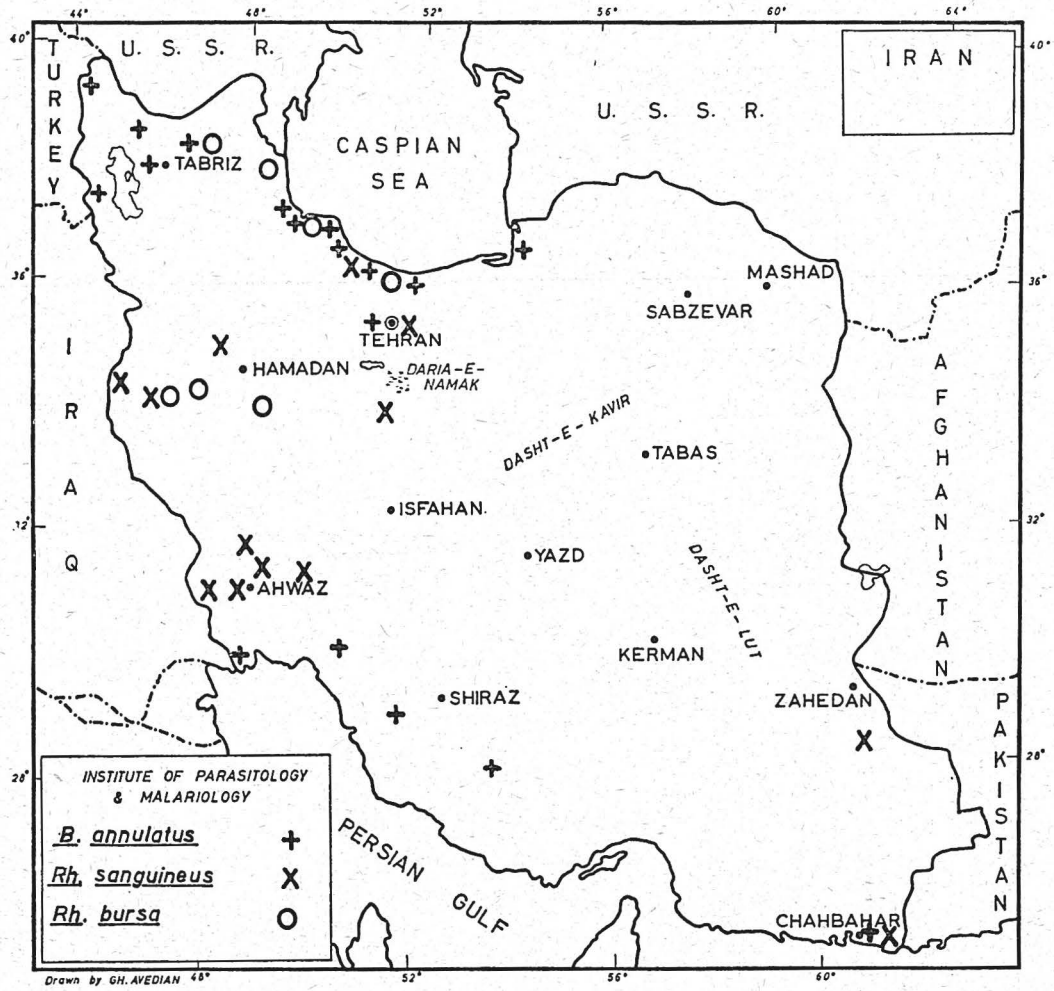

FIG. 4. — Collecting localities of *Boophilus annulatus*, *Rhipicephalus sanguineus* and *Rhipicephalus bursa* in Iran.

Ornithodoros tholozani in the vector of human relapsing fever *(Borrelia persica)* in this country. Other hosts are cattle. One single female was collected from a porcupine and another female in a mice burrow (both records are made by the Pasteur Institute) in Isfahan, where other specimens of this species had never been observed before. These ticks have been collected all over the year.

Family Ixodidae.

8. *Boophilus annulatus* (Say, 1821) syn. : *B. calcaratus* (Birula, 1895) inhabits steppes, pastures and forest areas and seems to tolerate different climatic conditions to certain extend. It has been found in 5 different regions :

1) it is very common along the Caspian Sea littoral (large cultivated lands, pastures and forests), where the climate is warm and extremly humid in summertime and mild and damp in wintertime.

In the other 4 regions *Boophilus annulatus* occurs only in smaller localized populations :

2) in some mountainous areas of Azerbeijan up to 1340 m altitude (mild and semiarid summers and cold winters).

3) Around Tehran, elevation 1100 m (hot, dry summers and rather cold winters).

4) Near Jahrom, Kazerun and Behbahan (hot, dry summers and mild, semiarid winters).

5) In neighbourhood of Khoramshahr (saline marshy lands) and Chahbahar (both localities very hot and damp in summertime and mild and damp in wintertime).

Boophilus annulatus has been mostly collected from cattle and sheep, and in stables, but sometimes it attacks horses as well. In the hot zone adults were found during all the year, but in the mild zones in spring, summer and autumn. Nymphs were seldom observed.

9. *Dermacentor marginatus* (Sulzer, 1776) is the only species of the genus *Dermacentor*, that has been found up to now in Iran with certainty. These ticks seem to be rare. In only one case we collected 26 specimens near the Caspian Sea coast ; no report about their host is available.

10. *Haemaphysalis concinna* Koch, 1844. Our collections origin from 5 places of the Caspian Sea littoral. These villages are situated in the coastal lowlands and in mountainous areas not far from the sea coast. The specimens were collected from cattle and in stables during springtime.

11. *Haemaphysalis erinacei* Pavesi, 1884 syn. : *H. numidiana* Neumann, 1905 was taken from hedgehogs (once associated with *Rhipicephalus sanguineus*) near Tehran, from a burrow of *Meriones* sp. near Mashad and from 2 fox cubes found in a fox den at appr. 2200 m altitude in east Kurdistan. Adults were collected during May, June, July and September and nymphal stages in June.

12. *Haemaphysalis inermis* Birula, 1895, which DELPY (1938) reported from the Mazandaran province, has not been observed by the Institute of Parasitology and Malariology.

13. *Haemaphysalis punctata* Can. and Fanz., 1878 syn. : *H. cinnabarina punctata* (Can. and Fanz., 1878). We have only one collection from the north-eastern part of Iran taken from cattle. DELPY (1938) recorded this species from the northern

provinces and the Caspian Sea littoral (since there is no definite information about places of collections, these records are not shown on distributional map).

14. *Haemaphysalis sulcata* Can. and Fanz., 1878 syn. : *H. cholodkovskyi* Olenev, 1928 has been recorded from 6 places in various parts of Iran, from which were

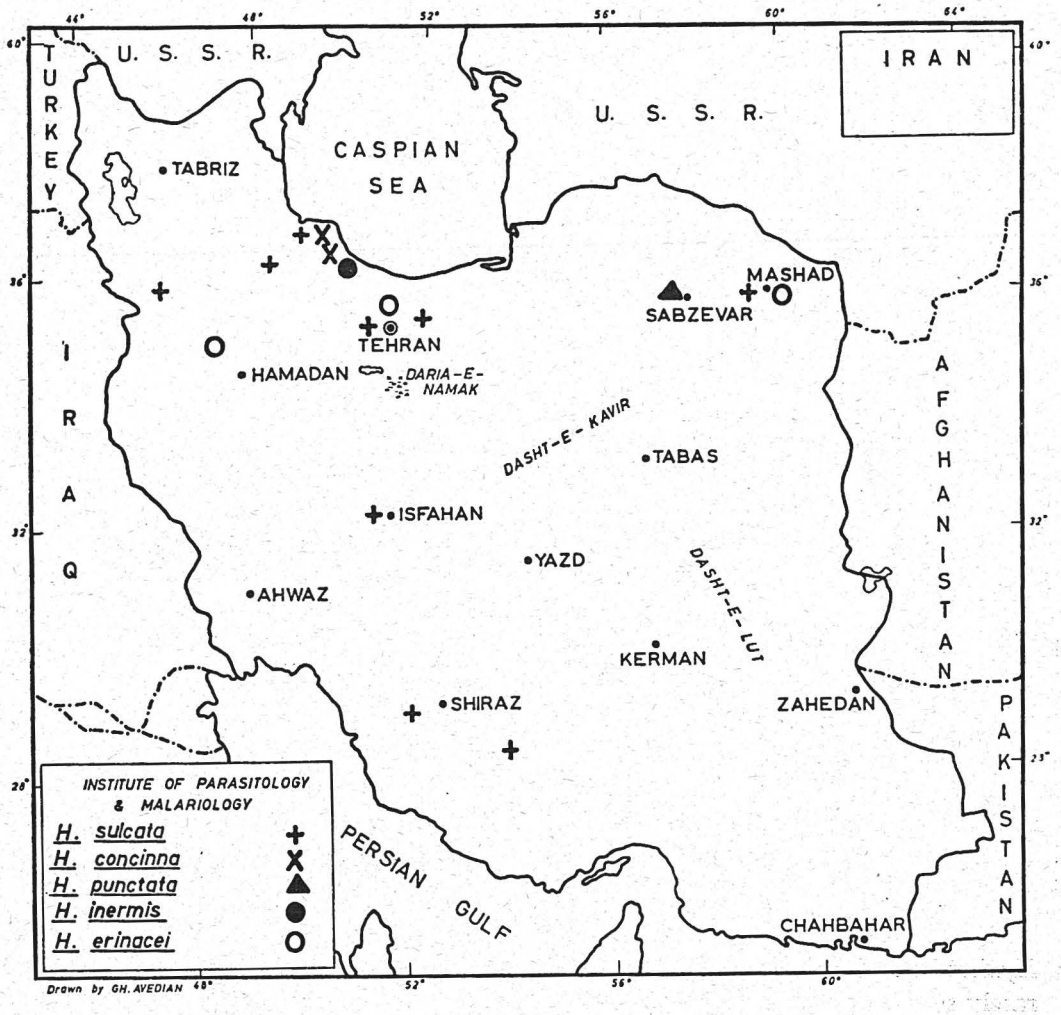

FIG. 5. — Collecting localities of *Haemaphysalis sulcata, Haemaphysalis concinna, Haemaphysalis punctata, Haemaphysalis inermis* and *Haemaphysalis erinacei* in Iran.

5 in mountainous areas with hot and dry climate in summer and cold in winter. The sixth one comes from a town near the Caspian Sea. The origin of 2 of our records is further south and of 3 of our records is further west from the geographical range of this species described by DELPY (1938), who reported this species from Tehran, Isfahan, Firuzkuh, Khorassan and the Alburz mountains (only the 3 for-

mer records are shown on distributional map). *Haemaphysalis sulcata* has been collected from sheep, ground squirrels, in stables, in a burrow of *Rattus norvegicus* and from the ground during April, May and September ; during December near Kazerun.

The Hyalommas are the most common ixodid ticks on domestic animals in Iran.

The systematic rank of some species of this genus (as *H. detritum, H. dromedarii* and *H. excavatum*) is not yet definitely stabilized by the taxonomists working on Hyalommas. There are different opinions on their nomenclature and criteria for their identification, which led to create different schools such as the Soviet, Delpy and Hoogstraal school and others.

In this paper the author is following the school of DELPY due to his extensive studies in this country. It might be possible that our list of *Hyalomma* species has to be revised as soon as the present taxonomic problems will be solved.

15. *Hyalomma aegyptium* (Linnaeus, 1758) is common on tortoises (*Testudo* sp.) in Iran. We collected this tick from nearly all examined tortoises (Tehran, Kermanshah, Hamadan and Sanandaj). One specimen origins from a lizard. The ticks have been collected in April, May and August ; nymphal stages in August.

16. *Hyalomma detritum* Schulze, 1919 occurs in small numbers in localized foci of different places in Iran. It is mostly found on cattle and sheep in xeric mountain areas with not more than 1500 m altitude and in humid coastal localitites. This species has been seen from the first spring to the last summer months in the above mentioned areas and during December in southern Iran (Kazerun).

17. *Hyalomma dromedarii* Koch, 1844 is common on camels (dromedaries) in the arid semideserts, steppes and in mountain areas (up to 1700 m altitude) of central and southern Iran. Some records are from the northern and western parts. The ticks have been collected in large quantities from camels. Other hosts are cattle and sheep, and this species is often found in stables. It is recorded during all the year.

18. *Hyalomma excavatum* Koch, 1844 is the most common species of the genus *Hyalomma* in Iran. It is widely distributed throughout the dry parts and has been rarely seen along the Caspian Sea littoral. It is recorded up to 1900 m above sea level. The most common hosts appear to be cattle and sheep, but it is often collected from camels and in stables. *Hyalomma excavatum* was sometimes taken from horses, buffaloes, burrows of *Meriones persicus* and *Spermophilus* sp. and once from a mountain goat and a hare. The ticks were collected during all the year.

19. *Hyalomma rufipes glabrum* Delpy, 1949 seems to be extremly rare in Iran. Ticks of this species have been collected in October and May at two places : from camels in southern Iran (Kerman) and in a stable at Tehran.

20. *Hyalomma savignyi* (Gervais, 1844) is widely distributed in localized, small sized populations throughout nearly all parts of Iran. It occurs in dry highlands and lightly damp lowlands and in various types of landscape. There are only two separate records from extremly humid pasture areas at the Caspian Sea lit-

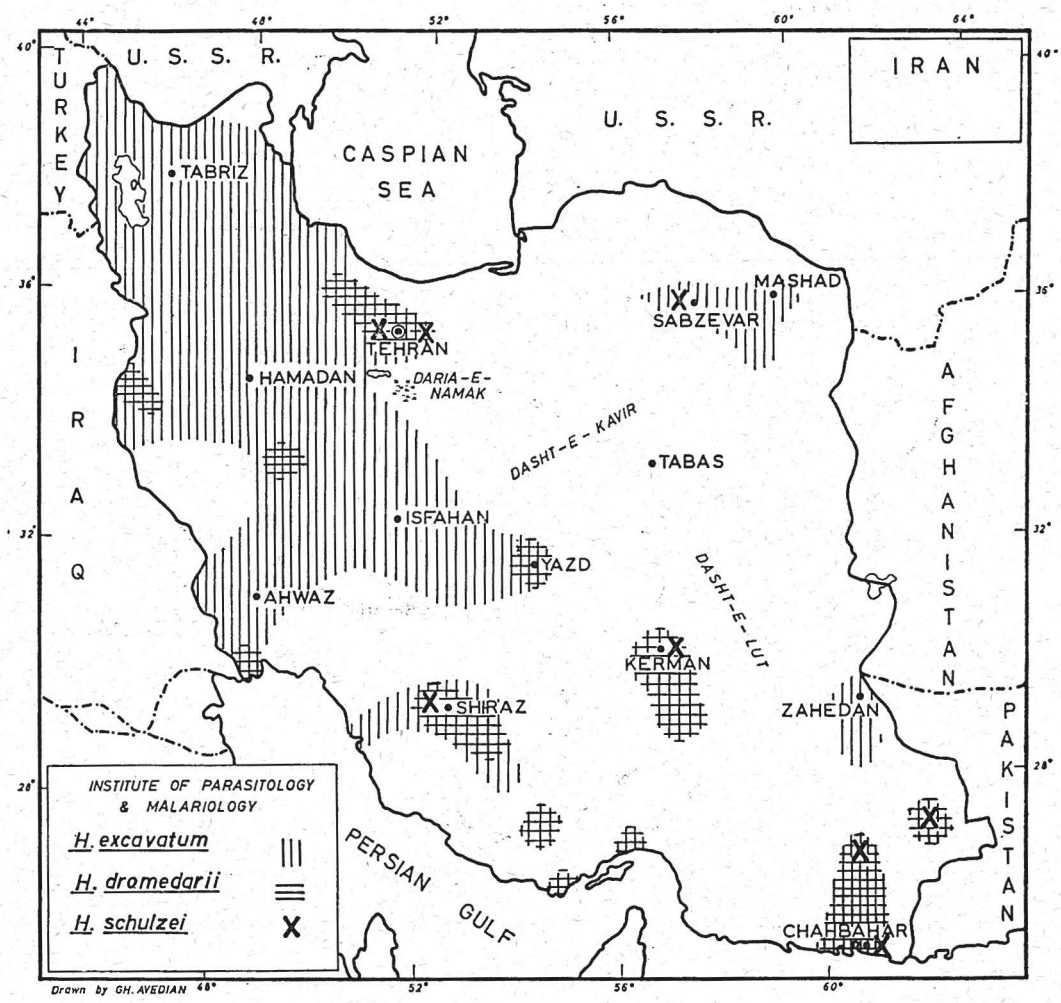

FIG. 6. — Approximate range of distribution of *Hyalomma excavatum* and *Hyalomma dromedarii* and collecting localities of *Hyalomma schulzei* in Iran.

toral. Specimens were mostly collected from spring to autumn, but in the warmer areas of southern Iran also during November (near Kazerun) and January (near Jiroft and Jahrom). Nymphs have been observed in March. *Hyalomma savignyi* has been found up to 1900 m altitude. The most common hosts are cattle. Records from sheep, buffaloes, camels and a hare are available, too.

21. *Hyalomma schulzei* Olenev, 1931 [1] is a relatively rare species in Iran and has been observed on camels (dromedaries) and sometimes on cattle in different parts of Iran. It occurs in the dry highlands of central Iran and in mountainous

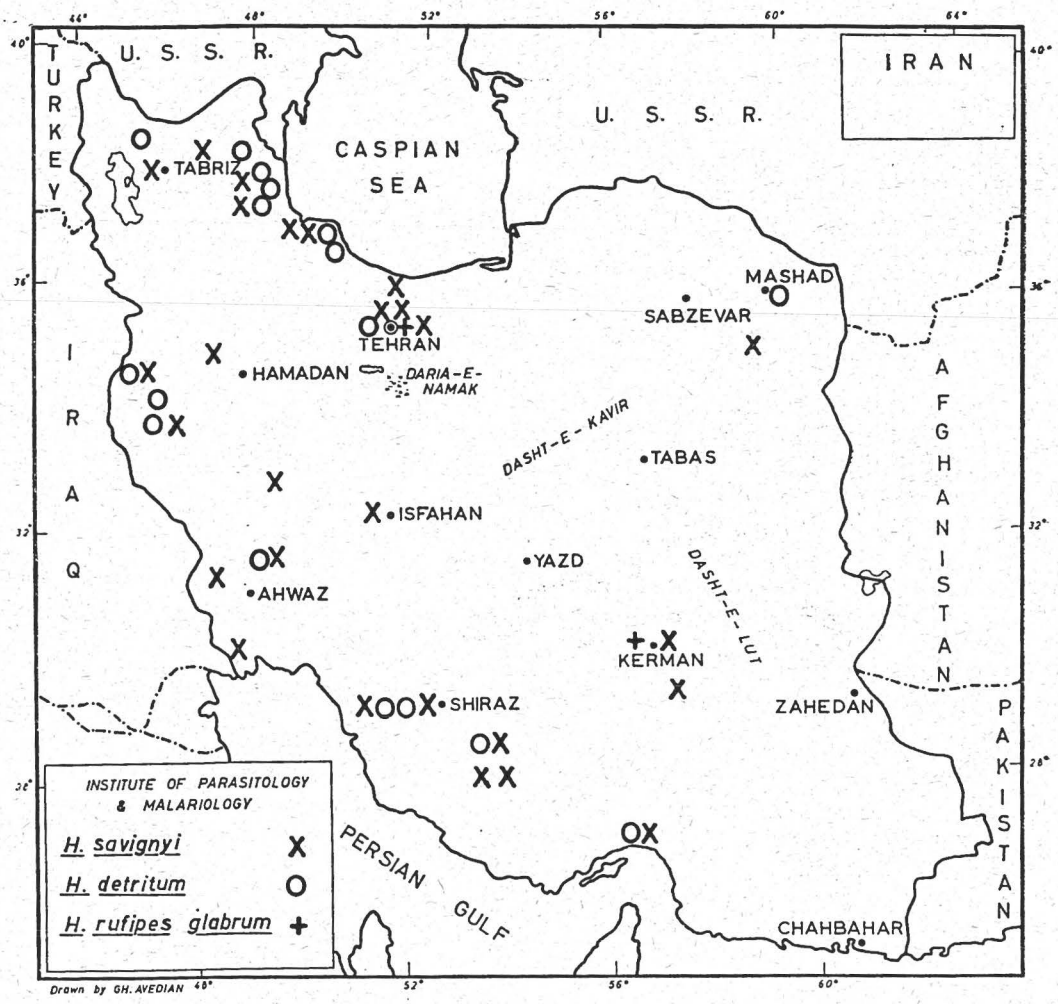

FIG. 7. — Collecting localities of *Hyalomma savignyi*, *Hyalomma detritum* and *Hyalomma rufipes glabrum* in Iran.

areas and humid coastal localities of southeastern Iran. Ticks of this species have been normally collected from spring to autumn; only in southern Iran during February.

1. In DELPY'S publication (1949 *c*, p. 289) this species was reported as *H. brumpti*; later Dr. DELPY kindly informed the author, that it was a misprint and should be corrected as *H. schulzei*. Apparently the said publication is also used by HOOGSTRAAL (1956, p. 454), who reports *H. brumpti* as a species present in Iran. In this paper we are glad, to correct this small error.

Once a nymphal stage of *Hyalomma* sp. has been taken from the neck of a woman, who visited a village near Tehran some days before.

22. *Ixodes crenulatus* Koch, 1835 has been found only once on a porcupine near Tehran. These eleven unidentified specimens have been kindly placed at our

FIG. 8. — Collecting localities of *Ixodes ricinus*, *Ixodes crenulatus*, *Ixodes* ? sp., *Dermacentor marginatus* and *Hyalomma aegyptium* in Iran.

disposal by Dr. RAFYI and Dr. MAGHAMI, Razi Institute, Tehran-Hessarak. Two of the ticks in question were sent to Dr. D. R. ARTHUR, King's College, London, who kindly confirmed our identification.

23. *Ixodes ricinus* (Linnaeus, 1758) is an hydrophilic tick, which occurs only in the humid lowlands and lower hills of the Caspian Sea littoral. It has been collected from cattle and in stables from spring to autumn.

24. *Ixodes* ? sp., an unidentified species, was collected by Dr. DJANBAKHSH from a jackal near Ramsar (Caspian Sea littoral). With the use of available keys and monographs it was impossible to determine the two specimens. In order to settle this question further material is necessary.

25. *Rhipicephalus bursa* Can. and Fanz., 1877 has a "spotty" distribution in western Iran and at the Caspian shores. This tick occurs both in lowlands and in mountain areas up to 1800 m above sea level and was mostly found on cattle, sheep, goats and in stables. One specimen was taken from a person. All ticks have been collected in spring and the early summer months.

26. *Rhipicephalus sanguineus* (Latreille, 1806) inhabits mainly western and southwestern Iran and the area round Tehran. It has been found in some other parts of Iran as well. The highest elevation, where this species has been observed, was up to 1900 m. It is common on dogs and parasites also various animals like sheep, cattle, foxes, jackals, mountain goats, hares and hedgehogs. One hedgehog died the day after it was infested by 91 specimens of *Rhipicephalus sanguineus*. Ticks of this species have been collected in spring, early summer and autumn.

REMARKS.

Searching for ticks 16 bats have been examined. Besides some mites only one larval stage of Ixodidae was found.

Following three species were reported from Iran by the Soviet workers ; having no records on these species, they could not be included in this list :

1) *Ixodes vespertilionis* Koch, 1844 has been reported from northern Iran by POMERANTZEV (1950, p. 78).

2) *Haemaphysalis caucasica* Olenev, 1928 has been reported from the Savalan-mountains, Azerbeijan by POMERANTZEV (1950, p. 117).

3) *Dermacentor niveus* Neumann, 1897 has been reported from Iran by OLENEV according to ANASTOS (1957, p. 61). This record has not been repeated in POMERANTZEV'S monograph 1950.

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This preliminary list of ticks occurring in Iran and the given distributional data are far away to be complete particularly due to the fact that nearly half of the identified ticks have been collected from stables and human habitations and not from their respective hosts. The opinion of the author is, that the reason for the considerably few records of *Haemaphysalis* and *Dermacentor* are due to the above mentioned facts.

It is necessary to extend and intensify collecting ticks directly from their hosts, especially from wild animals in order to enlarge the knowledge about the occurrence

of ticks in Iran, besides their immature stages, their geographical distribution and detailed data regarding their ecology.

ACKNOWLEDGMENTS.

I am greatly indebted to Dr. N. ANSARI, Director of the Institute of Parasitology and Malariology, to Dr. Ch. MOFIDI, Acting Director, to Dr. A. MESGHALI, Chief, Division of Entomology and Mr. E. SHAHGUDIAN, Senior Entomologist, who have given me every encouragement and have been most helpful with aid and advice relative to this work. Thanks are due to Dr. B. DJANBAKHSH, Chief, Section of Applied Entomology, for giving me many interesting data and specimens as well as to the staff of the Institute for collecting the material.

I am grateful to Mr. H. HOOGSTRAAL of the United States Naval Medical Research Unit Number Three, Cairo for confirming the identification of *H. erinacei* and sending me some *Hyalomma* species and also to Dr. D. R. ARTHUR, Department of Zoology, King's College, London for confirming the identification of *I. crenulatus* and advising me about *Ixodes* ? sp.

Through the kindness of Dr. A. RAFYI, Director of Razi Institute, Tehran-Hessarak and Dr. Gh. MAGHAMI, Chief, Department of Parasitology, I was able to go for several times through the excellent *Hyalomma* collection of Dr. DELPY and bring the *Ixodes crenulatus* specimens to the Institute of Parasitology and Malariology for further study.

I should thank Dr. M. BALTAZARD, Director, and other members of Tehran Pasteur Institute for providing me with their tick collection. I have also to thank Mr. W. SPATZ for assistance in preparation and correction of this manuscript.

SUMMARY

1. — This paper gives a list and maps of distribution of 26 tick species occurring in Iran (*Argas persicus, A. reflexus, Ornithodoros canestrinii, O. erraticus, O. lahorensis, O. tartakovskyi, O. tholozani, Boophilus annulatus, Dermacentor marginatus, Haemaphysalis concinna, H. erinacei, H. inermis, H. punctata, H. sulcata, Hyalomma aegyptium, H. detritum, H. dromedarii, H. excavatum, H. rufipes glabrum, H. savignyi, H. schulzei, Ixodes crenulatus, I. ricinus, I. ?* sp. *Rhipicephalus sanguineus, Rhipicephalus bursa*). *Hyalomma* species are identified according to the school of DELPY. Most of the material (41.644 specimens) has been collected by the entomological staff of the Institute of Parasitology and Malariology of Iran and only two species *(O. erraticus, H. inermis)* have not been observed by the Institute.

2. — Four species : *Boophilus calcaratus* (Bir., 1895), *Haemaphysalis numidiana* Neum., 1905, *H. cinnabarina punctata* (Can. & Fanz. 1878) and *H. cholodkovskyi* Olenev, 1928, previously reported from Iran, are considered synonyms of *B. annulatus* (Say, 1821), *H. erinacei* Pavesi, 1884, *H. punctata* Can. & Fanz., 1878 and *H. sulcata* Can. & Fanz., 1878 respectively.

3. — Three species : *Dermacentor marginatus, Ixodes crenulatus* and *Ixodes* ? sp. are new for Iran.

RÉSUMÉ

1. — L'article donne une liste et des cartes de distribution de 26 espèces de tiques présentes en Iran *(Argas persicus, A. reflexus, Ornithodoros canestrinii, O. erraticus, O. lahorensis, O. tartakovskyi, O. tholozani, Boophilus annulatus, Dermacentor marginatus, Haemaphysalis concinna, H. erinacei, H. inermis, H. punctata, H. sulcata, Hyalomma aegyptium, H. detritum, H. excavatum, H. rufipes glabrum, H. savignyi, H. schulzei, Ixodes crenulatus, I. ricinus, I ?* sp., *Rhipicephalus sanguineus, R. bursa)*. Les espèces de *Hyalomma* sont identifiées selon l'école de DELPY. La plupart du matériel (41.644 spécimens) est récoltée par le personnel entomologique de l'Institut de Parasitologie et de Malariologie de l'Iran et seulement 2 espèces (*O. erraticus* et *H. inermis*) ne sont pas observées par l'Institut.

2. — Quatre espèces : *Boophilus calcaratus* (Bir., 1895), *Haemaphysalis numidiana* Neum., 1905, *H. cinnabarina punctata* (Can. & Fanz., 1878) et *H. cholodkovskyi* Olenev, 1928 déjà rapportées de l'Iran sont considérées synonymes de *B. annulatus* (Say, 1821), *H. erinacei* Pavesi 1884, *H. punctata* Can. & Fanz., 1878 et *H. sulcata* Can. & Fanz., 1878 respectivement.

3. — Trois espèces : *Dermacentor marginatus, Ixodes crenulatus* et *Ixodes* ? sp. sont nouvelles pour l'Iran.

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