

## PLANTS OF THE TOURAN PROTECTED AREA, IRAN

K. H. Rechinger

With a contribution by P. Wendelbo (*Chenopodiaceae*)

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A commented list of vascular plants from the Touran Protected Area is presented. The area of 18 420 km<sup>2</sup> of desert, semidesert and steppe constitutes a part of the extensive desert of Dasht-e Kavir in central and eastern Iran.

The list is based on collections by the author and his wife in spring 1975 and for chenopods mainly on collections by P. Wendelbo in autumn 1975. 375 species are reported; the following are new to the flora of Iran, viz., *Cithareloma* cf. *lehmannii* Bunge, *Heliotropium acutiflorum* Kar. & Kir., *Horaninowia ulicina* Fisch. & Mey., *Isatis trachycarpa* Trautv., *Paracaryum calathicarpum* (Stocks) Boiss., and *Paracaryum platycalyx* Rech. f. & Riedl. Evidence is given for the inclusion of *Fortuynia bungei* (Burm.) Shuttlew. as a synonym of *F. garcinii* (Burm.) R. Br. and *Smirnowia iranica* Sabeti as a synonym of *S. turkestanica* Bunge.

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### گیاهان منطقه حفاظت شده توران در ایران از، رشینگر

لیست گیاهان آوندی منطقه حفاظت شده توران ارائه میگردد، این منطقه بمساحت ۱۸۴۲۰ کیلو مترمربع شامل بیابان، نیمه بیابان و استپ قسمتی از دشت کویر مرکزی و شرقی ایران است. لیست فوق براساس جمع آوری های مؤلف و همسرش در بهار سال ۱۹۷۵ با اضافه جمع آوری هائیکه توسط پروندلیو بخصوص از خانواده *Chenopodiaceae* در پاییز همان سال بعمل آمد تهیه شده است. مجموعاً ۳۷۵ گونه از منطقه فوق گزارش داده میشود که گونه های زیر برای فلور ایران جدید هستند.

*Cithareloma* cf. *lehmannii* Bunge, *Heliotropium acutiflorum* Kar. & Kir., *Horaninowia ulicina* Fisch. & Mey., *Isatis trachycarpa* Trautv., *Paracaryum calathicarpum* (Stocks) Boiss., *Paracaryum platycalyx* Rech. f. & Riedl.

همچنین شواهدی بمنظور تقلیل گونه *Fortuynia bungei* (Burm.) Shuttlew. تحت  
همنام بگونه *F. garcinii* (Burm.) R. Br. و *Smirnowia iranica* Sabeti به  
*S. turkestanica* Bunge ارائه میشود.

## INTRODUCTION

This paper is the second in a series of papers dealing with the flora of national parks and protected areas of Iran stimulated by the interest of His Excellency Mr. Eskandar Firouz, Director of the Department of the Environment, Tehran. The first paper of this series (Rechinger & Wendelbo 1976) deals with the Kavir Protected Area situated on the north-western border of the Dasht-e Kavir.

The Touran Protected Area covers a surface of 18 420 km<sup>2</sup> and it has a circumference of 665 km. It is situated in the northern part of the Kavir desert between 34° 45' - 36° 30' latitude N and 55° - 57° longitude E. The highest point reaches 2281 m, the lowest 700 m. The major western portion of the area lies within the province of Shahrud, the smaller eastern part in the province of Khorasan. H. Freitag, who is preparing a paper on the vegetation of the Touran Protected Area, will furnish a more detailed description of the topography, geology and climatology.

Much of what has been said in the introduction of the Kavir paper applies also to the Touran paper. There are, however, a few points which I want to stress. The name of "Touran" which has been given to the protected area is derived from the name of a village situated in the centre of the area in question and it has nothing - or not directly - to do with the internationally well known geographical term Turan as used for the immense desertic or subdesertic central Asiatic plains situated to the east of the Caspian/ Iran, the official name of the Iranian Empire, is necessarily used in two different senses. "Flora Iranica" as stated on the cover of each volume of this work, covers the Iranian Highlands and the bordering mountain ranges, thus including also Afghanistan, the western part of Pakistan (west of the Indus), furthermore the North of Iraq and small sections of the Soviet Union (Talysh and the mountainous part of Turkmenistan). Therefore the term "Flora Iranica area" has been used wherever the whole area of this flora is meant, while "Iran"

refers to Iran in a political sense.

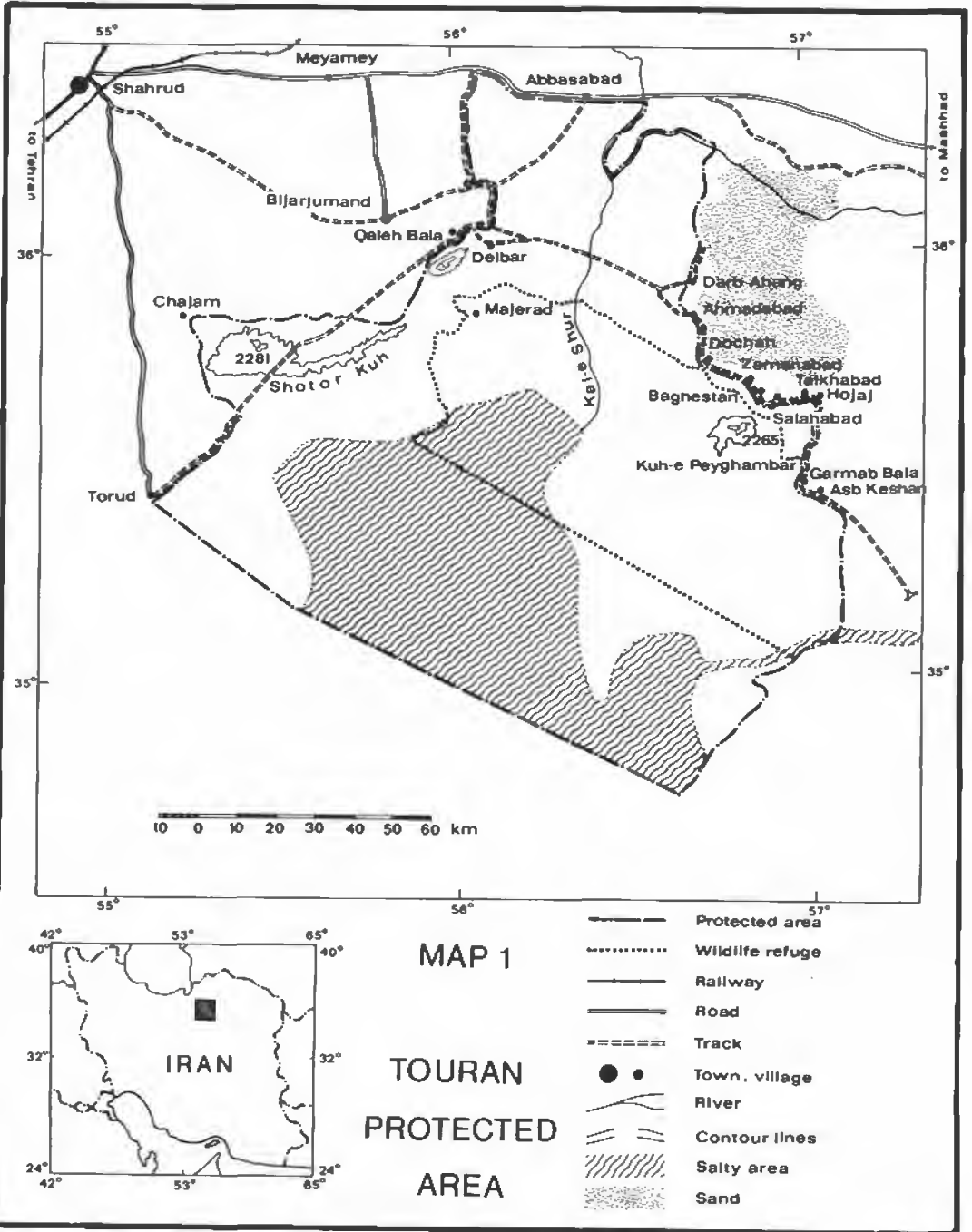
My thanks go to the following persons who have named the herbarium material of individual families or genera:

- H. Schiman-Czeika, Wien - *Acantholimon*, *Acanthophyllum*  
 A. Gilli, Wien - *Orobanchaceae*  
 J. Grau, München - *Myosotis*  
 A. Huber-Morath, Basel - *Achillea*  
 M. Iranshahr, Tehran - *Anthemis*  
 A. Polatschek, Wien - *Erysimum*  
 D. Podlech, München - *Astragalus* (Sect. *Chronopus* and *Myobroma*)  
 H. Riedl, Wien - *Boraginaceae*, *Ephedraceae*  
 I. Riedl, Wien - *Silene*  
 J. L. van Soest, 's-Gravenhage - *Taraxacum*  
 P. Wendelbo, Göteborg - *Alliaceae*, *Calligonum*, *Chenopodiaceae*, *Iridaceae*, *Liliaceae*.

The base for the following plant lists is mainly the specimens collected and noted by me and my wife Wilhelmina between April 26th and May 2nd 1975.

To avoid repetition of the localities on which my specimens have been collected these localities are listed below under the numbers of my diaries. For the sake of briefness the plant list itself only gives the locality number. Exception has been made for Wendelbo's late season findings (September 20th and 21st, mostly *Chenopodiaceae*) for which localities and notes are completely reproduced.

18. Qaleh Bala, 1120 m, field borders. - 27.4
19. Limestone hills NE. of Qaleh Bala, 1300-1500 m. - 27.4
20. Compact sand patches between Qaleh Bala and Delbar, 1100 m. - 27.4
21. Delbar, field border, 1100 m. - 28.4
22. Dried up river bed 18 km SE. of Delbar towards Ahmadabad, 820 m. - 28.4
23. Sandy flats 28-30 km ESE. of Delbar towards Ahmadabad, 1000 m. - 28.4
24. Sandy flats 48 km ESE. of Delbar towards Ahmadabad, 1000 m. - 28.4
25. NNE. of Ahmadabad towards Darb Ahang, 800 m. - 29.4



26. Sanddunes near Darb Ahang, 18 km NNE. of Ahmadabad, 800 m. — 29.4
27. Fixed sand dunes 5–10 km from Ahmadabad towards Zamanabad, 900–950 m. — 30.4
28. Small limestone gorge 10 km S. of Zamanabad, 1050 m. — 30.4
29. 15–20 km N. of Zamanabad, 1200 m. — 30.4
30. At the foot of Kuh-e Peyghambar, S. of Zamanabad, 1300 m. — 30.4
31. Kuh-e Peyghambar S. of Zamanabad, limestone, 1300–1500 m. — 1.5
32. Jafarabad near Zamanabad, field borders, 1200 m. — 2.5
- 33A. Salahabad 6 km S. of Zamanabad, 1100–1200 m. — 2.5
- 33B. Sand dunes 7 km E. of Salahabad towards Asb Keshan, 1100 m. — 2.5
34. River bed 22 km from Salahabad towards Asb Keshan, 1200 m. — 2.5
- 35A. On the pass 26 km from Salahabad towards Asb Keshan, 1300 m. — 2.5
- 35B. "Dasht", SE. of Asb Keshan, 1150 m. — 2.5
36. On the pass between Asb Keshan and Bargh, shale, 1200 m. — 2.5
37. Gorge between Asb Keshan and Bargh, 1150 m. — 2.5

These specimens have been numbered 50297–51094. The first set is deposited at the Vienna Natural History Museum (W), a duplicate set at the Herbarium of the Ariamehr Botanical Garden, Tehran (TARI). Mr. M. Iranshahr, Head of the Botanical Section of the Plant Pests and Disease Research Institute, Evin, Tehran (IRAN), has accompanied us; his collection of herbarium specimens has been numbered independently and has been deposited at his institution. As most specimens have been exchanged by their collectors on the spot, Mr. Iranshahr's set will be practically identical with the ones in Vienna and Ariamehr Herbarium. I want to thank all the participants of the expedition for their excellent spirit of cooperation. Also Mr. Reza Barkhordari and Mr. Abbas, the drivers, have

contributed considerably towards the success of the enterprise.

As can be seen from the localities some records from the immediate neighbourhood of the Touran Protected Area have been included as the species concerned are expected to grow within the area as well.

Prof. Per Wendelbo, Gothenburg, from 1974 to 1976 botanical adviser at the Ariamehr Botanical Garden, Tehran, has visited the Touran Protected Area accompanied by Mr. Foroughi in autumn 1975. His expedition was primarily aimed at the family of *Chenopodiaceae*. Most of the members of this family are late flowering, and ripe fruits are necessary for correct identification. Prof. Wendelbo has named his specimens himself and he has kindly contributed his list of 41 *Chenopodiaceae* to this paper. With 5 additional species observed by myself the number of species of *Chenopodiaceae* known from the Touran Protected Area amounts to 46, thus second in number to the *Compositae* comprising 56 species. The families richest in species, *Chenopodiaceae* and *Compositae*, seem to be a characteristic feature of desertic and sub-desertic areas of Central Iran. For the Kavir Protected Area (Rechinger & Wendelbo 1976) the situation is similar (figures of the Kavir area in parenthesis):

- 2 *Chenopodiaceae* 46 (35)
- Compositae* 56 (33)
- Cruciferae* 41 (28)
- Boraginaceae* 28 (25)
- Gramineae* 17 (22)
- Caryophyllaceae* 12 (14)
- Leguminosae* 26 (17)

In the Touran as well as in the Kavir Protected Area *Astragalus* 18 (11) and *Salsola* 11 (7) are among the largest genera.

#### NOTES ON THE VEGETATION

I shall not attempt to discuss the vegetation of the Touran Protected Area in detail as Prof. H. Freitag, Göttingen, has recently spent a couple of weeks in the Touran area in order to



map the vegetation. I only want to draw attention to a few striking features. Y

### Limestone hills

There are several isolated hills formed of solid (mostly limestone) rock along the borders of the Touran protected area, e. g., the hills near Qaleh Bala (locality no 19) and the Kuh-e Peyghambar near Zamanabad (localities no 30 and 31). Under certain light conditions they look exactly like islands and the surrounding flat ground like the sea. Not only these solid hills themselves but also their vegetation is in contrast to the soft alluvial soil surrounding them.

X The following list enumerates the species collected and/or observed within the Touran area exclusively on these island-like hills. As can be easily gathered from this list it is largely composed of species belonging to the true Iranian floral element and the list contains even a few ligneous plants as *Amygdalus lycioides*, *Pistacia khinjuk* and *Rosa* sp. and species confined to rock crevices like *Cheilanthes persica*, *Campanula khorasanica* and *Valeriana ficarii-folia*. Four species of *Cousinia* and several *Astragali* are confined to the solid rocky hills.

*Cheilanthes persica*  
*Pistacia khinjuk*  
*Lappula sinaica*  
*Myosotis minutiflora*  
*Onosma johnstonii*  
*Paracaryum platycalyx*  
 – *stellatum*  
*Rochelia bungei*  
*Campanula khorasanica*  
*Silene bupleuroides*  
*Achillea tenuifolia*  
*Aegopordon berardioides*  
*Anthemis odonthostephana*  
*Artemisia* sp.  
*Chrysanthemum gaubae*  
*Cousinia lachnosphaera*  
 – *lasiandra*  
 – *meshhedensis*  
 – *onopordioides*

*Jurinea carduiiformis*  
*Phagnalon nitidum*  
*Scariola orientalis*  
*Scorzonera raddeana*  
*Thevenotia persica*  
*Tragopogon jezdianus*  
*Pseudosedum multicaule*  
*Alyssum lanceolatum*  
*Arabidopsis wallichii*  
*Moriera spinosa*  
*Torularia aculeolata*  
*Euphorbia bungei*  
 – *microsciadia*  
*Biebersteinia multifida*  
*Geranium rotundifolium*  
*Eremostachys molucelloides*  
*Hymenocrater elegans*  
*Nepeta persica*  
*Salvia leriifolia*  
*Astragalus (Ammodendron) podolobus*  
 – (*Erioceras*) *ulothrix*  
 – (*Malacothrix*) *comosus*  
 – (*Myobroma*) *angustidens*  
 – (*Myobroma*) *macropelmatus*  
 – (*Xiphidium*) *argyroides*  
*Hedysarum micropterum*  
*Onobrychis tavernierifolia*  
*Papaver decaisnei*  
 – *pavonium*  
*Acantholimon acmostegium*  
*Bongardia chrysogonum*  
*Atraphaxis spinosa*  
*Polygonum afghanicum*  
 – *polycnemoides*  
*Anemone biflora*  
*Clematis songarica*  
*Thalictrum isopyroides*  
*Rhamnus pallasii*  
*Amygdalus lycioides*  
*Rosa* sp.  
*Rubia florida*  
*Haplophyllum furfuraceum*  
 – *perforatum*  
*Scrophularia striata*  
*Veronica macropoda*  
*Bunium cylindricum*  
 – *rectangulare*

*Eryngium* cf. *bungei*  
 – cf. *nigromontanum*  
*Prangos latiloba*  
 – cf. *pabularia*  
*Valeriana ficariifolia*  
*Nardurus subulatus*  
*Piptatherum vicarium*  
*Iris kopetdagensis*  
*Fritillaria gibbosa*  
 – sp.  
*Gagea gageoides*  
 – *reticulata*

✕ I want to mention also a small but characteristic plant community occupying rock crevices or small hollows sheltered from sunlight as well as from direct rain; several tiny annuals have been found on such habitats, e. g., *Nardurus subulatus* but also *Gagea gageoides* belongs here.

It is worth while mentioning that no species new to science have been discovered; also so called narrow endemics are rather poorly represented in the desert mountain list. Species rather widely distributed through the most arid parts of the Iranian Highlands prevail and larger genera are usually represented by their hardest representatives. ✓

### Sand dunes

The psammophilous vegetation has attracted very little attention so far within Iran. Even Zohary's (1973) treatment contains very inadequate information on this point. Records are scattered throughout various papers, e. g., by Bornmüller and myself. To make the following list more complete, pertinent records should have been extracted from the parts of Flora Iranica published so far. Many botanical collectors including myself have gathered specimens along the section Meyamey – Abbasabad – Sabzevar of the Shahrud – Mashhad road, which crosses partly sandy areas and forms the northern boundary of the Touran Protected Area. In the meantime most of these species have been reported from within the area.

One of the most important discoveries of the trip has been made in the dunes: *Smirnowia*

*turkeстана*, a bright pink flowered papilionaceous shrub with bladder-like fruits and single leaflets. It has lately also been recorded from Kasha. Formerly it was known from deserts of Sovietic Central Asia, the area generally known as Turan and the same is true for *Heliotropium acutiflorum* and *Horaninowia ulicina*. Other psammophytes with the same type of distribution had been discovered the year before in the Kavir Protected Area as new for Iran, viz., *Chamaesphacos ilicifolius*, *Chrozophora gracilis* and *Salsola aperta*. Many psammophilous species listed below have been reported before from very few Iranian localities only. A special paper is planned, in which the problems connected with the psammophilous desertic flora of Central Iran will be discussed more in detail. In a way these Turanian psammophytes constitute, together with certain halophytes, a counterpart to the true Iranian xerophilous psammophytes discussed above.

*Heliotropium acutiflorum*  
 – *nodulosum*  
 – *popovii* subsp. *gillianum*  
*Silene affinis*  
 – *nana*  
*Agriophyllum latifolium*  
 – *minus*  
*Corispermum lehmannianum*  
*Haloxylon persicum*  
*Horaninowia ulicina*  
*Salsola praecox*  
 – *richteri*  
 – *sclerantha*  
*Cousinia turkmenorum*  
*Scorzonera pusilla*  
*Convolvulus eremophilus*  
*Cithareloma* cf. *lehmannii*  
*Isatis emarginata*  
*Malcolmia grandiflora*  
*Octoceras lehmannianum*  
*Spirorrhynchus sabulosus*  
*Tetracme recurvata*  
*Chrozophora gracilis*  
*Euphorbia cheirolepis*  
 – *turczaninowii*

*Erodium glaucophyllum*  
 – *pulverulentum* subsp. *bovei*  
*Chamaesphacos ilicifolius*  
*Astragalus* (*Ammodendron*) *squarrosus*  
 – (*Harpilobus*) *hauarensis*  
 – (*Myobroma*) *flexus*  
 – (*Oxyglottis*) *ammophilus*  
*Smimowia turkestanica*  
*Calligonum* cf. *comosum*  
 – *leucocladum* var. *serratum*  
 – *turkestanicum*  
*Scrophularia leucoclada*  
*Tamarix brachystachys*  
 – *hispida* var. *karelinii*  
*Ferula foetida*  
*Schumannia karelinii*  
*Carex physodes*  
*Astenatherum forsskahlii*  
*Stipagrostis pennata*  
*Colchicum robustum*

*Isatis minima*  
*Malcolmia africana*  
*Matthiola chenopodiifolia*  
*Sterigmotemon acanthocarpum*  
*Torularia torulosa*  
*Scabiosa olivieri*  
*Euphorbia densa*  
*Thuspeiantha persica*  
*Ziziphora tenuior*  
*Astragalus* (*Falcinellus*) *bakaliensis*  
 – (*Oxyglottis*) *ammophilus*  
*Glaucium elegans*  
*Roemeria hybrida*  
*Consolida rugulosa*  
*Callipeltis cucullaris*  
*Veronica campylopora*  
 – *macropoda*  
*Hyoscyamus pusillus*  
*Valerianella dufresnia*  
 – *szovitsiana*  
 – *triplaris*

### Spring annuals

The following is a list of the most widely spread and most frequent spring annuals. They do not form a plant community for themselves but tend rather to fill gaps between small shrubs and other perennials. At least some of them take over where natural vegetation has been destroyed or damaged. Some annuals, e. g., *Matthiola chenopodiifolia* and *Sterigmotemon acanthocarpum* are locally abundant forming, at flowering time, colourful patches in slight depressions.

*Anebia decumbens*  
 – *linearifolia*  
*Holosteum glutinosum*  
*Anthemis austro-iranica*  
*Crepis sancta* subsp. *iranica*  
*Heteroderis pusilla*  
*Koelpinia tenuissima*  
*Microcephala lamellata*  
*Oligochaeta minima*  
*Alyssum linifolium*  
 – *marginatum*  
*Clypeola dichotoma*  
*Goldbachia laevigata*

### LIST OF SPECIES

Species new to the flora of Iran are indicated by an asterisk. Cf. means a preliminary determination, not. that the species has been annotated but not collected and W. & F. means Wendelbo and Foroughi.

### PTERIDOPHYTA

#### Sinopteridaceae

*Cheilanthes persica* (Bory) Mett. ex Kuhn – 19.

### GYMNOSPERMAE

#### Ephedraceae

*Ephedra strobilacea* Bunge ex Lehm. – 18.

### ANGIOSPERMAE – DICOTYLEDONES

#### Anacardiaceae

*Pistacia khinjuk* Stocks – Ahmadabad to Zamanabad, mountain slope, 1100 m, W. & F. 18810.

## Boraginaceae

- Arnebia decumbens* (Vent.) Coss. & Kral. — 24, 27, 32, 33A, 35A, 37.  
*A. linearifolia* DC. — 20, 22, 23, 24, 26.  
*A. minima* Wettst. — 21.  
*Asperugo procumbens* L. — 30.  
*Caccinia macranthera* (Banks & Soland.) Brand — 24.  
*Gastrocotyle hispida* (Forssk.) C. B. Clarke — 22, 24.  
 \**Heliotropium acutiflorum* Kar. & Kir. — 26.  
 New for the Flora Iranica area. This species has been known so far from Central Asia (Turanian Lowlands). It is a typical psammophyte.  
*H. erembium* Bunge — 22.  
*H. nodulosum* Rech. f., Aell. & Esf. — 25, 33B.  
*H. popovii* H. Riedl subsp. *gillianum* H. Riedl — 27, 33B.  
*Heterocaryum irregulare* H. Riedl — 24.  
*H. macrocarpum* Zak — 18.  
*H. rigidum* A. DC. — 27, 37.  
*Lappula ceratophora* (M. Pop.) M. Pop. — 22, 24, 33A.  
*L. ceratophora* is widely spread all over Central Asia and the Flora Iranica area but it has been collected so far at a few scattered localities only.  
*L. sessiliflora* (Boiss.) Gürcke — 30.  
*L. sinaica* (DC.) Aschers. ex Schweinf. — 18, 19, 31, 37.  
*L. spinocarpus* (Forssk.) Aschers. & O. Kuntze — 22.  
*Myosotis minutiflora* Boiss. & Reut. — 19, 31.  
*Nonnea caspica* (Willd.) G. Don — 24, 27.  
*N. caspica* (Willd.) G. Don subsp. *zygomorpha* H. Riedl — 18, 19, 26, 32.  
*N. turcomanica* M. Pop. — 18.  
*Onosma johnstonii* H. Riedl — 36.  
 \**Paracaryum calathicarpum* (Stocks) Boiss. — 22.  
 New for Iran; known so far only from Pakistan and Afghanistan. The locality next to the new one is near Herat.  
*P. intermedium* (Fresen.) Lipsky — 21, 28, 36.  
 \**P. platycalyx* Rech. f. & Riedl — 19, 20, 30, 36.  
 New for Iran. Known so far from Pakistan

and Afghanistan only.

*P. salsum* Boiss. — 24, 26, 29.

This species has been collected only twice so far: south of Tehran, Bode, and on the northern border of the Touran Protected Area between Meyamey and Shahrud, Rechinger 5330-b.

*P. stellatum* H. Riedl — 37.

Widely spread over Iran, Afghanistan and Pakistan, but known only from very few scattered localities.

*Rochelia bungei* Trautv. — 19.

Described from the hills near Shahrud, collected moreover only once in Lorestan.

## Campanulaceae

*Campanula khorasanica* (Rech. f. & Aell.) Rech. f. — 19, 31.

This species is confined to rock crevices. It is evidently an endemic of the mountains of NE. Iran and adjacent Turkmenistan. It is replaced farther west in Iran by *C. incanescens* Boiss.

## Capparidaceae

*Capparis spinosa* L. — 37 (not.).*Cleome coluteoides* (Boiss.) Bunge — 18 (not.), 21 (not.), 27, 32 (not.).

## Caryophyllaceae

*Acanthophyllum diezianum* Hand.-Mzt. — 36.*Cerastium* sp. — 19, 30.*Holosteum glutinosum* (M. B.) Fisch. & C. A. Mey. — 18, 20, 21, 24, 28, 32.*Lepyrodiclis holosteoides* (C. A. Mey.) Fisch. & C. A. Mey. — 18, 30, 32.*Silene affinis* Boiss. — 22, 26.*S. bupleuroides* L. — 19.*S. chaetodonta* Boiss. — 36.*S. coniflora* Nees v. Esenb. — 18, 30.*S. conoidea* L. — 18, 32.*S. nana* Kar. & Kir. — 25, 26, 32.*Stellaria blatteri* Mattf. — 20, 24, 36.*S. media* (L.) Vill. s. l. — 18.



## Chenopodiaceae

*Allenia auricula* (Moq.) Ulbr. — Between Chajam and Dochah, 1020 m, W. & F. 18740; N. of Delbar, 1100 m, W. & F. 18766. — 24.

*Ae. subaphylla* (C. A. Mey.) Aellen — E. of Chajam, 960 m, W. & F. 18733.

A frequent plant, on different kinds of soil.

It forms bushes up to 1.20 m high and more broad.

*Ae. glauca* (M. B.) Aellen — 21.

*Agriophyllum latifolium* Fisch. & C. A. Mey. — Ahmadabad to Zamanabad, 1000 m, on sand, W. & F. 18788. — 27.

Also seen on the sand dunes north of Zamanabad and south-west of Talkhabad. Apparently only occurring on sand and here frequent in the area. It may become much branched and bushy; a plant 60 cm high and 80 cm broad was noted. When dry they will roll along the sand. It was of interest to note that the seeds of this species were collected for food by the local people.

*A. minus* Fisch. & C. A. Mey. — Ahmadabad to Zamanabad on sand, 900–1100 m, W. & F. 18789. — 26.

This species is also confined to sand.

*Anabasis eriopoda* (Schrenk) Benth. — Between Chajam and Dochah, 1020 m, silty soil on flat ground probably covered by water in winter, W. & F. 18737, 18744; N. of Delbar, 1100 m, whitish soil probably gypsum, together with *Esfandiarica calcarea*, W. & F. 18767.

This species seems to have been collected only a few times in Iran and only in the north-eastern part. It is strongly glaucous and the berry-like fruits may be purplish red or pale brown.

*A. setiflora* Moq. — Chajam to Dochah, 1020 m, flat ground, sandy-silty, W. & F. 18736; between Delbar and Kal-e Shur river, 700 m, W. & F. 18770.

*Atriplex dimorphostegia* Kar. & Kir. — Ahmadabad to Zamanabad, 900 m, flat ground with sandy clay, W. & F. 18795; N. of Zamanabad, 1100 m, sand dunes, W. & F. 18919. — 22, 23, 24, 26, 27, 36.

The leaves of this plant are boiled and eaten with mast. Local name: salmeh shur.

*A. griffithii* Moq. — 36.

*A. leucoclada* Boiss. — Between Chajam and Dochah, 1020 m, bank of dry river, silty soil, more or less prostrate, W. & F. 18743; N. of Dochah, sometimes flooded plain, 1030 m, intricately branched, some specimens upright and about 60 cm high, W. & F. 18746; Delbar to Ahmadabad by Kal-e Shur river, 700 m, W. & F. 18777.

*Ceratocarpus arenarius* L. — Ahmadabad to Zamanabad, 900 m, W. & F. 18796 — 24.

*Ceratoides latens* (J. F. Gmel.) Reveal & Holmgren Syn.: *Kraschennikovia ceratoides* Guldent., *Eurotia ceratoides* C. A. Mey. — SW. of Talkhabad, sandy-gravelly soil, 100 m, W. & F. 18823. — 20, 33A.

*Chenopodium vulvaria* L. — 18.

*Corispermum lehmannianum* Bunge — Ahmadabad to Zamanabad, on sand, 1000 m, W. & F. 18786.

This species is confined to sand dunes.

*Esfandiarica calcarea* Sharif & Aellen — N. of Delbar, whitish soil probably with gypsum, 1100 m, W. & F. 18765. — 20, 36.

*Gamanthus gamocarpus* (Moq.) Bunge — E. of Chajam, 960 m, silty soil, W. & F. 18732; between Delbar and Kal-e Shur, 700 m, W. & F. 18771.

*Girgensohnia oppositiflora* (Pall.) Fenzl — Between Chajam and Dochah, 1020 m, W. & F. 18739.

*Halimochemis longifolia* Bunge — S. of Bijarjuman, 1100 m, W. & F. 18755; N. of Hojaj, 1150 m, W. & F. 18824.

The two localities mentioned are west resp. east of the Touran Protected Area. The determination of these specimens is somewhat uncertain. It is an extremely characteristic plant, to a certain degree reminding of *Gamanthus gamocarpus*. The leaves are very succulent, and the bracteoles are coloured purplish near base.

*H. pilifera* Moq. Syn.: *Halotis occulta* Bunge, *Halimocnemis pilosa* Moq. — E. of Chajam, 960 m, W. & F. 18731; near Kal-e Shur river,

SE. of Delbar, 700 m, W. & F. 18772.

A very common and widespread species within the area. Often on flat ground with somewhat silty soil. In most specimens one cannot find the reduced wings of the perianth segments which should be characteristic of *Halotis occulta*.

*Halocharis sulphurea* Moq. — Ahmadabad to Zamanabad, flat ground with silty-sandy soil, 900 m, W. & F. 18798.

*Halocnemum strobilaceum* (Pall.) M. B. — Salty soil by Kal-e Shur river, SE. of Delbar, 700 m, W. & F. 18779.

*Halopeplis pygmaea* (Pall.) Bunge — Salty soil by Kal-e Shur river, SE. of Delbar, 700 m, W. & F. 18923.

*Halostachys belangeriana* (Moq.) Botsch. — Salty soil by Kal-e Shur river, SE. of Delbar, 700 m, W. & F. 18778.

*Haloxylon aphyllum* (Minkw.) Iljin — No specimens were pressed from the Protected Area, but this species was noted in several places between Ahmadabad and Zamanabad (Wendelbo). — 25.

*H. persicum* Bunge ex Boiss. & Buhse — This species is frequent on the sand dunes within the Touran Protected Area between Ahmadabad and Zamanabad and north of Zamanabad.

Some specimens were up to 3.5 m high with thick stems. According to information obtained from the villagers in the little village of Sabri situated on the eastern border of the large, sandy area that forms the north-easternmost border of the Touran Protected Area, there is a forest of *Haloxylon persicum* in the sand dunes several kilometres to the west of the village. There should be specimens 7 to 8 m high with stem diameter near base of 40 cm. Until 13 years ago these trees were extensively cut, and there was a group of people with between 100 and 150 camels that lived from transporting out this wood. The forest is now protected by the Department of Forestry and Range Management. According to information given to us *Haloxylon* should grow surprisingly rapidly. On young plants the branches were said to grow

up to 1 m in one year.

*Horaninowia platyptera* Sharif & Aellen — Ahmadabad to Zamanabad, 900 m, flat ground, W. & F. 18797; by Kal-e Shur river SE. of Delbar, 700 m, W. & F. 18927.

The wings of the perianth segments are not always very well developed and it is questionable if the closely related *H. aptera* Sharif & Aellen, which should be distinguished on lacking wings, is not conspecific.

\**H. ulicina* Fisch. & C. A. Mey. — Ahmadabad to Zamanabad, 900–1100 m, on sand, W. & F. 18787, 18817.

Rather frequent on the sand dunes all along this stretch. I have seen no previous record of this species from Iran.

*Hypocylix kernerii* Woloszcz. — 15 km N. of Torud on road to Shahrud, 850 m, stony ground, W. & F. 18703; 23 km N. of Torud, 1100 m, stony slope, frequent, W. & F. 18706.

The two localities mentioned are north of the Touran Protected Area. — This little known plant was collected in fruit later on the same trip. It is surprising that it has been placed near to the genus *Suaeda* in the tribe *Suaedeae*. To me it looks very like a *Salsola* with its well developed wing of the fruiting perianth segments. Usually there are about 3 flowers in the leaf axil whereas most *Salsola* species only have one. The genus should be transferred to *Salsoleae* and be placed near *Salsola*.

*Kochia stellaris* Moq. — Between Chajam and Dochah, 1020 m, W. & F. 18738; between Delbar and Kal-e Shur, 700 m, W. & F. 18774.

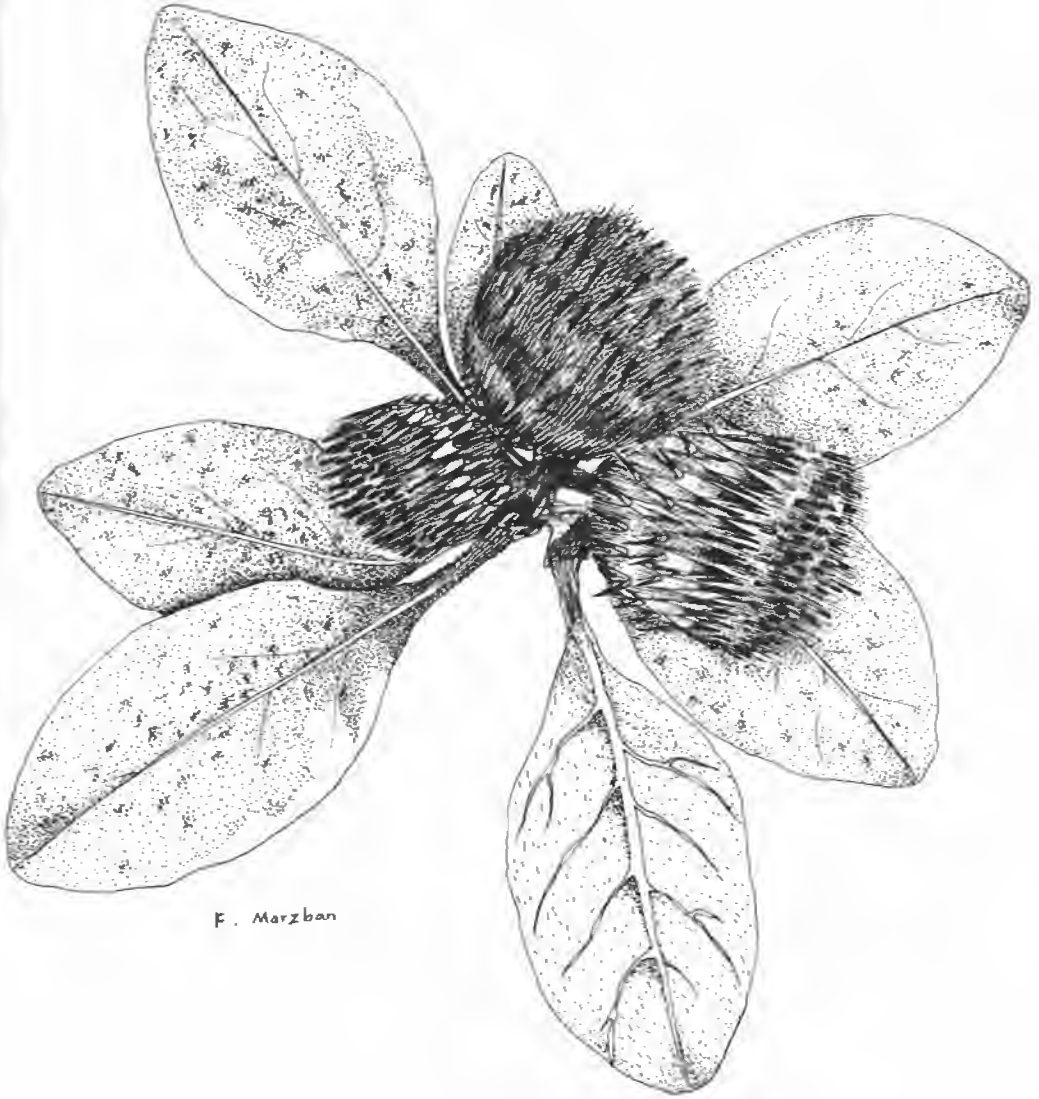
*Londesia eriantha* Fisch. & C. A. Mey. — 22, 24, 36, 37.

*Noaea spinosissima* (L. f.) Moq. — 18.

*Petrosimonia glauca* (Pall.) Bunge — N. of Dochah, 1030 m, plain becoming flooded, silty soil, W. & F. 18745; between Delbar and Kal-e Shur, 700 m, and by Kal-e Shur river, 700 m, W. & F. 18773, 18776; wide plain becoming flooded E. of Delbar, 700 m, W. & F. 18926.

*Salicornia herbacea* L. — Salty, wet soil by Kal-e Shur, SW. of Delbar, 700 m, W. & F. 18924.

*Salsola aucheri* Bunge — N. of Hojaj, 1150 m,



F. Marzban

Fig. 1. *Aegopordon berardioides*, x 4/5.

stony ground, W. & F. 18826; N. of Garmab Bala, 1830 m, dominant on stony hills, W. & F. 18918.

These localities are east of the Touran Protected Area. — Small shrubs up to 60 cm wide and about 30 cm high, with characteristic hard, glaucous, sausage-shaped leaves. The wings of the fruiting perianth varied from a golden brownish to dark red.

*S. dendroides* Pall. — Margin of plain becoming flooded, N. of Dochah, 1030 m, forming large dense stands, partly mixed with *Alhagi camelorum*, W. & F. 18748.

*S. incanescens* C. A. Mey. — S. of Bijarjuman, 1100 m, W. & F. 18750.

This locality is west of the Touran Protected Area.

*S. leptoclada* Gand. Syn.: *S. carinata* C. A. Mey. — S. of Bijarjuman, 1100 m, W. & F. 18752.

This locality is west of Touran Protected Area.

*S. cf. nitraria* Pall. — S. of Bijarjuman, 1100 m, W. & F. 18752.

This locality is west of Touran Protected Area.

*S. orientalis* Gmel. Syn.: *S. rigida* Pall. — Between Chajam and Dochah, 1020 m, W. & F. 18742; W. of Ahmadabad, 950 m, W. & F. 18784; 930 m, W. & F. 18922.

This species is easy to recognize on the leafy shoots in the leaf axils and the rather bad smell from the crushed leaves.

*S. praecox* Litw. — About 50 km N. of Torud on road to Shahrud, sand dunes, 1000 m, W. & F. 18725; S. of Bijarjuman, 1100 m, sandy soil, W. & F. 18758.

These localities are west of Touran Protected Area.

*S. richteri* Karel. — On sand dunes between the Ahmadabad and Zamanabad from 1000 to 1100 m, W. & F. (not.). — 33B.

A *Salsola* shrub growing to 1.5 m height was very frequent. It was very variable in length of leaves and in size and colour of fruiting wings. Many specimens seemed to be intermediate between *S. richteri* and *S. arbuscula*

Pall.

*S. sclerantha* C. A. Mey. — W. of Ahmadabad, 950 m, W. & F. 18782; Ahmadabad to Zamanabad, 900–1000 m, on sand, W. & F. 18799, 18811. — 26.

*S. tomentosa* (Moq.) Spach Syn.: *S. aurantiaca* Bunge ex Boiss. — Between Chajam and Dochah, 1020 m, W. & F. 18734; W. of Ahmadabad, 950 m, W. & F. 18783.

This is together with *Salsola orientalis* the most common of the shrubby *Salsola* species found in the driest kind of low shrub steppe.

*S. turcomanica* Litw. — Ahmadabad to Zamanabad, 900 m, flat ground flooded in spring, silty soil, W. & F. 18794; between Chajam and Dochah, 1020 m, flat ground with sandy-silty soil, W. & F. 18735.

*Seidlitzia rosmarinus* (Ehrh.) Bunge — Between Delbar and Kal-e Shur river, 700 m, W. & F. 18769.

*Suaeda arcuata* Bunge — Between Delbar and Kal-e Shur, by a well, 700 m, W. & F. 18775.

This species is no doubt anthropochorous.

## Compositae

*Acantholepis orientalis* Less. — 22.

*Achillea tenuifolia* Lam. — 28.

*A. wilhelmsii* C. Koch — 18 (not. as *A. santolina*) 21, 32 (not.).

*Aegopordon berardioides* Boiss. — 37.

*Amberboa turanica* Iljin — 22, 24, 26, 37.

*Anthemis austro-iranica* Rech. f., Aell. & Esf. — 20, 22, 24, 26, 28, 30, 35A, 35B, 36, 37.

*A. odontostephana* Boiss. — 37.

*Artemisia herba-alba* Asso — 18 (not.), 21 (not.), 32 (not.).

*Carduus pycnocephalus* L. subsp. *albidus* (M. B.) Kazmi — 18.

*Centaurea pulchella* Ledeb. — 37.

*Chardinia orientalis* (L.) O. Kuntze — 30.

*Chrysanthemum gaubae* Bornm. — 30, 31.

*Cirsium arvense* (L.) Scop. — 18 (not.).

*Cousinia congesta* Bunge — 18 (not.).

This is one of the very few widely spread species of *Cousinia*: Iran, Afghanistan, Turkmenistan.





Fig. 2. *Cousinia piptocephala*, x 1/2.

*C. eryngioides* Boiss. — 18 (not.).

Widely and more or less evenly spread throughout the north-eastern sector of Iran and adjacent Turkmenistan, replaced in Afghanistan by *C. fraternella* Bornm.

*C. lachnosphaera* Bunge — 35A.

*C. lasiandra* Bunge — 32.

*C. meshhedensis* Bornm. & Rech. f. — 19, 31.

Another endemic of the mountains of NE. Iran.

*C. onopordioides* Ledeb. in Eichw. — 18 (not.), 31.

*C. onopordioides* is still more widely spread than *C. congesta*: from Transcaucasia in the West right through to Kara Kum and Pakistan in the East.

*C. piptocephala* Bunge — 35A (not.); Ahmabad to Zamanabad, 1000 m, on sand, W. & F. 18814.

The area of *C. piptocephala* is confined to the immediate surroundings of the Kavir and Lut deserts.

*C. prolifera* Jaub. & Spach — 22, 32.

*C. prolifera*, better known under the name *C. minuta*, is one of the very few annual species of *Cousinia*. It grows in flat loamy depressions where humidity gathers in spring. *C. prolifera* is very variable and rather widely spread: from Iran in the West through Afghanistan and Pakistan to Central Asia and Kashmir.

*C. turkmenorum* Bornm. — 27.

The only true psammophytic *Cousinia* of the Touran Protected Area.

*Crepis sancta* (L.) Bab. subsp. *iranica* Rech. f. — 19, 20, 21, 22, 24, 28, 30, 35B, 36, 37.

*Echinops robustus* Bunge — 23 (not.), 34, 35A.

*Epilasia hemilasia* (Bunge) C. B. Clarke — 22, 26, 27, 35.

*Gnaphalium luteo-album* L. — 30.

*Gymnarrhena micrantha* Desf. — 37.

*G. micrantha* is one of the Saharo-Sindian species penetrating north into Iran and Afghanistan along the border of the great desert basins.

*Heteroderis pusilla* (Boiss.) Boiss. var. *pusilla* — 21, 22, 24, 26, 28, 30, 32, 33A, 35B, 37.

*H. pusilla* (Boiss.) Boiss. var. *leucocephala* (Bunge) Rech. f. — 18, 19, 22, 26, 32, 33A, 35B.

*Jurinea radians* Boiss. — 21, 36.

*J. radians* is an endemic of NE. Iran. It is replaced in Afghanistan and Pakistan by the closely related *J. variabilis* Aitch. & Hemsl.

*J. ramosissima* DC. — 19, 30.

*J. ramosissima* belongs to the geographical group of species characterizing the borders of the great Central Iranian desert basins.

*Koelpinia linearis* Pall. — 18.

*K. tenuissima* Pavl. & Lipsch. — 24, 32, 33A, 35B, 37.

*Lactuca glaucifolia* Boiss. — 20, 22, 24, 35B.

*L. undulata* Ledeb. — 18, 19, 28, 36.

*Launaea acanthodes* (Boiss.) O. Kuntze — S. of Bijarjmand, 1100 m, W. & F. 18761. — 23 (not.), 32.

*Microcephala lamellata* (Bunge) Pobed. — 22, 24, 27, 36, 37.

*Oligochaeta minima* (Boiss.) Briq. — 22, 23, 27, 35, 37.

*Outreya carduiformis* Jaub. & Spach Syn.: *Jurinea carduiformis* (Jaub. & Spach) Boiss. — 28.

*Phagnalon nitidum* Fresen. — 28.

*Picnomon acarna* (L.) Cass. — 18 (not.).

*Pulicaria crispa* (Forssk.) DC. — Ca 25 km N. of Torud, 1100 m, W. & F. 18714.

*Scariola orientalis* (Boiss.) Sojak — 18 (not.), 32 (not.); 23 km N. of Torud, 1100 m, W. & F. 18707.

*Schischkinia albispina* (Bunge) Iljin — Syn.: *Oligochaeta albispina* (Bunge) Briq. — 24, 29, 36.

*Scorzonera litwinowii* Krasch. & Lipsch. — 36.

*S. paradoxa* Fisch. & C. A. Mey. — Syn.: *S. picridioides* Boiss. — 19, 24, 30, 36.

*S. pusilla* Pall. — 22, 24.

*S. raddeana* C. Winkl. — 19, 31.

*Senecio desfontainei* Druce — 22, 26, 27, 37.

*Taraxacum pseudocalocephalum* v. Soest f. *stramineum* v. Soest — 18, 30.

*T. pseudodissimile* v. Soest — 18, 30.

*Thevenotia persica* DC. — 19.

*Tragopogon jezdzianus* Boiss. & Buhse — 19, 31.

This little known species seems to be widely



Fig. 3. *Oligochaeta minima*, x 3/4 (left). — *Schischkinia albispina*, x 3/4 (right).

spread on the hills around the big Iranian desert basins.

*T. montanus* Nikitin — 32.

*Varthemia persica* DC. — Pass between Ahmabad and Zamanabad, 1050 m, in crevices of rocks, W. & F. 18807. — 18 (not.).

*Zoegea purpurea* Fresen. — 36, 37.

#### Convolvulaceae

*Convolvulus eremophilus* Boiss. & Buhse — Ahmabad to Zamanabad, on sand, 1000 m, W. & F. 18821. — 20, 33B.

*C. erinaceus* Ledeb. in Eichw. — Ahmabad to Zamanabad, on sand, 1000 m, W. & F. 18818.

#### Crassulaceae

*Pseudosedum multicaule* (Boiss. & Buhse) Boriss. — 31.

#### Cruciferae

*Aethionema carneum* (Banks & Soland.) B. Fedtsch. — 19, 30, 32.

*Alyssum dasycarpum* Steph. ex Willd. — 18, 32, 33A, 35.

*A. lanceolatum* Baumg. — 19.

An endemic of the hills of NE. Iran, adjacent Turkmenistan and of Afghanistan.

*A. linifolium* Steph. ex Willd. — 18, 27, 30, 32, 33A, 36.

*A. marginatum* Steud. ex Boiss. — 19, 20, 21, 24, 30, 32.

*Arabidopsis pumila* (Steph.) N. Busch — 18.

*A. wallichii* (Hook. f. & Thoms.) N. Busch — 19, 31.

These seem to be the westernmost localities of a variable Westhimalayan-Afghanian species together with the known locality from



Fig. 4. *Zoegea purpurea*, x 3/5.



the Shahvar mountains near Shahrud (Rehlinger 5897).

*Brassica deflexa* Boiss. subsp. *leptocarpa* (Boiss.) Hedge — 20, 21, 24.

*Cardaria draba* (L.) Desv. — 18, 30 (not.).

*Chorispora tenella* (Pall.) DC. — 18, 30.

\**Cithareloma* cf. *lehmannii* Bunge — Between Ahmadabad and Zamanabad, 900–1100 m, on sand W. & F. 18816. — 27.

Until recently the genus *Cithareloma* has been represented by two species only: *C. lehmannii* Bunge and *C. vernum* Bunge, both occurring in sandy deserts in Central Asia. A third species has been discovered by me in a sandy desert near Kandahar in SE. Afghanistan in 1967: *C. registanicum* (Rehlinger 1968, p. 249). All three species seem to be clearly distinguished by characters of fruit size and shape as well as pedicel and fruit proportions. The scanty specimens found in the Touran Protected Area represent in any case the first record for the genus *Cithareloma* in Iran, and at the same time a considerable extension of the generic distribution range towards the Southwest. More ample material will be needed for a certain determination, as the Iranian plants seem to deviate from typical *C. lehmannii* in shorter pedicels.

*Clypeola aspera* (Grauer) Turritill — 19, 30, 36.

*C. dichotoma* Boiss. — 19, 20, 21, 24, 26, 35B.

*Crambe kotschyana* Boiss. — 30.

*Descurainia sophia* (L.) Webb & Berth. — 18.

*Erysimum crassicaule* (Boiss.) Boiss. — 20, 32.

*E. crassicaule* is occurring rather frequently in the surroundings of the great desert basins of Iran and southern Afghanistan. According to Polatschek (personal communication) *E. stocksianum* (Boiss.) Boiss. cannot be kept separate from *E. crassicaule* on the base of recently collected specimens.

*Euclidium syriacum* (L.) R. Br. — 18.

*Fortuynia garcinii* (Burm.) Shuttlew. Syn.:

*E. bungei* Boiss., Fl. Or. 1: 402 (1867) syn. nov. — 23 km N. of Torud, 1100 m, W. & F. 18705.

After having studied *Fortuynia* recently at several localities in nature, I came to the

conclusion that the two species cannot be kept separate. The above mentioned locality north of Torud on the northern border of the Kavir seems to be far the northernmost locality of this genus (and species), followed by Ozbagu and Tabas. *Fortuynia* is rather widely spread in the southern section of the Flora Iranica area and it covers large areas as a dominating plant near Tabas and Anarak.

*Goldbachia laevigata* (M. B.) DC. — 21, 24, 26, 27, 32.

*Isatis buschiana* Schischk. — 32.

*I. emarginata* Kar. & Kir. — 26, 27.

*I. emarginata*, in contrast to the extremely frequent *I. minima*, is a rare plant. It has been described from Central Asia and so far it has been reported within the Flora Iranica area from three localities in Iran and one locality in Turkmenistan and Pakistan only.

*I. minima* Bunge — 21, 22, 23, 24, 25, 26, 32, 33A, 37.

\**I. trachycarpa* Trautv. — 22, 24, 26.

This is a new record for Iran. So far *I. trachycarpa* has been reported only from Kizyl Kum, Kara Kum and Turkmenistan.

*Lepidium vesicarium* L. — 35A, 37.

*Leptaleum filifolium* (Willd.) DC. — 22, 24.

*Malcolmia africana* (L.) R. Br. var. *africana* — 18, 31 (not.), 32, 37.

*M. africana* (L.) R. Br. var. *trichocarpa* (Boiss. & Buhse) Boiss. — 28, 31, 37.

*M. grandiflora* (Bunge) O. Kuntze — 24, 26, 27.

*M. grandiflora* is another Central Asiatic species known so far only from very few scattered localities in North, South and East Iran, Turkmenistan and Afghanistan.

*M. strigosa* Boiss. — 32.

*Matthiola chenopodiifolia* Fisch. & C. A. Mey. — 21, 22, 23, 24, 26, 35B.

*Moriera spinosa* Boiss. — 19.

*Octoceras lehmannianum* Bunge — 22, 23, 24, 26, 27, 32, 33A.

*Octoceras* is a monotypic Central Asiatic psammophytic genus, so far reported only from few localities in Iran; it is more frequent in Afghanistan and Pakistan.



Fig. 5. *Malcolmia grandiflora*, x 3/5.

*Sameraria armena* (L.) Desv. — 32.

*S. elegans* Boiss. — 21, 27.

*Sisymbrium septulatum* DC. — 21, 32.

*Spirorrhynchus sabulosus* Kar. & Kir. — 26.

*Spirorrhynchus* is another monotypic Central Asiatic psammophytic genus. It has been reported so far only from three localities in Iran and three localities in Pakistan but I have not seen any specimens from Afghanistan.

*Sterigmostemon acanthocarpum* Fisch. & C. A. Mey. — 20, 21, 22.

*Tauscheria lasiocarpa* Fisch. ex DC. var. *lasiocarpa* — 29.

*T. lasiocarpa* var. *gymnocarpa* (Fisch. ex DC.) Boiss. — 29, 31.

*Tetracme recurvata* Bunge — 26, 27.

*T. recurvata* has been described from Kizyl Kum and reported so far from Iran from two localities only. It is a true psammophyte.

*Torularia aculeolata* (Boiss.) O. E. Schulz — 19, 31.

*T. tonulosa* (Desf.) O. E. Schulz — 18, 21, 22, 26, 27.

### Cuscutaceae

*Cuscuta brevistyla* Braun ex A. Rich. — 22, 26.

### Dipsacaceae

*Scabiosa olivieri* Coult. — 21, 22, 24, 28, 32, 33A, 35A, 35B, 37.

*S. rotata* M. B. — 24, 29, 36.

### Euphorbiaceae

*Chrozophora gracilis* Fisch. & C. A. Mey. — 27.

This is one of the true Turanian psammophytes only recently discovered in Iran (Rehinger & Wendelbo, 1976).

*C. hierosolymitana* Spreng. — Ahmadabad to Zamanabad, on sand, 900–1100 m, W. & F. 18791.

*Euphorbia buhsei* Boiss. — 18, 21.

*E. bungei* Boiss. — 19, 30.

*E. cheirolepis* Fisch. & C. A. Mey. ex Ledeb. — Between Ahmadabad and Zamanabad, on sand, 900–1100 m, W. & F. 18790.



Fig. 6. *Euphorbia turczaninowii*, nat. size.

*E. densa* Schrenk — 22, 26, 27, 32, 36.

*E. gedrosiaca* Rech. f., Aell. & Esf. — 21, 24.

*E. microsciadia* Boiss. — 18 (not.), 30, 31.

*E. turcomanica* Boiss. — 25 km N. of Torud, 1100 m, W. & F. 18709.

*E. turczaninowii* Kar. & Kir. — 26, 27, 33B.

### Fumariaceae

*Fumaria parviflora* Lam. — 32.

*F. vaillantii* Lois. — 18, 30.

### Geraniaceae

*Biebersteinia multifida* DC. — 18 (not.), 19, 30.

*Erodium glaucophyllum* (L.) Ait. — 24.

*E. pulverulentum* (Cav.) Willd. subsp. *bovei* (Del.) Schönb.-Temesy — 22, 23, 26, 37.

*Geranium rotundifolium* L. — 19, 31.

## Labiatae

*Chamaesphacos ilicifolius* Schrenk — Ahmabad to Zamanabad, 1000 m, on sand, W. & F. 18815. — 26, 27, 33B.

This typically Turanian small annual psammophytic *Labiatae* has only recently been discovered in Iran (Rechinger & Wendelbo, 1976).

*Eremostachys hyoseyamoides* Boiss. & Buhse — 32.

This species has been known so far only from two localities on the northern border of the Kavir.

*E. molucelloides* Bunge — 20, 28, 30, 37.

*Hymenocrater elegans* Bunge — 19, 28, 31.

*Lallemantia royleana* (Wall.) Benth. — 22, 24, 28, 35.

*Lamium amplexicaule* L. — 18.

*Marrubium alternidens* Rech. f. — 18.

*Nepeta bracteata* Benth. — 30, 37.

*N. ispanhanica* Boiss. — 24, 26, 36, 37.

*N. micrantha* Bunge in Ledeb. — 26, 36.

*N. persica* Boiss. — 31, 37.

*N. pungens* Benth. — 36.

*N. sewerzovii* Regel — 30.

*Perowskia abrotanoides* Karel. — Near Delbar, 1100 m, stony dry river bed, W. & F. 18930. — 18 (not.).

*Salvia leriifolia* Benth. — 35A, 36.

This is probably one of the westernmost localities of this typically Afghanian and East Iranian species.

*S. macrosiphon* Boiss. — 36.

*Thuspeinantha brahuica* (Boiss.) Briq. — 32.

*Th. persica* (Boiss.) Briq. — 21, 23, 24, 26, 32.

*Ziziphora tenuior* L. — 18, 19, 20, 21, 28, 30, 37.

## Leguminosae

*Alhagi camelorum* L. — N. of Dochah, 1030 m, W. & F. 18747. — 18 (not.).

*Astragalus (Ammodendron) podolobus* Boiss. & Hohen. — 28, 30, 37.

*A. (Ammodendron) squarrosus* Bunge — 23, 27.

*A. (Chronopus) aciniferus* Boiss. — 22, 24.

*A. (Erioceras) ulothrix* G. Beck — 19.

*A. (Falcinellus) bakaliensis* Bunge — 18, 22, 23, 24, 26, 30, 37.

*A. (Harpilobus) campylorrhynchus* Fisch. & C. A. Mey. — 24, 27, 31, 32.

*A. (Harpilobus) corrugatus* Bertol. in DC. — 22, 24, 35, 37.

*A. (Harpilobus) hauarensis* Boiss. — 23, 24, 26, 33B.

*A. (Harpilobus) hauarensis* Boiss. var. *glaber* Townsend — 23.

*A. (Malacothrix) comosus* Bunge — 30, 35A.

*A. (Mirae) mirus* Sirj. & Rech. f. Syn.: *Dorycnium calycinum* Stocks — 26, 36. See illustration in Rechinger (1957, Fig. 26 & 27).

This odd and little known species has been reported before only from West Afghanistan and as a species of doubtful generic alliance under the name of *Dorycnium calycinum* Stocks from Baluchestan. The older specific epithet *calycinum* cannot be transferred to *Astragalus* because of the homonym *Astragalus calycinus* M. B.

*A. (Myobroma) angustidens* Freyn & Sint. — 28.

*A. (Myobroma) flexus* Fisch. — 27.

*A. (Myobroma) macropelmatus* Bunge — 30, 32.

*A. (Oxyglottis) ammophilus* Kar. & Kir. — 20, 21, 22, 23, 24, 26, 27, 32, 35B.

*A. (Oxyglottis) oxyglottis* Stev. — 22, 24, 26, 35B.

*A. (Oxyglottis) tribuloides* Del. — 26, 35B.

*A. (Xiphidium) argyroides* G. Beck ex Stapf — 30.

*Goebelia pachycarpa* C. A. Mey. — Ahmabad to Zamanabad, 1000 m, on sand, W. & F. 18822. — 29, 30.

This species is very frequent in many parts of Khorasan where it is growing on various kinds of loamy and sandy soils. It sometimes invades neglected cultivations and it is not eaten by cattle. It has its western boundary in Khorasan.

*Hedysarum micropterum* Bunge ex Boiss. — 19, 30.

*Medicago lupulina* L. — 30.

*Onobrychis aucheri* Boiss. subsp. *teheranica* Bornm. — 21, 24, 35B, 36.

*O. tavernierifolia* Stocks ex Boiss. — 30.





Fig. 7. *Goebelia pachycarpa*, x 3/5.

*Smirnowia turkestanica* Bunge Syn.: *S. iranica* Sabeti (1977). — Ahmadabad to Zamanabad, on sand, 1000 m, W. & F. 18813. — 25, 27, 33B.

This is an impressive shrub growing 1–1.5 m high with deep pink flowers, inflated fruits and undivided leaves. It is growing exclusively on deep sand and belongs to the true Turanian element. — I have compared carefully my flowering and Wendelbo's fruiting specimens from the Touran Area with specimens in the Vienna herbarium from the classical area in USSR. I came to the conclusion that *S. turkestanica* is variable in growth, size, outline of leaflets, and in size and shape of fruits but there are no tangible differences between Iranian specimens and those from Russian Central Asia. The majority of Russian specimens have single leaflets as the Iranian ones. Sabeti's drawing of *S. iranica* fits perfectly our material from the Touran Area. The hilum of ripe seeds of Wendelbo's fruiting specimens are round, exactly as in Russian material, and not elliptic as stated in the description of *S. iranica*.

*Trigonella noëana* Boiss. — 18.

#### Malvaceae

*Malva neglecta* Wallr. — 18, 30.

#### Orobanchaceae

*Cistanche fissa* (C. A. Mey.) Beck — 25.

*C. laxiflora* Aitch. & Hemsl. — 22.

A rare species reported so far only from two localities in West Afghanistan and from one locality in West Iran (Lorestan).

*Orobanche mutelii* F. Schulz var. *spinosa* (Rouy) G. Beck f. *spissa* — 27.

#### Papaveraceae

*Glaucium elegans* Fisch. & C. A. Mey. — 20, 24, 26, 35B, 36, 37.

*Hypocoum pendulum* L. — 18, 21, 24, 28, 30, 37.

*Papaver decaisnei* Hochst. & Steud. ex Boiss. — 19, 28, 30, 37.

*P. pavoninum* Fisch. & C. A. Mey. — 30.

*Roemeria dodecandra* (Forssk.) Stapf — 18.

*R. hybrida* (L.) DC. — 18, 20, 22, 24, 26, 28, 30, 32, 33A, 35, 37.

#### Plantaginaceae

*Plantago evacina* Boiss. — 22, 35B.

A rare species reported so far only from three localities each from Iran and from Afghanistan.

*P. lanceolata* L. — 18 (not.).

#### Plumbaginaceae

*Acantholimon acmostegium* Boiss. & Buhse — 17, 19, 28.

*Limonium iranicum* (Bornm.) Lincz. — S. of Bijarjmand, 1100 m, W. & F. 18754; Delbar to Ahmadabad, by Kal-e Shur river, 700 m, W. & F. 18780.

#### Podophyllaceae

*Bongardia chrysogonum* (L.) Spach — 19, 30.

#### Polygonaceae

*Atraphaxis spinosa* L. — 19.

*Calligonum* cf. *comosum* L'Hér. — Ahmadabad to Zamanabad, 900–1100 m, sand, W. & F. 18793.

Up to 2.5 m high, sometimes with tree-like stem. The fruits are larger than mentioned in Flora Iranica.

*C. leucocladum* (Schrenk) Bunge var. *serratum* Litw. ex Pavl. — Ahmadabad to Zamanabad, 900–1100 m, sand, W. & F. 18792.

Shrub 60 cm high, zig-zag-branching, branches white. Widely spread over Central Asia. So far reported from one locality in East and one locality in Central Iran only.

*C.* cf. *turkestanicum* (Korov.) Pavl. — 50 km N. of Torud, sand dunes, W. & F. 18722.

Shrub up to 2.5 m high with a tree-like stem of 12 cm diam. The species has been described from Turkmenistan and was reported from Iran without exact locality.

*Polygonum afghanicum* Meisn. in DC. — 19, 37.

- P. polycnemoides* Jaub. & Spach — 36.  
*Pteropyrum aucheri* Jaub. & Spach — S. of Bi-jarjumand, 1030 m, W. & F. 18764.  
*Rheum cf. ribes* L. — 35A (not.).

**Primulaceae**

- Androsace maxima* L. — 18.

**Ranunculaceae**

- Anemone biflora* DC. — 19, 31.  
*Ceratocephalus falcatus* Pers. — 19, 26, 30.  
*Clematis songarica* Bunge — 30.  
*Consolida rugulosa* (Boiss.) Schrödinger — 18, 21, 22, 23, 26, 27, 32, 33A, 35B, 37.  
*Nigella integrifolia* Regel — 31.  
*Thalictrum isopyroides* C. A. Mey. — 19.

**Rhamnaceae**

- Rhamnus pallasii* Fisch. & C. A. Mey. — 19.

**Rosaceae**

- Amygdalus lycioides* Spach — N. of Delbar, 1100 m, W. & F. 18768. — 19, 28, 35A.  
*Hulthemia persica* (Michx.) Bornm. — 18.  
*Rosa* sp. — 31.

**Rubiaceae**

- Callipeltis cucullaris* (L.) Rothm. — 19, 24, 28, 29, 30, 36, 37.  
*Galium ceratopodum* Boiss. — 30.  
*G. setaceum* Lam. subsp. *decaisnei* (Boiss.) Ehrendf. — 36.  
*G. spurium* L. — 18.  
*Leprunis trichodes* (J. Gay in DC.) Schischk. — 24, 36.  
*Rubia florida* Boiss. — 19.

**Rutaceae**

- Haplophyllum furfuraceum* Bunge ex Boiss. — 35A.

This species is evidently a narrow endemic of the hills bordering the North of the Kavir basin.

- H. pedicellatum* Bunge ex Boiss. — 32.

- H. perforatum* (M. B.) Kar. & Kir. — 19.  
*H. robustum* Bunge — 27.

**Scrophulariaceae**

- Scrophularia leucoclada* Bunge — 24, 27.  
*S. striata* Boiss. — 18 (not.), 19, 28, 30, 31.  
*Veronica anagallis-aquatica* L. — 30.  
*V. anagalloides* Guss. — 30.  
*V. arguteserrata* Schmalh. — 30.  
*V. campylopoda* Boiss. — 18, 19, 24, 27, 28, 30, 32, 35.  
*V. macropoda* Boiss. — 19, 20, 28, 36, 37.

**Solanaceae**

- Hyoxyamus leucanthera* Bornm. & Gauba — 18, 32.  
*H. pusillus* L. — 21, 22, 24, 26, 27, 30 (not.), 32, 37.  
*Lycium depressum* Stocks — 35A, 37.  
*L. ruthenicum* Murr. — 26.

**Tamaricaceae**

- Reaumuria fruticosa* Bunge ex Boiss. — N. of bridge of Kal-e Shur between Ahmadabad and Delbar, margin of wide salt flat, flooded in spring, W. & F. 18925.

Frequent, broad shrub to 1 m high, greyish. Very characteristic, very rarely collected; known so far from two localities in Khorasan and from a few places in Turkmenistan.

- Tamarix brachystachys* Bunge — 26, 34.  
*T. hispida* Willd. var. *karelinii* (Bunge) Baum — 27, 34.

**Thymelaeaceae**

- Dendrostellera lessertii* (Wikstr.) v. Tiegh. — 19, 20, 27.

**Violaceae**

- Viola occulta* Lehm. — 18.

**Umbelliferae**

- Bunium cylindricum* (Boiss. & Hohen.) Drude



Fig. 8. *Schumannia karelinii*, x 1/3.

- 31.

*B. persicum* (Boiss.) Fedtsch. - 30.*B. rectangulare* (Hausskn.) Wolff - 18, 19, 30.*Cachrys* aff. *serpentinicae* Rech. f. - 21.

A small plant with few umbel rays, similar to *C. serpentinica* Rech. f. in leaf division. Fruits unripe, determination therefore uncertain.

*Ducrosia anethifolia* DC. - 37.*Eryngium* cf. *nigromontanum* Boiss. & Buhse - 18 (not.).

Young, determination uncertain.

*Eryngium* cf. *bungei* Boiss. - 31.

Young, determination uncertain.

*Fenula foetida* (Bunge) Regel - 29.*Frangos latiloba* Korov. - 31.*P.* cf. *pabularia* Lindl. - 19.*Psammogeton canescens* (DC.) Vatke - 50 km N. of Torud, sand dunes, 1000 m, W. & F. 18724.*Ps. brevisetus* Boiss. - 24, 37.*Scandix* sp. - 18, 19, 30.*Schumannia karelinii* (Bunge) Korov. - 22, 27.*Zosima absinthifolia* (Vent.) Link - 30.**Valerianaceae***Valeriana ficariifolia* Boiss. - 31.*Valerianella dufresnia* Bunge ex Boiss. - 22, 24, 26, 27, 33A, 36.*V. oxyrrhyncha* Fisch. & C. A. Mey. - 24, 28.*V. szovitsiana* Fisch. & C. A. Mey. - 19, 22, 24, 30, 36.*V. triplaris* Boiss. & Buhse - 20, 22, 24, 36, 37.**Zygophyllaceae***Peganum harmala* L. - 23 (not.), 32 (not.).*Zygophyllum eurypterum* Boiss. & Buhse - 21 (not.), 22, 23 (not.), 24 (not.).

Locally dominant e. g., between Delbar and Ahmadabad. Hadidi (1972, pp. 22-25) has on the base of herbarium material presented a treatment of this species and its relatives which should be applied to populations in nature. Also the ecological requirements and the sociological links of this species-group ought to be studied.

**ANGIOSPERMAE - MONOCOTYLEDONES****Alliaceae***Allium borszczowii* Regel - 26, 27.*A. caspium* (Pall.) M. B. - 27.*A. scotostemon* Wendelbo - 20, 21.*A. umbilicatum* Boiss. - 18.**Amaryllidaceae***Ixiolirion tataricum* (Pall.) Roemer & Schult. - 18.**Cyperaceae***Carex diluta* M. B. - 30.*C. divisa* Huds. - 30.*C. physodes* M. B. - 20.*C. stenophylla* Wahlenbg. - 19.**Gramineae***Astenatherum forsskahlii* (Vahl) Nevski - Ca 50 km N. of Torud, sand dunes, W. & F. 18716. *Boissiera squarrosa* (Banks & Soland.) Nevski - 28, 30, 32.*Bromus danthoniae* Trin. - 36.*B. tectorum* L. - 18, 21, 30, 36.*Erenopoa persica* (Trin.) Roshev. var. *songarica* (Schrenk) Bor - 30.*Eremopyrum bonaepartis* (Spr.) Nevski - 22, 24, 27, 32.*E. orientale* (L.) Jaub. & Spach - 35B, 36.*Henrardia persica* (Boiss.) C. E. Hubb. var. *glaberrima* (Hausskn. ex Bornm.) C. E. Hubb. - 36.*Hordeum glaucum* Steud. - 18, 21, 30.*Nardurus subulatus* (Banks & Soland.) Bor - 19.*Pennisetum orientale* L. C. Rich. - 37.*Phalaris minor* Retz. - 37.*Phragmites australis* (Cav.) Trin. ex Steud. - Delbar to Ahmadabad by Kal-e Shur river, 700 m, W. & F. 18781.*Piptatherum vicarium* (Grig.) Roshev. - 19.

Westernmost record. Known so far from NE. Khorasan, Afghanistan, Pakistan and Soviet Central Asia.





Fig. 9. *Astenatherum forsskahlii*, x 1/2.

### Iridaceae

*Iris kopetdagensis* (Vved.) Mathew & Wdb. — 18, 31.

*I. songarica* Schrenk — 32 (not.).

### Juncaceae

*Juncus gerardi* Lois. — 30.

### Liliaceae

*Colchicum robustum* (Bunge) Stefanoff — 19, 24, 27.

*Eremurus nderiensis* (M. B.) Regel — 31.

*Fritillaria* sp. — 19.

*F. gibbosa* Boiss. — 31, 32.

*Gagea gageoides* (Zucc.) Vved. — 19.

*G. reticulata* (Pall.) Roem. & Schult. — 18, 19, 24, 30.

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*Poa bulbosa* L. — 18, 30 (not.).

*Stipagrostis pennata* (Trin.) de Winter — 50 km N. of Torud, sand dunes, W. & F. 18720. — 25, 33B.

*Taeniatherum crinitum* (Schreb.) Nevski — 37.