ABSTRACT

The pteridophyte account of Flora Iranica (ed. K.H. Rechinger) is still not published. The Caspian forests provide suitable habitats for the growth of many ferns and fern allies in Iran. In semi-arid and mountainous areas of Iran, mesophilous plants are restricted to rock crevices, waterfall proximity, stream banks and lake shores. Based on field collections and study of herbarium specimens in Iranian herbaria, an updated and annotated inventory of the Iranian ferns and fern allies is provided with an identification key, original line-drawings and/or photographs of most species, and distribution maps. Altogether 52 species are known in 26 genera and 15 families, viz. Ophioglossaceae (4), Psilotaceae (1), Equisetaceae (4), Osmundaceae (1), Marsileaceae (1), Salviniaceae (2), Dennstaedtiaceae (1), Pteridaceae (11), Aspleniaceae (8), Thelypteridaceae (2), Woodsiaceae (4), Blechnaceae (1), Onocleaceae (1), Dryopteridaceae (9) and Polypodiaceae (2). The intriguing discovery of *Psilotum nudum* is discussed with regard to its habitat and shoot anatomy. *Cystopteris fragilis* subsp. *dickieana,* as a new record, and the occurrence of *Polystichum lonchitis*, *Pteris vittata* and *Ophioglossum polyphyllum* in Iran are confirmed. *Azolla filiculoides* is a recently introduced invasive plant widely spread in the Anzali wetland and other aquatic habitats in N Iran. Several doubtful records are excluded from the pteridophyte flora of Iran.

INTRODUCTION

Iran is a large country with 1,648,195 km^2 surface area and a great bioclimatic diversity, ranging from humid forests along the Caspian Sea to extremely arid temperate to hot deserts in the central and southern parts (Fig. 1). Suitable pteridophyte habitats in Iran are restricted to the narrow forest zone along the S Caspian Sea and scattered microhabitats in many mountain areas of Iran, particularly in the Zagros and Alborz Mts (Map 1).

Early information on Iranian pteridophytes was summarised by BOISSIER (1884), who accounted for the presence of 13 species. PARSA (1950) listed 30 species. An updated edition of that Flora (PARSA & MALEKI, 1978) added many species, mostly based on the Flora of USSR (BOBROV *et al.* 1934), without any

voucher documentation. WENDELBO *et al*. (1974) published a small identification manual in Persian, reporting 34 species from Iran. PARTOVI-TABAR (1975) presented a list with localities for 26 species from Iran, mainly in the Herbarium of Iranian Research Institute of Plant Protection (IRAN). WENDELBO (1976) provided an annotated checklist for ferns of Iran, including 37 species. ASSADI (1987) and AKHANI (1998, 2005) included pteridophytes in their botanical accounts of Arasbaran Protected Area and Golestan National Park, two major protected areas located at the westernmost and easternmost forests of northern Iran. GHAHREMANINEJAD (1999) published a manual for identification of wild plants of Gilan in which several fern species were reported, but no voucher specimens cited. REZAEI & KHANGHOLI (2003) reported the occurrence of *Psilotum nudum* in the Caspian forests. Some additional species were added by FRASER-JENKINS (1981), DENK (1998), NAQINEZHAD & KAVOOSI (2004), MAZOOJI & FALLAHIAN (2005) and MAZOOJI *et al.* (2006). Altogether, ca. 80 pteridophyte species have been reported from Iran.

In this publication, the inventory of Iranian ferns and fern allies is presented based on extensive collections and field studies in almost all parts of the country and using available material in the herbaria of Iranian Research Institute of Plant Protection (IRAN), Central Herbarium of University of Tehran (TUH), Ferdowsi University of Mashhad (FUMH), Herbarium of University of Shiraz (SHIRAZ) and the second authors' collection in herbarium of Botanical Biodiversity Research Laboratory (BBRL or Hb. Akhani, abbreviated as Hb. Akh.). The authorities of the herbarium of Research Institute of Forests and Rangelands (TARI) allowed us only to see and check 5 species and 11 specimens. A few specimens have also been studied in Islamic Azad University-Oloum & Tahghighat Herbarium (IAUH). In this inventory, an updated and annotated checklist with indication of voucher material and an identification key to known species of Iranian pteridophytes are given and original line drawing illustrations by R. KHOSHRAVESH and/or original photographs from living plants of most species are presented. The distribution maps of all known taxa were generated using DMAP software (MORTON 2001) (Maps 1-54). This book aims to serve as an aid for identification of Iranian pteridophytes prior to publication of the Flora Iranica treatment, and offers supplementary locality

data for specimens not available for study by the authors of the Flora Iranica accounts. The pteridophyte volume of Flora Iranica has been in preparation for many years by pteridologists such as K.U. Kramer †, C.R. Fraser-Jenkins, T. Reichstein †, S.P. Khullar, R. Viane and W. Greuter. The volume is now almost ready for the press, and we have been able to use the classification and nomenclature adopted therein for the purpose of the present publication.

RESULTS

An identification key to species is provided, followed by an enumeration of accepted species and their studied voucher specimens. Traditional pteridophytes, plants with regular alternation of gametophytic and sporophytic phase, are traditionally known as ferns and fern allies in plant taxonomy. KRAMER & GREEN (1990) divided pteridophytes into four groups: Psilotatae, Lycopodiatae, Equisetatae and Filicatae. The recent classification based on combined molecular and morphological data (SMITH *et al.* 2006), rearranged high- level classification of pteridophytes and applied the general term "ferns" to four recognized classes, Psilotopsida, Equisetopsida, Marattiopsida and Polypodiopsida. In the present study, we follow the familial nomenclature of SMITH *et al.* (2006) and the generic and species nomenclature largely of Med-Checklist (GREUTER *et al.* 1984) and Flora Iranica (unpublished).

1. Key to known genera and species of Iranian Pteridophytes

The names of doubtfully present species are in brackets.

1. + Stem green, articulate; leaves small, whorled and fused into a sheath above each node; sporangia aggregated in a cone at the end of the fertile stem.. *Equisetum* (2)
   - Plants not as above ……...…….. 8
2. + Fertile and sterile stems different; fertile stems brown, unbranched, vegetative stems with whorled branches (if plant lacks strobili, try next lead)…….…. 3
   - Fertile and sterile stems green, usually branched ……..…... 4
3. + Fertile stem up to 1 cm thick; sheaths with 20-35 teeth; strobili 0.5-2 × 4-7 cm

…...…….…… 9. *E. telmateia*

- Fertile stem up to 0.5 cm diam., sheaths with 8-10 teeth, strobili 0.5 × 2-3 cm …. …….……..... 6. *E. arvense*

4. + Sheaths with 20-35 teeth, main stem ca. 1 cm diam. ……..... 9. *E. telmateia*

- Sheaths with <20 teeth, main stem up to 0.5 cm in diameter ……... 5

5. + Main stem irregularly branched from base; strobili acute … 8. *E. ramosissimum*

- Main stem regularly branched, branching verticillate; strobili acute or obtuse ....…….…….. 6

6. + Teeth 10-18; strobili acute …….…….…..... 8. *E. ramosissimum*

- Teeth <10; strobili obtuse ……..... 7

7. + Branches hexagonal in cross section; strobili at the end of main stem, stem dark green …….……..……..... 7. *E. palustre*

- Branches quadrangular in cross section; main stem without strobili; plant pale green ……..…….. 6. *E. arvense*

8. + Plants aquatic; fronds or whole plant floating ……..... 9

- Plants terrestrial; epilithic or epiphytic …..…….……..... 12

9. + Fronds compound, quadrifoliate, with a long petiole ……..... *Marsilea* (10)

- Leaves simple, sessile …….....……..... 11

10. + Fronds hairy; sporocarps ± sessile, obovoid ..... [*M. strigosa*]

- Fronds glabrous; sporocarps pedicellate, ellipsoidal. ..…..... 11. *M. quadrifolia*

11. + Leaves opposite, ovate, papillose above, scabrous, 6-8 × 8-18 mm…….……... …….…… 13. *Salvinia* (*S. natans*)

- Leaves imbricate, glabrous above, 1-2 × 2-4 mm … 12. *Azolla* (*A. filiculoides*)

12. + Stem green, dichotomously branched, with scale-like leaves and 3-locular sporangia; plant epiphytic ..……..... 5. *Psilotum* (*P. nudum*)

- Plants not as above; habitat terrestrial or epilithic, rarely epiphytic ..…..... 13

13. + Fronds with a laminar, green, sterile and a non-laminar, spicate or racemose fertile portion ……..... 14

- Fronds not as above, sori borne on the abaxial surface or along the margin, sometimes on fronds that differ conspicuously from the sterile fronds in shape and color ….....…… 18

14. + Fronds bipinnate, fertile portion terminal. ....…….. 10. *Osmunda* (*O. regalis*)

- Fronds simple or once pinnate, fertile portion arising at the base of a sterile one 15

15. + Fronds simple, venation reticulate, fertile portion undivided; sori sessile……. ……..... *Ophioglossum* (16)

- Fronds pinnate, venation dichotomous, fertile portion pinnately divided, with sori on stipitate lobes …….…… 1. *Botrychium* (*B. lunaria*)

16. + Fronds usually solitary, sterile portion broadly ovate-elliptic, >2 cm wide, the fertile portion arising from its base; plant 10-30 cm tall (in closed forests, on soil or epiphytic) .....……..…..…..... 4. *O. vulgatum*

- Fronds usually 2 to several, < 2 cm wide; plant 3-10 cm tall .....…… 17

17. + Sterile frond portion linear-lanceolate; fertile portion arising from its middle (moist soils in openings of the hyrcanian forests) ..... 2. *O. lusitanicum*

- Sterile frond portion oblong-lanceolate; fertile portion arising from near its base (islands of the Persian Gulf) .....……..... 3. *O. polyphyllum*

18. + Fronds ± dimorphic, fertile segments either non-laminar or, if laminar, narrower than the sterile ones and with linear sori continuous along the margin …..…. 19

- Fronds monomorphic, sori borne on the abaxial surface or along the margin …..... ...…..…….....……..... 23

19. + Fronds 1-pinnate (the lowermost pinnae sometimes forked) ……..... 20

- Fronds 2-3-pinnat …….……...…….……. 22

20. + Pinnae of sterile fronds sessile, linear, margin entire or revolute; sterile pinnae non-laminar; sori contiguous to the costae ..... 41. *Blechnum* (*B. spicant*)

- Pinnae petiolulate, margin serrate; sori borne under the reflexed margin of laminar pinnae …….….....……..…….. *Pteris* (21)

21. Pinnae in 3–6(-10) pairs, those of lowest pair forked at least once 23. *P. cretica*

- Pinnae in 20-30 or more pairs, those of lowest pair simple, not forked ..... …….…….. 25. *P. vittata*

22. + Fertile frond non-laminar, brown, 1-pinnate, segments linear, margin rolled back; sterile frond 2-pinnate, green, ultimate segments oblong, margin entire, apex rounded …….…… 42. *Matteuccia* (*M. struthiopteris*)

- Fronds green, 2-3-pinnate; fertile segments laminar but narrower than the sterile ones, sori borne under the reflexed margin of fertile frond; sterile segments

linear, margin dentate-serrate, apex acute. ..... 24. *Pteris* (*P. dentata*)

23. + Annual plant, slender, without rhizome, with persistent prothallus; pinnae dimorphic, basal pinnae flabellate, upper pinnae elliptic-rhomboid …… …….. 16. *Anogramma* (*A. leptophylla*)

- Perennial plants with persistent rhizomes …….…….. 24

24. + Plant up to 2 m tall, rhizome branched, long creeping; petioles almost as long as the lamina, erect, indurated; lamina villous below 3-pinnate, margin of pinnules lobed, reflexed ..... 14. *Pteridium* (*P. aquilinum*)

- Combination of characters not as above ..……..…..……...….. 25

25. + Sori covered with the revolute margin of pinnae forming a pseudoindusium; petiole and rachis black (except in *Onychium*), wiry .....…..... 26

- Sori borne on abaxial face of the lamina; indusia present or not, petiole and rachis of varying colour and consistence 30

26. + Fronds thinly membranous, irregularly 2-3 pinnate, segments cuneate-flabellate, with a long capillary stalk, with apical sori (wet, shaded rocky places near water, widespread) …….....…… 15. *Adiantum* (*A. capillus-veneris*)

- Fronds firm, regularly 1-4-pinnate, segments linear to orbicular, sessile or shortly petiolulate, with marginal sori (dry, sunny rocky places, mainly in the south and north-east) 27

27. + Fertile segments or ultimate lobes narrow, oblong-lanceolate, apiculate, sori linear, ± continuous along the margin; fertile segments wider…… …….....….....…….. 22. *Onychium* (*O. divaricatum*)

- Fertile and sterile segments or ultimate lobes similar, oblong to orbicular, apically rounded .....……..……..... *Cheilanthes* (28)

28. + Basal pinnae with an enlarged, pinnatifid basal basiscopic lobe . 18. *C. coriacea*

- Basal basiscopic lobe of basal pinnae not enlarged .....……..…….. 29

29. + Margin of pseudoindusia with long, tortuous hairs hiding the lamina abaxially; sori confluent …….....…… 19. *C. persica*

- Margin of pseudoindusia with short hairs not hiding the lamina; sori not confluent …….…….....…… 17. *C. acrostica*

30. + Sori linear, indusia present ……..…….....…….. *Asplenium* (31)

- Sori orbicular or ovate (crescent-shaped in *Athyrium*), with or without indusia ….

..... 39

31. + Fronds simple, lamina oblong-lanceolate, cordate to sagittate at base, margin undulate ..... 30. *A. scolopendrium*
- Fronds pinnatifid, dichotomously divided, or 1-3-pinnate 32

32. + Fronds pinnatifid, ± coriaceous; lobes obtusely triangular, covered with dense scales on the abaxial face, rolled inwards when dry ..... 27. *A. ceterach*
- Fronds 1-3-pinnate or dichotomously divided, membranous, lacking scales abaxially and retaining its shape when dry 33

33. + Fronds 1-pinnate 34
- Fronds 2-3-pinnate or dichotomously divided 35

34. + Rachis reddish-black throughout; pinnae elliptical, cuneate at base, margin dentate ..... 32. *A. trichomanes*
- Rachis reddish-brown at base, green above; pinnae suborbicular, truncate at base, margin crenate ..... 33. *A. viride*

35. + Fronds dichotomously divided into linear segments ..... 31. *A. septentrionale*
- Fronds 2-3-pinnate; segments variously shaped but not linear 36

36. + Lamina lanceolate, 3-pinnate; pinnules palmatifid, segments 3-5, linear-cuneiform, apex retuse and bidentate ..... 34. [*A. fissum*]
- Lamina deltate, elliptical or ovate, 2-3-pinnate; pinnules not palmatifid, segments ovate or rhombic 37

37. + Fronds 10-50 cm long, deltoid, pinnae of 5-13 (or more) segments, base of petiole swollen ..... 26. *A. adiantum-nigrum*
- Fronds 4-10(-15) cm long, elliptic or ovate, pinnae of 3-5 segments, base of petiole not swollen 38

38. + Lamina eglandular; pinnules deeply dissected, margin denticulate ..... 29. *A. ruta-muraria*
- Lamina glandular-pubescent; pinnules shallowly dissected, margin crenate ..... 28. *A. lepidum* subsp. *haussknechtii*

39. + Fronds 1-pinnate or pinnatifid 40
- Fronds 2-3-pinnate 43

40. + Lamina pinnatifid, lobes oblong, margin entire to serrate; sori orbicular to broadly elliptical, 2-4 × 2-5mm, indusium absent ..... *Polypodium* (41)

- Lamina pinnate, lobe margins crenuate or aristate-dentate …..……..... 42

41. + Sori orbicular, dark brown; sporangial annulus with (10-)11-16(-19) ……. indurated cells (often in open, sunny, rocky habitats) …… 53. *P. vulgare*
- Sori elliptic, yellowish brown; sporangial annulus with (5-)6-11(-13) indurated cells (often epiphytic, in closed forests) .....……... 52. *P. interjectum*

42. + Lamina coriaceous, winter-green; pinnae asymmetric, oblong, margin aristate-dentate; indusium absent ..…….…… 50. *Polystichum* (*P. lonchitis*)
- Lamina membranous, pinnae symmetric, obtusely 3-9-lobed; indusium present ….…… 38. *Woodsia* (*W. alpina*)

43. + Fronds, at least abaxially, covered with a dense indumentum of hairs or scales; sporangia arranged along the veins, often submarginal; indusia absent…...…. 44
- Fronds green, usually glabrous (except in some *Polystichum*); sporangia indistinct laminal sori; indusium present or absent .....…….…… 45

44. + Fronds covered with felted white hairs on both sides.. 20. *Cosentinia* (*C. vellea*)
- Fronds glabrous above, densely scaly below ……. ……. 21. *Paragymnopteris* (*P. marantae*)

45. + Fronds 3-pinnate, pinnae opposite; pinnules pinnatifid with serrate margin; sori orbicular, indusium reniform ……..…… 45. *Dryopteris* (*D. dilatata*)
- Fronds 2-pinnate, if 3-pinnate then pinnae alternate and sori ovoid 46

46. + Pinnules asymmetrical, often coriaceous, margin aristate-dentate; indusium peltate ……..... *Polystichum* (47)
- Pinnules symmetrical, teeth not aristate, indusium when present, either reniform or laterally affixed .....….…..……..... 49

47. + Lowermost pinnae as long as or longer than the following ones; fronds oblong to narrowly triangular ……..…..... 51. *P. woronowii*
- Lowermost pinnules shorter than the following ones; frond elliptical to ovate 48

48. + Pinnules hairy above, pinnae symmetrical …….……. 49. *P. braunii*
- Pinnules glabrous above, pinnae asymmetrical ….……..... 48. *P. aculeatum*

49. + Fronds with scales and sometimes glandular hairs, but lacking eglandular hairs .....….…..…… 51
- Fronds with stiff, straight eglandular hairs, in addition to scales; indusium

reniform, often ephemeral .....…… *Thelypteris* (50)

50. + Fronds spaced along the rhizome, margin of mature pinnules revolute; sori submarginal ....…… …… 40. *T. palustris*

- Fronds tufted, margin of fertile pinnules indistinctly revolute; sori close to the midrib .....……..…… 39. *T. limbosperma*

51. + Fronds 2-3-pinnate, margin of pinnules dentate or incised; sori elongate, ± curved (crescent-shaped) …… 35. *Athyrium* (*A. filix-femina*)

- Fronds 2-pinnate, sori orbicular ……..……..... 52

52. + Plant slender; frond thin, translucid; indusia lateral, ovate-triangular …… …….……..…… *Cystopteris* (53)

- Plant robust; fronds firm, not translucid; indusia reniform ..... *Dryopteris* (55)

53. + Spores rugose …….....…… 37b. *C. fragilis* subsp. *dickieana*

- Spores echinulate …….. 54

54. + Pinnules < 0.5 cm wide, with teeth truncate or notched above the excurrent vein .....……... 36. *C. alpina*

- Pinnules > 0.5 cm wide, margin acutely dentate, with veins excurrent into the tip .....…..……. 37a. *C. fragilis* subsp. *fragilis*

55. + Pinnules oblong, margin serrulate; petiole less than 1/4 lamina in length; fronds winter-green …….....…….…… 56

- Pinnules ovate to elliptical, margin dentate; petiole longer than 1/4 of the lamina; fronds dying during winter or not …….…..…… 57

56. + Rachis and petiole covered with filiform black scales; young sori covered completely by the indusium ..……..... 43. *D. affinis*

- Rachis and petiole covered with broad pale brown scales; young sori only partially covered by the indusium ……..…….……...…… 46. *D. filix-mas*

57. + Frond dying during winter, slender, eglandular, pale green, petiole green; pinnae pinnatifid to pinnatisect; pinnules sessile, wide elliptic, margin dentate (high-altitude mountain forests) ..... 44. *D. caucasica*

- Frond winter-green, rigid, dark green, glandular on both sides; petiole pale; pinnules narrowly elliptic, often pinnatifid or incised (lowland and submonate forests) …….....……..... 47. *D. pallida*

2. Enumeration of species

Psilotopsida

Ophioglossaceae

1. *Botrychium lunaria* (L.) Sw. in J. Bot. (Schrader) 1800 (2): 110. 1801. (Fig. 2. Map 2).

Golestan: Golestan National Park, Chartongi and Besh Jakhdan area, 37°29' N, 55°52' E, 1750-1950 m, 16.6.1995, Akhani 11271 (Hb. Akh.); Mazandaran: Orim, ca. 50 m, 5.7.1959, Wendelbo 1056 (45053-IRAN).

2. *Ophioglossum lusitanicum* L., Sp. Pl.: 1063. 1753. (Fig. 3A. Map 3).

Gilan: Langeroud, Leyla-kuh, beside the mountain road of Jir-Sara to Emamzadeh-Seyyed Kazem, Sadegh-Ali-Sara village (Bijar Cheshmeh), 200-300 m, 18.11.2003, Naqinezhad 33472, 33473 (THU).

This species has recently been reported from Iran by NAQINEZHAD & KAVOOSI (2004).

3. *Ophioglossum polyphyllum* A. Braun in Seubert. Fl. Azor.: 17. 1844. (Fig. 3B. Map 4).

Hormozgan: Persian Gulf, Lavan Island, 5.1977, Termeh & Moussavi, 35290 (IRAN).

The presence of *Ophioglossum polyphyllum* in Iran was mentioned in the general distribution of the species in Flora of the Arabian Peninsula (MILLER 1996). Recently, ESKANDARI (2007) reported its occurrence in Iran based on the above cited specimen, in a conference abstract book and again in a short paper (ESKANDARI & SHIRZADIAN 2007). It was first collected by Bornmüller in 1892-1893 on the islands of Hormus [Hormoz] and Karrak [Khark], but this find, published under the erroneous designation "*Ophioglossum arabicum*" (BORNMÜLLER 1894), was generally ignored.

4. *Ophioglossum vulgatum* L. Sp. Pl.: 1062. 1753. (Figs 3C, 47A. Map 5).

Gilan: Road of Bandar-e Anzali to Asalem, 0-30 m, 31.3.1966, Mobayen 28429 (TUH); Talesh, Asalem, 30-50 m, 15.5.1971, Iranshahr, (45325-IRAN). Mazandaran: Ramsar, S of Hotel Ramsar, road to Limakesh, 36°53'56" N, 50°39'13" E, 81m, epiphyte on *Parrotia persica*, 23.5.2004, Akhani 17560 (Hb. Akh.); Tonekabon, Garmabisheh, 5.9.1985, Termeh & Matin (45340-IRAN); Nowshahr, 0-21 m, 29.4.1973, Maleki 26469 (TUH); Aghamashad, 750-800 m, 1.5.1965, Mobayen 28428 (TUH); 30 km SE of Pol-e Sefid, Sangdeh, in forest, 2000-2500 m, 11.7.1974, Renz & Iranshahr, (45326-IRAN); Khoshkehdaran, Sibon forest, 5.13.1985, Termeh & Matin (45341-IRAN).

Psilotaceae

5. *Psilotum nudum* (L.) P. Beauv., Prodr. Aethéogam.: 112. 1805. (Figs 46B-C, 47A-G. Map 6).

Mazandaran: Ramsar, S of Hotel Ramsar, road to Limakesh, 36°53'56" N, 50°39'13" E, 81 m. 23.5.2004, Akhani 17559 (Hb. Akh.).

The recent discovery of *Psilotum nudum* in Iran (REZAEI & KHANGHOLI 2003) is of high plant-geographical importance. The nearest other localities are in the Asir region of Saudi Arabia and S Yemen (MILLER 1996) and SW of Europe in Spain (GREUTER *et al.* 1984, GARZÓN & OLLERO 2002). The morphology and stem anatomy of this plant are identical with that found outside Iran (Figs 46B-C, 47A-G).

Psilotum nudum is an extremely rare plant and found on a few trees in a very fragile, interesting habitat. It grows as an epiphyte on *Parrotia persica*, an endemic Hyrcanian tree, in a lowland forest along a river running to the tourist city of Ramsar, just behind hotel Ramsar (Fig. 46C).

As large parts of the area are private property, any expansion of the nearby road and urban and suburban area (Fig. 46C) can easily destroy the habitat and cause the extinction of *Psilotum nudum* in Iran. Therefore, we consider the threat category of this species as critically endangered, according to IUCN threat categories, and call for urgent conservation measures, perhaps by considering the area as a National Natural Monument.

Equisetopsida

Equisetaceae

6. *Equisetum arvense* L., Sp. Pl.: 1061. 1753. (Figs 4, 48A, B. Map 7).

Azarbaijan: Maragheh, Kardedeh, 1450 m, Sharif & Partovi 6487 (IRAN). Gilan: Asalem, 1200 m, 15.7.1968, Mirkamali (45750-IRAN); Deylaman, Laroukhani to Launak, 600 m, 9.7.1972, Termeh & Daryadel, *s.n.* (45749-IRAN); Bandar-e Anzali, 9.4.1967, Sharif (45741-IRAN); Siahkal to Deylaman, 6 km After Siahkal, 130 m, 2003, Aghabeigi (45744-IRAN). Hamedan: Shahnaz Dam, Yalpan Mt., 1980-2200 m, 7.2.1974, collector unknown, *s.n.* (IRAN). Golestan: Jahan-Nama Protected Area, before Mille Radkhan from Radkhan, 36˚38'05'' N, 54˚05'1'' E, 1524 m, 15.4.2006, S.M. Jafari 1620 (BBRL); ibid., Atashan rocks, 36˚ 41' 41''N, 54˚ 17' 77''E, 1730 m, 20.4.2006, S.M. Jafari 1814 (BBRL); southern border of Golestan National Park, Bidak, moist places around Cheshmeh Derazi, 37°16'50" N, 55°52'54" E, 1308 m, 22.4.2004, Akhani 18378 (Akh.); ibid., Tangerah, 930-1120 m, 10.6.1994, Termeh & Matin (45745 & 45747-IRAN); ibid., 420-470 m, 4.6.1975, Termeh (45746-IRAN); ibid., 500 m, 7.2.1972, Iranshahr & Zargani (45751-IRAN); ibid., Loveh, 700 m, 22.4.1974, Riedl & Ershad 15979 (45752-IRAN). Khorasan: Mashhad, Golmakan, Deh Keshveh, 1400 m, 3.6.1983, Qoreishi Alhoseini 10353 (FUMH); Mashhad to Chenaran, Frizi road, waterfall, 7.8.1984, Ayatollahi & Zangooei 11557 (FUMH); SW of Bojnurd, Rein, Zooy Rein towards Garmak, 37˚24'25'' N, 57˚01'50'' E, 1560-1644 m, 15.4.2006, Memariani & Zangooei 37187 (FUMH). Mazandaran: Ramsar, Javaherdeh, Seiqhal Mahalleh, 1850 m, 30.6.2001, Khoshravesh 6 (BBRL); Haraz road, Polur, near river, 2500-3000 m, 11.5.2000, Khoshravesh 7 (BBRL); Kojour, 1500-2000 m, 8.1948, Rechinger & Manuchehri, *s.n.* (IRAN); Kordichal, 1.10.1956, collector unknown (45700-IRAN); Hezar-jarib, 26.5.1948, Sharif 248 (45705-IRAN); Behshahr, Mehdi Rajeh forest, 680-700 m, 2.5.1999, Termeh & Eskandari (45743-IRAN). Semnan: Shahroud, Chehel Dokhtar, Malek-Aram, Tang-e Olang, 1380 m, 30.7.1972, Iranshahr & Zargani, *s.n.* (IRAN). Tehran: Karaj, Doab towards Shahrestanak, 1800-2000 m, 10.10.1971, Termeh & Partovi, *s.n.* (IRAN) Qazvin: NE of Qazvin, Vartovan village, 1700 m, Mobayen 26298 (TUH); road of Chalus, Asiab-var, 1240 m, 12.4.1965, Mobayen 28421 (TUH); Taleqan, collector unknown, 28422 (TUH).

Zanjan: Soltanieh, 7 km to Soltanieh towards Qeydar, 1850 m, 2.7.1972, Termeh & Moussavi, *s.n.* (IRAN).

7. *Equisetum palustre* L., Sp. Pl.: 1061. 1753. (Figs 5, 48C, D . Map 8).
Azarbaijan: 22 km Marand to Soufian, 1700 m, 6.6.1971, Iranshahr, *s.n.* (IRAN). Gilan: Bandar-e Anzali, 9.4.1968, Sharif (45701-IRAN). Golestan: Jahan-Nama Protected Area, 36˚40'47'' N, 54˚18'27'' E, 1720 m, 16.6.2006, S.M. Jafari 2275 (BBRL); ibid., Serah-e Chamansavar, 36˚ 37' 28''N, 54˚ 12' 08''E, 1517 m, 15.4.2006, S.M. Jafar 1619 (BBRL). Mazandaran: Sud de, 500 m, 20.8.1960, Pabot (45702-IRAN); Nowshahr, 2.1.1969, Termeh (45703-IRAN).

8. *Equisetum ramosissimum* Desf., Fl. Atlant. 2: 398. 1799. (Figs 6, 48E. Map 9).
In the Flora Iranica area only subsp. ***Ramosissimum***.
Ardebil: Meshkinshahr, Anzan, 1800 m, 12.9.2007, Eskandari & Torabi (45807-IRAN). Azarbaijan: 13 km Herow, Mianeh to Zanjan, 1050, 22.6.1971, Lamond (45726-IRAN); between Tabriz & Maku, 1300 m, 6.1963, Mobayen 28416 (TUH); Marand to Jolfa, Siahroud, Monjenabad, Asiab Kharabeh, 950 m, 7.8.1994, Moussavi & Tehrani (45723-IRAN); 22 km Marand to Soufian, 1700 m, 6.6.1971, Iranshahr (45704-IRAN); 16 km after Marand towards Tabriz, 1700 m, 14.7.1993, Nikookar & Mosallae *s.n.* (SHIRAZ); Urmieh, 1350 m, 25.8.1975, Pourmazlumi 28420 (TUH); ibid., 8.5.1983, Arghand (45734-IRAN); Khoy to Ghotour, Avrin Mt., 1260 m, 10.6.1970, Termeh (as *Equisetum fluviatile*) *s.n.* (45733-IRAN); Urmieh, Ghoush Pass, 1690-1820 m, 20.6.1970, Termeh (45729-IRAN); Ghotour, 2000 m, 10.6.1971, Iranshahr, *s.n.* (45730-IRAN); Khalkhal to Ardebil, 15 km to Khalkhal, 1500-2000 m, 23.5.1974, Termeh & Moussavi (as *Equisetum fluviatile*), *s.n.* (45732-IRAN). Fars: Ardakan (Sepidan), Margoon waterfall, 16.5.2004, Eskandari (45814-IRAN). Gilan: Deylaman, Larounak to Launak, 600-1600 m, 7.9.1972, Termeh & Daryadel (45706-IRAN); Anzali wetland, Selke Protected Area, 20.5.2008, Eskandari & Pahlevani (45801-IRAN). Golestan: Gorgan, Alentaur, 20.7.1957, Eyrag (45738-IRAN); Gorgan: Nodeh, Rechinger, Aellen & Esfandiari, 5508 (45755-IRAN); Minoodasht, 150-180 m, 11.5.1948, Sharif (as *Equisetum fluviatile*) 286 (45728 & 45739-IRAN); Golestan National Park, around

Soolegerd station, 7.7.1994, Akhani 9499 (Hb. Akh.); ibid., Tangerah to Sarcheshmeh, 670-730 m, 21.7.1991, Matin & Termeh (45748-IRAN); ibid., Almeh, 37°21' N, 56°8' E, 1600-1720 m, 8.7.1994, Akhani 9540 (Hb. Akh.); ibid., Shahpasand to Bojnurd, Almeh, 10.6.1975, Termeh (45724-IRAN); ibid., 6-7 km W of Dasht, valley of Qez-Qale-e Dasht, 37°18' N, 55°56' E, 1080-1100 m, 4.8.1994, Akhani 9863 (Hb. Akh.). Kerman: Kerman, 1972, collector unknown (45725-IRAN). Khorasan: Robat Sang to Robat Sefid, 10 km to Robat Sefid, 1850 m, 4.6.2006, Eskandari, Torabi & Javadi (47629-IRAN); Bojnurd, Hamid, 3.5.2007, Eskandari, Torabi & Javadi (45809-IRAN); Neyshaboor, Ebrahim Adham Mt., 2000 m, 12.5.1983, Rashed 10206 (FUMH); NW of Torbat-e Jam, Bardoo forest, 1500-1600 m, 24.6.2003, Joharchi 34809, 34810 (FUMH); Kalat-e Naderi, Archangan, 830 m, 23.4.1989, Joharchi & Zangooei 17069 (FUMH); Band-e Fariman, 1400 m, Faghihnia & Zangooei 19178 (FUMH); Kalat-e Naderi, Ghara Soo, 1150 m, 22.4.1989, Faghihnia & Zangooei 18937 (FUMH); ibid, 1100 m, 15.7.1990, Joharchi 17059 (FUMH); Akhlamad waterfall, 6.8.1984, Ayatollahi & Zangooei 11544 (FUMH); ibid, 1250 m, 20.8.1983, Rezaei & Mahvan 10608 (FUMH); Esfarayen, Tooy, Salook Mount hillside, 18.7.1984, Ayatollahi & Rezaei 11437 (FUMH); Dargaz, 1500-1550 m, 1.7.1996, Rafei & Zangooei 27708 (FUMH); 10 km from Shadmehr towards Kashmar, 5 km towards Qooch-Palang Mt. on right side of the road, 1350 m, 6.5.1996, Faghihnia & Zangooei 26657 (FUMH); Birjand, between Gaz and Chonesht, Ostad, 1850 m, 19.5.1998, Faghihnia & Zangooei 21824 (FUMH); 8 km from Kashmar towards Neyshaboor, 1400 m, 11.5.1983, Zangooei 10674 (FUMH); Fariman, (Chahar Tak Ab) Chahar Ta Gav, 1700-2000 m, 28.5.1984, Ayatollahi & Mahvan 11307 (FUMH); 5 km S of Dargaz, Qer Qez, 7.7.1985, Ayatollahi & Zangooei 13318 (FUMH); Neyshaboor, Fero, 1500 m, 8.7.1983, Zangooei 10538 (FUMH); W of Bojnourd, Almeh, 1650 m, 26.6.1989, Faghihnia & Zangooi 17835 (FUMH); SW of Dargaz, Qaraqat valley, 1500-1800 m, 1.7.1996, Rafei & Zangooei 27673 (FUMH); SW of Dargaz, Qaraqat valley, 1500-1800 m, 28.5.2005, Joharchi 33590 (FUMH); NW of Torbet-e Heydariye, Mojen river valley, near waterfall, 1700 m, 9.7.2003, Joharchi 34940 (FUMH); Mashhad, Radekan, Richgan Zoogrooh Mt., 1400 m, 5.8.1992, Faghihnia & Zangooei 22398 (FUMH); Mashhad, Kalat-e Ahan, 1500 m, 26.8.1992, Faghihnia & Zangooei 22517

(FUMH); between Torbet-e Heydariye and Khavaf, Pir-e Yahoo, 1500 m, 7.7.1992, Faghihnia & Zangooei 22128 (FUMH); Torbet-e Heydariye, Yarfazli valley, river, 2100 m, 22.7.1992, Faghihnia & Zangooei 22304 (FUMH); W of Torbet-e Heydariye, Sorkhabad, 1400 m, 8.6.1987, Joharchi & Zangooei 15338 (FUMH); N of Neyshaboor, Ebrahim Adham Mt., 1350 m, 26.6.1991, Faghihnia & Zangooei 20919 (FUMH); Torbet-e Heydariye, Mojen river, 1600 m, 21.8.1990, Faghihnia & Zangooei 19040 (FUMH); W of Torbet-e Heydariye, Mojen river bank, 6.8.1985, Zangooei 13452 (FUMH); SW of Bojnourd, towards Rein, left side of the road, Northern hillsides of Aladagh, 2010 m, 27.9.2007, Zangooei & Arjmandi 39287 (FUMH); Chenaran, 2 km from Frizi towards Sorkhe, 1762 m, 29.5.2005, Emadzadeh, Memariani & Zangooei 36470 (FUMH). Kordestan: Sanandaj, Marivan pass, 25 km to Sanandaj, 2200–2350 m, 3.7.1971, Iranshahr & Termeh, *s.n.* (IRAN). Lorestan: Alashtar, Tang-e Kahman, 27.6.2007, Eskandari, Shirzadian & Bahramishad (45806-IRAN); Borujerd, Vanaiee, 29.6.2007, Eskandari, Shirzadian & Bahramishad (45808-IRAN); Khorramabad, Cham-Divan, 1000 m, 20.5.1999, 24099 Veiskarami (TUH). Mazandaran: Ramsar, 7.6.1966, Esfandiari (45736-IRAN); Chalus, 10.3.1967, Esfandiari *s.n.* (IRAN); ca. 30 km N of Sari, Khazarabad, sandy coasts of the S Caspian Sea, guest house building of University of Tehran, ca. 20 m below sea level, 20.03.2001, Akhani 14535 (Hb.Akh.); Sangdeh, 20 km to waterfall, 1800 m, 19.5.1999, Termeh & Eskandari (45742-IRAN); Lar lake, 2700 m, 14.6.1980, Moussavi, Habibi & Tehrani 39785 (47626-IRAN); Amol, Rice Rresearch Center, 22.5.2008, Eskandari & Pahlevani (45804-IRAN). Markazi: Saveh; ca.15 km W of Razeghan, Bari-eh village in saline soils, 900-1500 m, 28.9.1986, Akhani 28419 (TUH). Tehran: Firuzkuh-e Namroud, river side, 1960 m, 5.9.1987, Ghahraman & Mozaffarian 5840 (TUH); Evin, 1650 m, 30.3.1961, Farrokhnia 28415 (TUH); Passghaleh, 1870 m, 4.1979, Azizian 28418 (TUH); Lavasan, 2180 m, Farajollahzadeh 28417 (TUH); Dizin, 3500 m, 5.1992, Attar & Mehdigholi 25597 (TUH); Dizin, Pey Kamar, 2650-2750 m, 22.6.1982, Moussavi, Habibi & Tehrani (47628-IRAN Semnan: Shahroud, 1380 m, Partovi (IRAN); Shahroud, Rechinger & Esfandiari (as *Equisetum fluviatile*) 5374 (45731-IRAN). Zanjan: Soltanieh, 7 km to Soltanieh from Qeydar, 1850 m, 2.7.1974, Termeh & Moussavi, *s.n.* (45735-IRAN).

We found two different forms of *Equisetum ramosissimum* among the material studied. The first had a main stem (> 1 cm diam.) with regular branching usually arising from the upper nodes, while the second had thinner stem (< 1 cm diam.) with a crowded branching from the base.

Equisetum fluviatile L. was recorded in some Iranian botanical literature (PARTOVI-TABAR 1975, MOBAYEN 1980, PARSA & MALEKI 1978). Some herbarium specimens so named, which were checked in IRAN and TUH (e.g. Termeh & Moussavi, 23.5.1974, 2.7.1974), differ from *Equisetum ramosissimum* by having whorled and regular branching (typical *Equisetum ramosissimum* has irregular branching). However, they show the apiculate cones that characterize *Equisetum ramosissimum*. Further detailed studies are required for a clarification of their status.

9. *Equisetum telmateia* Ehrh. in Hannover. Mag. 21: 287. 1783. (Figs 7, 48F, G. Map 10).

Azarbaijan: Takab, Takht-e Soleyman, Ahmadabad Sofla, 17.7.2006, Eskandari, Javadi & Torabi (47637-IRAN). Gilan: 24 km after Astara towards Ardebil, 750 m, 8.7.1993, Nikookar & Mosallaee *s.n.* (SHIRAZ); Lahijan to Rasht, between Belesbene and Dar Sazy, 0 m, 24.2.1977, Ghahraman & Aqhostin 28424 (TUH); Amarlu, Damash, Kuh-e Zard Chin, 1750-2250 m, 4.7.1972, Termeh & Daryadel (45712-IRAN); Bandar-e Anzali, -25 m, 9.4.1968, Sharif (IRAN); Anzali wetland, Selke Protected Area, 20.5.2007, Eskandari & Pahlevani (45800-IRAN); Lahijan, Agriculture station, 15.6.1981, collector unknown (45757-IRAN); Larukhani, Launak, 900-1500 m, Termeh & Daryadel, *s.n.* (IRAN); Abkenar, 1500 m, 18.5.2000, M. Seifi, *s.n.* (TUH); Rasht, 28.3.2005, Sharifian (47635-IRAN). Golestan: Gorgan, 0-150 m, 2.7.1975, Eyvaz, *s.n.* (IRAN); Minoodasht, 0-180 m, 12.5.1948, Sharif, *s.n.* (IRAN); Gorgan, Shamushak forest, 10.5.2007, Eskandari, Shirzadian & Bahramishad (45810-IRAN); Jahan-Nama Protected Area, arrival of Tarkat from Jahan-Nama Environment Building, 36˚40’59’’ N, 54˚18’43’’ E, 1700 m, 15.4.2006, S.M. Jafari 1660 (BBRL); ibid., 1532 m, 16.4.2006, S.M. Jafari 1701 (BBRL); Golestan National Park, eastern boder of Golestan National Park, between

Lowe and Kondeskuh, 1300 m, 26.9.1989, Zangooei 18022 (Hb. Akh.); Almeh, 1630-1730 m, 18.7.1991, Termeh & Matin (45717, 45719-IRAN); western border of Golestan National Park, pass between Tangerah and Quch-Cheshmeh, 1000-1300 m, 20.4.1999, Akhani 13376 (Hb. Akh.); Loveh, 200-700 m, 20.10.1993, Zangooei & Hossein Zadeh 23759 (FUMH). Hamedan: Shahnaz Dam, Yalpan Mt., 1980-2200 m, 12.7.1974, Termeh & Moussavi (45710-IRAN). Kerman: Baft, Hezaran, 18.4.1963, Yazdani (45721-IRAN). Khorasan: W of Bojnourd, Darkesh, Nargesli towards Abriz, 1570 m, 20.7.2004, Joharchi & Aydani 35706 (FUMH). Kordestan: Sanandaj to Marivan, 2200-2350 m, 3.7.1971, Termeh (45718-IRAN). Mazandaran: Ramsar, 0-150 m, 17.6.1966, Partovi, *s.n.* (IRAN); 10 km Chalus to Karaj, 16.5.2007, Eskandari & Pahlevani (45811-IRAN); 15 km from Abbasabad towards Kelardasht, 400-550 m, 5.5.1985, Termeh & Matin (47631-IRAN); Ghaemshahr, Kusichal, 0-150 m, 1.10.1952, collector unknown (IRAN); Nowshahr, -21 m, 2.1.1969, Termeh, *s.n.* (IRAN); Aghamashad, 750 m, 24.4.1965, Tregubov 28423 (TUH); Miankaleh wetland, 11.5.2001, P. Ahmadi, *s.n.* (TUH); road of Chalus, 500 m, 20.8.1960, Pabot 4919 (IRAN); Nowshahr, -21 m, 10.9.1966, Iranshahr *s.n.* (IRAN); Chalus, 40 m, 10.3.1967, Iranshahr *s.n.* (IRAN); Amol, Rice Research Center, 22.5.2008, Eskandari & Pahlevani (45803-IRAN); Kojur, 1948, Rechinger & Manouchehri (45713-IRAN); Lar lake, 14.6.1980, Moussavi, Habibi & Tehrani (47627-IRAN); Nowshahr, 22.2.1948, collector unknown (45707-IRAN); ibid., Maadan Sang, 10.9.1966, Khosroshahi *s.n* (45754-IRAN); Behshahr, Sang-e-Now, 13.5.2007, Eskandari, Shirzadian & Bahramishad (45813-IRAN); Hezar Jarib, 20.8.1945, Sharif (45708-IRAN). Semnan: Shahroud, Tash, 2200 m, 10.6.2006, Eskandari, Torabi & Javadi (47630-IRAN); Shahroud, Chehel Dokhtar, Malek Aran, Tang-e Olang, 30.7.1972, Iranshahr & Zargani (45714-IRAN). Tehran: Karaj, Shahrestanak, Eskandari (47632-IRAN); Karaj, Doab, Shahrestanak, Tang-e Loniz, 1800-2000 m, 4.7.1971, Termeh & Daryadel (45711-IRAN). Zanjan: Soltanieh, 7 km from Qeydar to Soltanieh, 1850 m, 2.7.1974, Termeh & Moussavi (45715-IRAN); 20 km W of Dandy, 17.7.2006, Eskandari, Javadi & Torabi (45633-IRAN).

Polypodiopsida

Osmundaceae

10. *Osmunda regalis* L., Sp. Pl.: 1065. 1753. (Fig. 8. Map 11).

Gilan: Hashtpar, Solon, 1500 m, collector unknown, 28383 (TUH); Hashtpar, Tavalesh, 1000 m, Maleki, 28384 (TUH).

Marsileaceae

11. *Marsilea quadrifolia* L., Sp. Pl.: 1099. 1753. (Figs 9, 49A. Map 12).

Gilan: Wetlands near the road from Abkenar towards Kapurchal, -30 m, collector unknown, *s.n.* (TUH); Astaneh, Dehshal, 8.12.1990, Sharifi & Zafarmand *s.n.* (45215-IRAN). Mazandaran: ca. 5 km SW of Chalus, 36°37' N, 51°23'15" E, field and forest margin, 130-140 m, 3.8.2001, Akhani & Ghasemkhani 15469 (Hb. Akh.).

Salviniaceae

12. *Azolla filiculoides* Lam., Encycl. 1: 343. 1783. (Figs 10, 49B. Map 13).

Ardebil: Moghan, Eslamabad, Aras River, 1350 m, 9.13.2007, Eskandari & Torabi (45441-IRAN). Gilan: Astara, Lavande-Vil, 10 m, 9.17.2007, Eskandari & Torabi (45484-IRAN); between Anzali and Rezvanshahr, 2 km E of Kapurchal, 37°32'32" N, 49°15'16" E, marshes of Caspian Sea, ca. -20 m, 23.11.2000, Akhani 14448 (Hb. Akh.); Anzali wetland, ca. -20 m, 5.11.1999, Akhani 13780 (Hb. Akh.); ibid., Selkeh Protected Area, 20.5.2008, Eskandari & Pahlevani (45495-IRAN).

The species was introduced into N Iran during the 1980s in order to enhance nitrate content of rice-cultivated fields. It soon escaped to neighboring wetlands and became an aggressive invasive plant, apparently due to its capability of vegetative reproduction. Now, it has invaded almost all freshwater ecosystems and rice fields, and is even found on the saline waters of the Caspian Sea. It has taken possession of the natural habitat of many native aquatic plants of the northern wetlands, covering the water surface almost completely (Fig. 49B). It filters the sun light required for photosynthesis by phytoplankton and the submerged aquatic flora, being a hazard for the survival of other aquatic organisms, and a threat to fish production. Therefore, urgent measures are required to control this plant in N Iran.

13. *Salvinia natans* (L.) All., Fl. Pedem. 2: 289. 1785. (Fig. 11. Map 14).

Gilan: Anzali wetland, -30 m, 9.8.1966, collector unknown 28641 (TUH); Anzali, Protected Area, Siah Kashim, -30 m, 5.8.1989, B. Riazi 28640 (TUH); Anzali wetland, Gol-e Lale Region, Tap-tap-roga (river), 9.9.1982, Termeh, Matin & Zargani (45231-IRAN); Bandar-Pahlavi, Talebabad, 11.6.1967, Mirkamali (45213-IRAN); Lahijan, Agricultural Garden, 15 m, 8.9.1989, Sabeti 38197 (45213-IRAN); Lahijan wetland, 9.8.1956, Sabeti 38198 (45214-IRAN); Amlash, Ostad-Kalayeh, 8.12.1990, Sharifi & Zafarmand (45216-IRAN); Amlash, 24.5.2008, Eskandari & Pahlevani (45508-IRAN). Khuzestan: Khorramshahr, Karoon river, 11.16.2004, Eskandari & Aminirad (45323-IRAN).

This species was collected by H. Akhani in the Bamdejh wetland N of Ahvaz in Khuzestan Province in 1987. The specimen was not available for inclusion in this account.

Dennstaedtiaceae

14. *Pteridium aquilinum* (L.) Kuhn in Kersten, Reis. Ost-Afr. 3 (3): 11. 1879. (Figs 12, 50A. Map 15.). In Iran only: subsp. ***aquilinum*** var. ***aquilinum***.

Ardebil: Ardebil to Astara, Damiroghlikishi forest, 1000 m, 7.21.1978, Termeh, Moussavi & Habibi (45349-IRAN); Heyran, 980 m, 9.14.2007, Eskandari & Torabi (45418-IRAN); Heyran, Veneh Bin, 1450 m, 9.14.2007, Eskandari & Torabi (45426-IRAN). Azarbaijan: Kalibar, Vaighan, Ainalou forest, 7.7.1978, Termeh, Moussavi & Habibi (45409-IRAN). Gilan: Astara, Lavande Vil, Latoon forest, 900 m, 17.4.2006, Eskandari & Torabi (IRAN); between Hashtpar & Anzali, 0-50 m, 9.8.1978, Ghahraman & Aghustiun 28530 (TUH); Asalem towards Khalkhal, 250 m, 18.10.1977, Zargani (6823-FUMH); 20 km from Anzali towards Talesh, 5.29.2005, Aghabeigi & Bahramishad *s.n* (45318-IRAN); Lisar, 166 m, 5.17.2005, Aghabeigi (45319-IRAN). Golestan: Golestan National Park, ca. 14 km SW of Lohandor, Koilar, 1350-1550 m, 4.6.1995, Akhani 11204 (Hb. Akh.); ibid., ca. 2 km S of Koilar, 37˚ 29’ N, 55˚ 50’ E, 1600-1750 m, 4.6.1995, Akhani, 11238 (Hb. Akh.); ibid., 8 km E of Tangerah, Baghlogh (Takhti-e-yek-e Toot), 950 m, 1.8.1994, Akhani, 9693 (Hb. Akh.); ibid., Tangerah, 1000-1200 m, 20.4.1995, Akhani 10375 (Hb. Akh.); ibid., 1 km E of Quch-Cheshmeh, 980 m, 28.6.1995, Akhani 11487 (Hb. Akh.); ibid., northern side of Shakha Mt., 1750-1900 m, 4.7.1995, Akhani 11603

(Hb. Akh.); ibid., ca. 3 km NE of Tangerah, Afrali, 37° 25' N, 55° 48' E, 1000-1100 m, forest opening dominated by *Pteridium aquilinum*, 30.6.1995, Akhani 11546 & 11538 (Hb. Akh.); ca. 14 km SW of Lohondor, Koilar, 37° 50' N, 55° 50' E, 1350-1550 m,4.6.1995, Akhani 11202 & 11203 (Hb. Akh.); 6 km E of Tangerah, Qameshli, forest opening dominated by *Pteridium aquilinum*, 37° 24' N, 55° 50' 30'' E, 1160-1250 m, 15-16.7.1995, Akhani 11810 (Hb. Akh.); Tangerah to Zav, 6.16.1993, Termeh & Matin (45368-IRAN); Gorgan, Minoondasht, 7.16.1948, Sharif (45314-IRAN); Gorgan, Naharkhoran forest, 450 m, 8.21.1978, Tehrani, Moussavi & Termeh 39320 (45369-IRAN); Gorgan, Shamushak, 5.10.2007, Eskandari, Shirzadian & Pahlevani (45006-IRAN). Kermanshah: Eslamabad, Dalahu, 1644m, 25.5.1973, Mobayen 28654 (TUH). Mazandaran: Ramsar, Javaherdeh, Leibi-e Taleh-Kash, 1600-1800 m, 30.7.2001, Khoshravesh 14 (BBRL); Ramsar, Sadat-Mahalleh, 5.12.1951, collector unknown 38195 (45312-IRAN); Ramsar, 30.5.1969, Mostofi *s.n* (52017-IRAN); Chalus forest, 50 m, 4.7.1977, Termeh & Moussavi (45311-IRAN); Kelarabad, 9.26.1956, 38192 (45316-IRAN); Tonekabon, 20 m, 2.6.1949, collector unknown, 28047 (TUH); Miankaleh Protected Area, ca. 4 km W of Sasan, 29.5. 1988, Akhani 4265 (Hb. Akh.); Nowshahr, Galanderoud, 5.28.1956, collector unknown 38193 (45315-IRAN); Nowshahr, Shahrposht, 6.17.1955, Pishkari 38194 (45310-IRAN); Nashtaroud, Band Bon, 7 m, 21.5.1972, Maleki 26468 (TUH). Tehran: Near Tehran, Joushanak, 6.1949, collector unknwon, 28653 (TUH).

Pteridium aquilinum is the most widespread species among Iranian ferns, occurring as a ruderal along the borders of the Hyrcanian forests. In disturbed places, forest margins and deforested areas, it can form very dense stands with almost no other associated species (Fig. 50A). The occurrence of this species in the W of Iran is interesting. Based on observations by M. Eskandari, the area looks dry and hardly suitable for such a moisture-loving plant. New collections are needed to confirm the ocurrence of this species in western parts of Iran.

Pteridaceae

15. *Adiantum capillus-veneris* L., Sp. Pl.: 1096. 1753. (Fig. 13, 50B. Map 16).

Azarbaijan: Jolfa to Siahroud, Asiab Kharabeh, 1400 m, 15.7.2004, Eskandari, Aghabeigi & Sajedi (45100-IRAN); ibid, 950 m, Moussavi & Tehrani 45150 (IRAN); Takab, Takht-e Soleyman, 17.7.2006, Eskandari, Torabi & Javadi (45291-IRAN). Chaharmahal-o-Bakhtiari: Ardal, Lirab, Azizabad, 2200 m, 28.6.2008, Eskandari, Torabi & Javadi (45486-IRAN); Ardal, Daurak Anari waterfall, 1520 m, 27.6.2008, Eskandari, Torabi & Javadi (45488-IRAN). Baluchestan: Saravan, 1165 m, 16.3.1949, Mirsalavatian 272 (45119-IRAN); Iranshahr, Damen, 571 m, 9.4.1950, Manuchehri 38102 (45118-IRAN); Iranshahr, Modanj, 770 m, 15. 3.1978, Moussavi & Tehrani *s.n.* (45146-IRAN); Saravan, Kalegan (Tal); 16.3.1949, Mirzayans 272 (45119-IRAN); Sarbaz, 3.10.1974, Iranshahr & Ershad (45365-IRAN). Esfahan: Kashan, Niasar, 23. 3.2007, Eskandari (45088-IRAN). Fars: Ardakan (Sepidan), Margoon waterfall, 16.5.2004, Eskandari (45151-IRAN); Fasa, 1370 m, 20.7.1955, Sharif 38106 (45125-IRAN); Shiraz, Kohmareh Sorkhi, 3.12.1991, Nikookar *s.n.* (SHIRAZ); Shiraz, 30 km towards Estahbanat, Gardaneh Morghak, 1500 m, 20.5.1975, Tehrani & Moussavi (45367-IRAN). Gilan: Manjil to Zanjan, Tashvir, 600-700 m, 1.6.1971, Iranshahr, 38107 (45122-IRAN). Golestan: Aliabad, Kabudwal forest, 14.9.2005, Eskandari (45136-IRAN); Gorgan, Ringo forest, 30.5.2005, Eskandari (45347-IRAN); Golestan National Park, ca. 3 km E of Kondeskuh, in valley of Qez-Qaleh, 800-850 m, 5.8.1994, Akhani 9909 (Hb. Akh.). Ilam: 30 km S of Ilam, Amma (Ilam Dam), 29.8.2006, Eskandari & Torabi, (45372-IRAN); 5 km S of Ilam, Sartaf, 29.8.2006, Eskandari & Torabi (45373-IRAN); ca. 10 km E of Darrehshahr, Eastern slopes of Kabirkuh, Qaleh Bahram-e Chubin, near Aramu village, moist cliffs, 33°5’9" N, 47°27'9" E, 710-750 m, 29.3.2001, Akhani 14684 (Hb. Akh.); Darrehshahr to Pol-e Dokhtar, Marbareh (waterfall); 26.6.2007, Eskandari, Shirzadian & Bahramishad (45448-IRAN); Ilam to Darrehshahr, Tang-e Razianeh, 24.6.2007, Eskandari, Shirzadian & Bahramishad (45447-IRAN); Mehran, Changuleh, 250 m, 10.3.1948, Behboudi 298 (45124-IRAN); Ilam to Mehran, 31.5.1951, Sharif 38105 (45123-IRAN); Ilam to Salehabad, Chamo, 29.8.2006, Eskandari & Torabi (45374-IRAN); Salehabad, Zeynagan (Cave), 22.6.2007, Eskandari, Shirzadian & Bahramishad (45449-IRAN). Kermanshah:

Eslamabad to Sarpole-zahab, Rijab, 30.8.2006, Eskandari & Torabi (45371-IRAN). Khorasan: N of Mashhad, N of Kardeh, Al waterfall, 1050 m, 9.10.1984, Joharchi & Ayatollahi 11808 (FUMH); ibid., 1400 m, 23.9,1996, Faghihnia & Zangooei 27552 (FUMH); Mashhad, Akhlamad waterfall, 6.8.1984, Ayatollahi & Zangooei 11543 (FUMH); ibid., 400 m, 15.6.2005, Eskandari, Javadi & Torabi 45138 (IRAN); Kalat-e Naderi, Khoan Zoo, Urtakan vilage, 1550 m, 9.6.1994, Faghihnia & Zangooei 24161 (FUMH); 175 km towards Azadshahr from Bojnourd, southern highlands of the road, 7.9.1987, Zangooei & Alvani 15830 (FUMH); NW of Bojnourd, S of Ayreghayeh, 12.6.2001, Joharchi 33735 (FUMH); Sarakhs, Agh Darband mine, 500 m, 12.8.1992, Faghihnia & Zangooei 22440 (FUMH); Neyshaboor, Ebrahim Adham Mt., 12.5.1983, Rashed, Bakhshoude & Rezaei 10207 (FUMH); ibid., 1350 m, 26.6.1991, Faghihnia & Zangooei 20928 (FUMH); ibid., valley of Ebrahim Adham cave, 10.5.1986, Bakhshoudeh 14202 (FUMH); Tabas, Cheshme Dehcherook spring, 1300 m, 29.4.1990, Zokaei 732 (FUMH); Tabas to Fero road, Mehrabani village, 14.3.1988, Zangooei 15917 (FUMH); SW of Dargaz, Chelmir, 1100 m, 7.7.1994, Faghihnia & Zangooei 24408 (FUMH); between Torbat-e Heydariye & Khavaf, Pir-e Yahoo, 1500 m, 7.7.1992, Faghihnia & Zangooei 2218 (FUMH); ibid., 1600 m, 25.6.2003, Joharchi 34855 (FUMH); SW of Nehbandan, S of Chahar-farsakh, Hoz-e Morteza Ali, 1900 m, 31.7.2001, Faghihnia & Hosseinzadeh 33934 (FUMH); ibid., Ghadamgah (Mazar), 1700 m, 7.4.1998, Hojjati & Zangooei 29859 (FUMH); Boshruyeh, Aliabad to Espak, 900 m, 12.5.1975, Iranshahr 45145 (IRAN); Esfarayen, Sarmeran, Joz valley, 1500 m, 17.6.1998, Rafei & Zangooei 31722 (FUMH); Birjand, Zeyni, Giyouk (Dam); 2.6.2007, Eskandari & Torabi 45408 (IRAN). Khuzestan: 25 km N of Andimeshk, 400 m, 25.2.1972, Iranshahr & Termeh 14900 (45121I-RAN); Bagh-Malek, Haparou to Sidoun, 800 m, 30.5.1973, Iranshahr & Moussavi *s.n* (45366-IRAN); Andimeshk to Doroud (By Train), Talezang, Shevy waterfall, 16.5.2004, Eskandari (45141-IRAN). Kohkilooye va Boyer Ahmad: Yasuj, Kakan, 2250 m, 1.7.2008, Eskandari, Torabi & Javadi (45487-IRAN); Basht, Tol-Chegha, Deh-e Barabar to Sarcheshmeh, 1100 m, 30.4.1989, Moussavi, Delghandi & Fatehi (45143-IRAN). Lorestan: Khorramabad, Veissian Bagheleh, 1400 m, 14.5.1999, Veiskarami 23574 (TUH); ibid., Nozhyan waterfall, 1320 m, 5.7.2008, Eskandari, Torabi & Javadi

(45490-IRAN); Bisheh, 15.6.1948, Rechinger & Manuchehri 5665 (45126- IRAN); Khorramabad to Pol-e Dokhtar, Afrineh waterfall, 13.5.2004, Eskandari (45140-IRAN); Khorramabad to Sepiddasht, Sarkaneh (Gerit), waterfall, 14.5.2004, Eskandari (45139-IRAN); Khorramabad, Tashkan, Sadd-Rofteh-Khan Sefid-Kouh, 1700 m, 18.7.1992, Delghandi & Tehrani (45331-IRAN). Mazandaran: Behshahr, Sang-e-Now, 13.5.2007, Eskandari, Shirzadian & Pahlevani (45463-IRAN); Nowshahr, 20 m, 25.4.1960, Asefi 38103 (45131-IRAN); ibid., Maadan-e Sang, 10.9.1966, Iranshahr 38109 (45127-IRAN); ibid., Galanderoud, 7.1956, Sabeti 38111 (45130-IRAN); ibid., Palangchal, 25.4.1960, Asefi 38104 (45132-IRAN); Tonekabon, Dohezar road, 15.5.2007, Eskandari & Pahlevani (45464-IRAN); 10 km Chalus to Karaj, 16.5.2007, Eskandari & Pahlevani (45462-IRAN); Chalus Tal, 14.9.1996, Iranshahr 38108 (45129-IRAN); Ramsar to Javaherdeh, ca. 10 km after Ramsar, beside the river, 400-800 m, 15.11.2001, Khoshravesh 20 (BBRL); Nowshahr, Chelendar, 30 m, collector unknown 22388 (TUH). Semnan: 31 km W Semnan, Momenabad (Gypsum hills), 1200 m, 19.5.1982, Termeh & Zargani *s.n.* (45144-IRAN); 8 km NE of Momenabad, 20.7.1975, Moussavi & Karavar *s.n.* (45142-IRAN). Tehran: W of Tehran, Pardisan Nature Park, along the Farahzad valley, 35°44'53" N; 51°20'28" E, 1350-1400 m, 6.5.1999, Akhani 13476 (Hb. Akh.). Zanjan: Tarom, Sorkhe Dizaj, Darreh Lar, 16.7.2006, Eskandari, Torabi & Javadi (45290-IRAN).

The species was also reported by Léonard (1981) from the eastern part of Lut desert, 10 km N of Guk, 29°57' N, 57° 43' E.

16. *Anogramma leptophylla* (L.) Link, Fil. Sp.: 137. 1841. (Figs 14, 50C. Map 17).

Fars: Ghar-e Shapour, 7.3.1970, Iranshahr 38099 (45321I-RAN); from Dalaki towards Konartakhteh, 2 km Konartakhteh, 29° 31' 57'' N, 51° 25' 47'' E, 500 m, 10.3.2004, Khosravi & Moussavi *s.n.* (SHIRAZ). Gilan: Harzevil, 22.7.1968, Mizayans 38100 (45322-IRAN). Khorasan: NW of Bojnourd, between Qouri Meydan & Dashtak, 650-700 m, 28.4.2001, Joharchi & Zangooei 33402 (FUMH). Khuzestan: Doroud to Andimeshk, waterfall Talezang to Shevy, 10.5.2004, Eskandari (45285I-RAN). Mazandaran: Ramsar, Tang-Darreh, 150-300 m, 4.1.2002, Khoshravesh 38 (BBRL).

17. *Cheilanthes acrostica* (Balbis) Tod. in Giorn. Sci. Nat. Econ. Palermo 1: 125. 1866. ("*Cheilanthes pteridioides*" auct.); (*Cheilanthes fragrans* (L.f.) Swartz). (Fig. 15. Map 18).

Azarbaijan: Kalibar, Vaighan, Asheghlou to Tatar (Dalik Dashi), 900 m, 9.7.1978, Termeh, Moussavi & Habibi *s.n* (45328-IRAN). Baluchestan: Khash, 19.2.1949, Sharif 27 (45085-IRAN); ibid., 26.3.1949, Mirzayans 273 (45090-IRAN); Ziaratgah to Sarbaz, 800 m, 3.10.1971, Iranshahr & Ershad 38132 (45080-IRAN); Sarbaz, 30.3.1949, Salavatian 270 (45087-IRAN); Tang-e Sarho 800-1100 m, 24.3.1949, Sharif 275 (45084-IRAN); Tang-e Sosh, 24.3.1949, Sharif 274 (45003-IRAN). Ilam: 24 km from Zarrinabad (Pahaleh) towards Fasil (Mehran-Dehloran road), Anaran Mt., 500-600 m, 3.5.1992, Akhani 8417 (Hb. Akh.); 20 km of Darrehshahr towards Malavi, Pole- Gavmishan (bridge), around the road and margin of cultivated lands, 35°5'13" N, 47°32'26" E, 522 m, 20.3.2001, Akhani 14644 (Hb. Akh.); ca. 7 km NE of Dehloran, in valley of Chare-Khoffash, 250-350 m, 5.5.1992, Akhani 8534 (Hb. Akh.); Mehran, Konjan-Cham, 3200 m, 30.3.1948, Behboudi 297 (45089-IRAN); 33 km after Ilam towards Salehabad, near Banroushan village, 700-800 m, 3.5.1992, Akhani 8302 (Hb. Akh.); ca. 25 km S of Salehabad, 5-6 km after Konjan-Cham towards Shoor-Shirin, Gypsum hills along Iran/Iraq frontier, 350-400 m, 1.5.1992, Akhani 8147 (Hb. Akh.). Fars: Komaroj, 900 m, 7.3.1970, Iranshahr 38135 (45074-IRAN); 10 miles N of Farashband, 500 m, 3.3.1975, Iranshahr & Termeh 38139 (45078-IRAN); Farash-Band, Kuh-e Pir, Konar Malek, 800-1300 m, 4.3.1975, Iranshahr & Termeh 38138 (45076-IRAN); Ghar-e Shapour, 19.2.1949, Iranshahr 38134 (45092-IRAN); 60 km to Shiraz, Persepolis (Takht-e Jamshid), 1618 m, collector unknown 16046 (TUH). Hormozgan: Bandar-Abbas, Kuh-e Genu, 1400-1700 m, 11.3.1986, Mozaffarian & Ghahraman 5390 (TUH); Hajiabad, Farghan, 16.4.2001, Pahlavani & Torabi (45327-IRAN); Homay to Siahoo, 28.4.2003, Aminirad, Sonboli & Tehrani (45264-IRAN); Bokhan Khash, 0-150 m, 19.2.1949, Sharif 27 (45085-IRAN). Kerman: Jebal Barez Mt., 2000-3000 m, 8.5.1945, Rechinger & Esfandiari 3846 (45086-IRAN); Jiroft to Darzin, 26 km Jiroft, Godar-e Moghak, 28.4.1977, Riedl & Ershad (45204-IRAN); Jiroft, Marz, Mamanak, Kuh-e Sefid (Bashagerd), 12.3.1978, Moussavi & Tehrani (45245-IRAN); Sirjan to Bandar-Abbas, Kuh-e Gohreh, 750 m, 10.3.1971, Iranshahr & Termeh 38131

(45079-IRAN). Khorasan: 20 km to Soomar, 18.12.1982, Rezanejhad, *s.n.* (FUMH); Torbat-e Heydarieh, 7 km Khavaf, 1500 m, 9.5.1983, Kianmehr 10159 (FUMH); SW of Tabas, Fero, 1950 m, 13.4.1995, Rafeie & Zangooei 24647 (FUMH). Khuzestan: Haftgel to Masjed Soleyman, Simeyli, 300-900 m, 6.3.1972, Iranshahr & Termeh 38137 (45075-IRAN); Dogonbadan to Genaveh, 3 km to Dogonbadan, 500 m, 2.7.1972, Iranshahr & Termeh 38136 (45077-IRAN); 12 km Behbahan to Aghajari, 3.3.1972, Iranshahr & Termeh 38133 (45081-IRAN); Mahshahr to Genaveh, 65 km SE of Hoveyzeh, Zeydan, 350 m, 29.2.72, Iranshahr & Termeh (45063-IRAN); Dezful, Shirin-ab, Zirband, 480 m, 26.4.1972, Maleki 26491 (TUH). Kohkilooye va Boyer Ahmad: Basht, Tol-Chega, Deh-e Barabar to Sarcheshmeh, 1200 m, 30.4.1989, Moussavi, Delghandi & Fatehi (45232-IRAN). Kordestan: Kamyaran, Sirvan river, Palangan, 19.5.2006, Eskandari, Shirzadian & Bahramishad (45256-IRAN); Marivan, Uraman-e Takht, 20. 5.2006, Eskandari, Shirzadian & Bahramishad (45255-IRAN). Khuzestan: Doroud to Andimeshk (along railway), Talezang to Shevy waterfall, 1900 m, 16.5.2004, Eskandari (45284-IRAN). Lorestan: 35 km of Darrehshahr, sloping ground N of the road, 33˚7’17’’ N, 47˚38’15’’ E, 722 m, 29.3.2001, Akhani 14634 (Hb. Akh.);; Khorramabad, Makhmalkuh, 15.5.2004, Eskandari (45286-IRAN); ibid., Nozhyan waterfall, 20.4.2002, Eskandari (45261-IRAN); Tang-e Malavi, 350 m, 25.2.1972, Iranshahr & Termeh 14898 (45083-IRAN). Semnan: Shahroud, Ghaleh Bala, 1500 m, 27.4.1975, Iranshahr (45246-IRAN); Shahroud, Mojen, 1700 m, 27.6.2006, Eskandari & Aminirad (45249-IRAN). Léonard (1981) has reported this species from Bam-Jiroft, 28°40' N, 57°47’ E.

18. *Cheilanthes coriacea* Decne. in Arch. Mus. His. Nat. 2: 190. 1841. (*Cheilanthes arabica* Decne., *Cheilanthes decaisnei* Kunze). (Fig. 16, 51A, Map 19). Fars: Kazerun, Sherenjan, NE of Parishan lake, 810 m, 18.4.1991, Khosravi & Nikookar 1228 (SHIRAZ), ibid., 1500 m, 27.4.2009, Eskandari & Bahramishad *s.n.* (IRAN).

Other reported specimen (KHOSRAVI 1998): Fars: Kazerun, Abgineh, S. slope on cliffs hanging, 10.10.1974, Foroughi & Assadi 15098 (TARI, n.v.).

19. *Cheilanthes persica* (Bory) Kuhn, Filic. Afr.: 73. 1868. (*Cheilanthes szovitsii* Fisch. & C.A. Mey.). (Figs 17, 51B. Map 20).

Fars: 60 km to Shiraz, Persepolis (Takht-e Jamshid), 1618 m, 23.3.1967, Mobayen 28528 (TUH). Golestan: Golestan National Park, 3 km SES Soolegerd, easternmost of Degarmanli valley and river, 10.7.1995, Akhani 11717 (Hb. Akh.); ca. 7 km W of Soolegerd, 37˚ 27' N, 56˚ 4' E, 1300-1600 m, 28.4.1995, Akhani, 10533 (Hb. Akh.); 8-10 km SW of Lohondor, along Qortoy valley, in *Juniperus excelsa* woodland, 37˚ 29' N, 55˚ 55' E, crevices of calcareous rocks, 1300-1400 m, 3.6.1995, Akhani 11183 (Hb. Akh.) Hormozgan: Bandar-Abbas, Kuh-e Genu, 1700-2200 m, 29.4.1987, Ghahraman & Mozaffarian 5591 (TUH). Kermanshah: Gilan-e Gharb, 805 m, 24.4.1968, Iranshahr 38140 (45072-IRAN). Khorasan: NW of Bojnourd between Eshghabad and Kal-Imani, 950 m, 17.4.2001, Joharchi & Zangooei 33239 (FUMH); Bojnourd, Darkesh to Nargesli, 1300-1500 m, 15.3.2005, Memariani & Zangooei 35780 (FUMH); Bojnourd, 3 km road of Baba Aman, Baba moosa slops, 1020 m, 17.5.2005, Memariani & Zangooei *s.n.* (FUMH); Kuh-e Binaloud, Akhlamad, Darreh-Akhlamad, 30.5.1948, Rechinger, Esfandiari & Aellen 4642 (45073-IRAN). Dargaz, 5 km towards Chelmir after Dodanloo, on the mountain, 650 m, 26.5.1982, Zokaei 1363 (FUMH).

20. *Cosentinia vellea* (Aiton) Tod. in Giorn. Sci. Nat. Econ. Palermo 1: 220. 1866. (*Cheilanthes vellea* (Aiton) F. Muell., Fragm. 5: 123. 1866, *Cheilanthes catanensis* (Cosent.) H.P. Fuchs, *Notholanea vellea* (Aiton) Desv.). (Fig. 18. Map 21).

Baluchestan: Sarbaz, 900 m, 30.3.1940, Salavatian 38124 (45068- IRAN); Ziaratgah to Sarbaz, 10.3.1974, Iranshahr & Ershad 38128 (45064-IRAN). Bushehr: Khormuj, Kuh-e Beyrami, 60 m, 3.2.1975, Iranshahr & Termeh 38123 (45067-IRAN). Kerman: Jiroft, Delfard, 1200-1500 m, 17.3.1971, Iranshahr & Termeh (45062-IRAN). Khuzestan: Dezful, Zireband, 480 m, 28.2.1973, Maleki 26490 (TUH); 12 km Behbehan from Aghajari, 400 m, 3.3.1972, Iranshahr & Termeh 14897 (45071-IRAN); Mahshar to Genaveh, 65 km SE of Hoveyzeh, Zeydan, 350 m, 29.2.1972, Iranshahr & Termeh 14899 (45082-IRAN); Doroud to Andimeshk (along railway), Talezang to Shevy waterfall, 16.5.2004, Eskandari (45288-IRAN) Fars: Takht-e

Jamshid, 65 km NW of Shiraz, 1618 m, 25.5.1987, collector unknown 28674 (TUH); Konartakhteh, 505 m, 6.3.1970, Iranshahr 38130 (45065-IRAN); 11 km N of Farash-band, 750 m, 3.3.1975, Iranshahr & Termeh 38129 (45066-IRAN); Farash-band, Kuh-e Pir, Konar Malek, 800-1300 m, 4.3.1975, Iranshahr & Termeh 38125 (45070-IRAN).

21. *Paragymnopteris marantae* (L.) K.H. Shing in Indian Fern J. 10: 229. 1993 (*Cheilanthes marantae* (L.) Domin). (Map. 22).

Reported specimens: Azarbaijan: Kalibar Protected Area, between Makidi and Veinagh, ca. 1500 m, at base of limeston rocks, Wendelbo & Assadi 17018 (WENDELBO 1976); Arasbaran, Tolua Ali, 650 m, Assadi & Vosoughi 24941 (TARI).

We were unable to check the above specimens, cited by KHOSRAVI (1998).

22. *Onychium divaricatum* (Poir.) Alston in Bol. Soc. Brot., ser. 2, 30: 21 (1956). (*Onychium melanolepis* (Decne) Kunze). (Figs 19, 51C. Map 23).

Bushehr: 60 km E of Bushehr, road of Kuh-e Siah, Teihoo–Khar pass, 500 m, 30.3.1957, Mobayen & Arefi 28427 (TUH); 0-14 mile N of Dalaki, 250 m, 2.3.1975, Iranshahr & Termeh 38169 (45168-IRAN); 5 mile to Taheri, 21.2.1975, Iranshahr & Termeh 38170 (45169-IRAN); Khormuj, Kuh-e Beyrami, 23.2.1975, Iranshahr & Termeh 38167 (45172-IRAN). Fars: Farshband, Ahram, 1.10.1951, collector unknown 38162 (45174-IRAN); Farshband, Kuh-e Piri, Konar Malek, 1000 m, 4.3.1975, Iranshahr & Termeh 38168 (45170-IRAN); Kazerun, Ghar-e Shapour, 7.3.1970, Iranshahr 38163 (45175-IRAN); Takht-e Jamshid (Persepolis), 29°56'1" N, 52°53'32" E, 1647 m, 29.3.2001, Akhani 16143 (Hb. Akh.); 18 km from Chenar-Shahijan towards Kazerun, ca. 2 km after Bishapour, c. 750 m, 19.11.1991, Akhani 7923 (Hb. Akh.); between Kazerun and Konartakhteh, 900 m, 3.3.1990, Ghahraman & Mozaffarian 9509 (TUH); 4.5 km after Komarej towards Kazerun, 29°40'43'' N, 51°30'13'' E, 800 m, 10.3.2004, Khosravi & Moussavi *s.n.* (SHIRAZ); Kazerun, Mashtan village, Hoorad valley, 29°33'4.6'' N, 51°31'25'' E, 999 m, 13.4.2007, Karimi *s.n.* (SHIRAZ). Hormozgan: Bandar-Abbas, Kuh-e Genu, 1400-1800 m, 11.3.1986, Ghahraman & Mozaffarian 5381 (TUH); 11 km E of

Senderk towards Dare Pahn, 26°47'37" N, 57°30'38" E, 521 m, 5.5.2008, Akhani, Khoshravesh & Memariani, *s.n.* (Hb. Akh.); Bandar-Abbas, Bandar-Charak to Gavbandi, 32 mile Boehi, 100 m, 19.2.1975, Iranshahr & Termeh 38166 (45171-IRAN). Kerman: Jiroft, Marz, Mamanak, Kuh-e Sefid (Bashagerd), 1200 m, 12.3.1978, Moussavi & Tehrani (45247-IRAN); Kerman to Bandar-Abbas, 1.2.1949, Sarkissian (45173-IRAN).

23. *Pteris cretica* L., Mant. Pl.: 130. 1767. (Figs 20, 51D, E. Map 24).

Ardebil: Heyran, Agh Chai, 10.9.2007, Eskandari & Torabi (45411-IRAN); Khalkhal, Andabil, Naav, 10.9.2007, Eskandari & Torabi (45424-IRAN). Gilan: 14 km from Asalem towads Khalkhal, 300 m, 16.5.1977, Termeh & Matin (45356-IRAN); Talesh, Asalem, 15.5.1971, Iranshahr 38200 (45199-IRAN); Loumir, 14.5.1967, Abaii 12131 (45198-IRAN); Fouman, 5 km Masouleh forest, 2.8.1999, Termeh & Eskandari 60 (45217-IRAN); Rezvanshahr, Pare-sar, Visadar, 100 m, 18.4.2006, Eskandari & Torabi (45225-IRAN); ca. 30 km S of Rasht on the road towards Rudbar, 3 km N of Emamzadeh-Hashem, Golsarak, moist valley along the river, 37°2’32" N, 49°37’42" E, 135-140 m, 24.11.2000, Akhani 14499 (Hb. Akh.); 20 km NW of Rezvanshahr towards Astara, Gisoum Forest Park, ca. 50 m, alluvial lowland forest, 5.11.1999, Akhani 13785 (Hb. Akh.); Lunak waterfall, 19.5.2008, Eskandari & Pahlevani (45509-IRAN); Rahimabad to Sefidab, ca. 3 km to Sefidab, near the river, 360 m, 10.7.2001, Khoshravesh 17 (BBRL). Golestan: Jahan-Nama Protected Area, ca. 7 km from Kord Kuy towards Derazno, 36˚42’47’’ N, 54˚05’53’’ E, 1670-1750 m, 18.3.2005, S.M. Jafari 1547 (BBRL); Ziarat to Naharkhoran forest, 27.8.1975, Moussavi & Karavar (45258-IRAN); ibid., 30.4.1984, Sharif 84 (45195-IRAN); Aliabad, Kabudwal forest, 14.9.2005, Eskandari (45134-IRAN); Gorgan, Naharkhoran, 21.4.1977, Riedle & Ershad 15792 (45194-IRAN); ibid., 450 m, 8.9.1988, Delghandi, Tehrani & Karavar (45200-IRAN); Gorgan, Ringo forest, 50 m, Eskandari (45342-IRAN); Gorgan, Shamushak, 10.5.2007, Eskandari, Shirzadian & Pahlevani (45478-IRAN). Mazandaran: 10 km Chalus to Karaj, 16.5.2007, Eskandari & Pahlevani (45479-IRAN); Chalus forest, 50 m, 5.4.1977, Moussavi & Termeh (45355-IRAN); Chalus Tal, 14.3.1966, Iranshahr 12009 (45201-IRAN); Chalus to Shahsavar, Abbasabad, 19.9.1971,

Delghandi & Habashi 38207 (45186-IRAN); Cheshmestan, 5 km to Vaz Tange village, 30.6.2008, Amini Rad (45493-IRAN); 25 km to Nour, lowland forests close to the Caspian Sea coast, 24.7.1998, Akhani 13144 (Hb. Akh.); Ramsar to Javaherdeh, ca. 10 km after Ramsar, 400-800 m, 30.5.2001, Khoshravesh 9 (BBRL); Ramsar, Jannat-Rudbar, 15.5.2007, Eskandari & Pahlevani (45262-IRAN); ibid., Sadatmahalleh, 21.5.1951, collector unknown 38203 (45193-IRAN); Chalus, 1100 m, 23.6.1982, Ghahraman & Aghustin 28647 (TUH); Nowshahr, Chelendar, 600 m, 30.3.1965, Tregubov 8650 (TUH); Shahsavar, Kamarband, 8.6.1956, Sabeti 38210 (45188-IRAN); ibid., Kelarabad, 8.6.1956, Sabeti 38204 (45191-IRAN); Tonekabon, Dohezar forest, 12.3.2003, Eskandari (45266-IRAN); Tonekabon, road towards Mirza Kuchek-Khan forest, 2.3.1983, Zargani (45357-IRAN); Nowshahr, Palangchal, 27.1.1956, Asefi (45190-IRAN); ibid., Shahrposht, 16.6.1955, Pishkari 38208 (45187-IRAN); ibid., Lajim, Rig-cheshmeh, 7.10.1956, collector unknown 38209 (45189-IRAN); ibid., Maadan-e Sang, 10.9.1966, Iranshahr 38201 (45202-IRAN); Galanderoud, 16.5.1956, collector unknown 38202 (45192-IRAN); Kheiroud-Kenar, 31.3.1965, Ghahraman 28648 (TUH); Neka, 27.7.1975, Moussavi & Karavar (45275-IRAN); Behshahr, Sang-e-Now, 13.5.2007, Eskandari, Shirzadian & Pahlevani (45480-IRAN); Pol-e Sefid, Sangdeh, Klij-kolah (Khorramabad), forest, 3.10.1984, Termeh & Matin (45236-IRAN).

24. *Pteris dentata* Forssk. subsp. *flabellata* (Thunb.) Runemark in Bot. Not. 115: 190. 1962. (Fig. 21. Map 25).

Gilan: 20 km NW of Rezvanshahr towards Astara, Gisoum Forest Park, 3 km S of the road, 37°40’ N, 48°60’ E, ca. 50 m, swampy forest dominated by *Buxus hyrcana*, 22.11.2000, Akhani 14428 (Hb. Akh.). Mazandaran: 25 km to Nour, lowland forests close to the Caspian Sea coast, 24.7.1998, Akhani 13145 (Hb. Akh.); forests near Tonekabon, 28.9.1971, Maleki 26466 (TUH); Nowshahr, 500 m, 26.3.1966, Tregubov 28645 (TUH); Nowshahr, 27.3.1966, Mobayen 28052 (TUH); Kheiroud-Kenar, 31.3.1965, Tregubov 28646 (TUH); Kelardasht, 1240 m, 26.9.1965, collector unknown 38196 (45203-IRAN).

25. *Pteris vittata* L., Sp. Pl.: 1074. 1753. (Map. 26).

Illustration: Miller (1996: Page 56, Fig. C).

Khuzestan: Siachal, Koelz 15247.

The above specimen, not seen by us, was verified by S.P. KHULLAR (unpubl.) for the purpose of his Flora Iranica account. The species was also reported by PARSA & MALEKI (1978) from the Islands of the Persian Gulf.

Aspleniaceae

26. *Asplenium adiantum-nigrum* L., Sp. Pl.: 1081. 1753. (*Asplenium yuanum* Ching in Bull. Fan Mem. Inst. Biol., Bot. 10: 174. 1940). (Figs 22, 52A. Map 27).

Ardebil: Ardebil to Astara, Damiroghlikishi forest, 1000 m, 7.12.1978, Moussavi, Termeh & Habibi 38763 (45329-IRAN); Heyran, 1900 m, 16.9.2007, Eskandari & Torabi (45420-IRAN); ibid., Agh Chai, 950 m, 13.9.2007, Eskandari & Torabi (45434-IRAN); Hoor to Lader, 980 m, 14.9.2007, Eskandari & Torabi (45419-IRAN); ibid., 1900 m, 16.9.2007, Eskandari & Torabi (45433-IRAN). Gilan: Astara, Lavande-vil, Latoon (forest & waterfall), 900 m, 17.4.2006 Eskandari (45222-IRAN); Hashtpar, Shafaroud forest, 9.10.199, Delghandi (45036-IRAN); Hashtpar to Asalem, Lisar, 16.5.1971, Iranshahr 38113 (45059-IRAN); Rudsar, Karesang, Chorteh forest, 1600 m, 6.1959, Maleki 26496 (TUH). Golestan: Gorgan, Naharkhoran, 5.11.1960, Sabeti (45037-IRAN); ibid., 450 m, 21.8.1978 Termeh, Moussavi & Tehrani *s.n.* (45280-IRAN); Gorgan, Shast-kola, Eskandari (45364-IRAN); Gorgan, Ziarat, Eskandari (45346-IRAN); Bandar-e Gaz (forest), 30.4.1948, Sharif 86S (45034-IRAN); ibid., 30.4.1948, Sharif 86 (45061-IRAN); Gonbad-e Kavus, 41 m, 18.4.1967, Tregubov 28393 (TUH). Golestan: Jahan-Nama Protected Area, ca. 2 km after Ziarat village, 36˚41’01’’ N, 54˚27’45’’ E, 1177 m, 17.3.2005, S.M. Jafari 1535 (BBRL); Golestan National Park, 6 km E of Tangerah station towards Tang-e Gol, 1 km S of main road, Darreh-Shahtiq (Shahtiq valley), 590-670 m, 4.7.1994, Akhani 11693 (Hb. Akh.); ibid., ca. 8 km NE of Tangerah, Qorghon forest, NE of Khojeh Galdi, 1150-1580 m, 29.6.1995, Akhani, 11518 (Hb. Akh.); ibid., Qorghon rocks, steep slopes under the shade of trees, 37° 28’ N, 55°47’ E, 1000-1200 m, 8.7.1999, Akhani 13679 (Hb. Akh.); S of Kord Kuy, forests between Kord Kuy and Radekan, 300-600 m, 18.4.2005, Memariani 35820 (FUMH).

Mazandaran: Abbasabad to Kelardasht, 15.5.2007, Eskandari, Shirzadian & Pahlevani (45465-IRAN); Kelardasht, Ujabeyt, Asalak forest, 1400 m, 19.3.1978, Termeh, Matin & Tehrani 38144 (45060-IRAN); ca. 8 km S of Kojur, between Kodir and Koliak village, submonate forest dominated by *Quercus castaneifolia*, *Tilia caucasica*, *Crataegus* and *Sorbus torminalis*, 36°27'10" N, 51°43'55" E, 1235 m, 12.9.1999, Akhani 13754 (Hb. Akh.); Nowshahr, Shahrposht, 17.6.1995, Pishkari 242 (45035-IRAN); Javaherdeh, Leibi-e Tale-Kash, 1600-1800 m, 3.8.2001, Khoshravesh 15 (BBRL); Tonekabon, Dohezar road, 15.5.2007, Eskandari & Pahlevani (45466-IRAN); Orim to Taru, 2000 m, 7.6.1959 Wendelbo 1128 (45033-IRAN); Chelendar, 600 m, 30.3.1965, Mobayen 28392 (TUH); Liwan, 10-30 m, Mobayen 8390 (TUH).

REICHSTEIN *et al.* (1994) placed Iranian plants of *Asplenium adiantum-nigrum* in subsp. *yuanum* (Ching) Viane *et al.*, considered as the allo-tetraploid that arose by chromosome doubling from the cross between *Asplenium cuneifolium* subsp. *woronowii* (Christ) Viane *et al.* and *Asplenium onopteris* L. They listed several specimens from N Iran as intermediate between *Asplenium adiantum-nigrum* subsp. *adiantum-nigrum* and subsp. *yuanum*. In the Flora Iranica account (Reichstein & Viane ined.), *Asplenium adiantum-nigrum* subsp. *yuanum* is treated as a synonym of *Asplenium adiantum-nigrum,* also considering that neither *Asplenium cuneifolium* nor *Asplenium onopteris* have so far been collected in Iran.

27. *Asplenium ceterach* L., Sp. Pl.: 1080. 1753. (*Ceterach officinarum* Willd.). (Figs 23, 52B. Map 28).

Ardebil: Heyran, 980 m, 14.9.2007, Eskandari & Torabi 45416 (IRAN); Heyran, Veneh Bin, 1450 m, 14.9.2007, Eskandari & Torabi 45443 (IRAN). Azarbaijan: Kalibar, Vaighan, Ainalou forest, 4.7.1978, Termeh, Moussavi & Habibi 38776 (45333-IRAN); ibid., Kuh-e Herreh Sar, 8.7.1978, Termeh, Moussavi & Habibi *s.n.* (45335-IRAN). Fars: Tang-e Bolhayat, near Dasht-e Arjan, 120 m, 18.3.1999, Khosravi & Nikookar 25 (SHIRAZ); Dasht-e Bar, Kotal-e Dokhlar to Kotal-e Pirezan, 1400 m, 3.10.1970, Iranshahr 38121 (45111-IRAN). Gilan: Talesh, Lisar, Ghaleh-e Salsal, 200 m, 16.4.2006, Eskandari & Torabi 45226 (IRAN); Shah-e Shahidan, Siahdashtebon, Dorfak Mt., 21.5.2008, Eskandari & Pahlevani (44503-

IRAN). Golestan: Azadshahr, Ramian, Shish-ab forest, 26.5.1982, Termeh & Zargani *s.n.* (45234-IRAN); Golestan National Park, ca. 3 km E of Kondeskuh, in valley of Qez-Qaleh,800-850 m, 5.8.1994, Akhani 9969 (Hb. Akh.); 3 km E of Tang-e Gol, Darreh-Abshar, 770 m, 8.7.1994, Akhani 6045 (Hb. Akh.); Tang-e Gol, 600 m, 13,10.1976, Termeh & Matin 45309 (IRAN); ibid., 20.4.1974, Riedl & Ershad 15798 (45023-IRAN); ibid., 12.4.1967, Iranshahr 38120 (45112-IRAN). Hormozgan: Bashagerd, Sinderk, 260 m, 14.2.1973, Iranshahr & Moussavi 45252 (IRAN). Kermanshah: Gilan-e Gharb, 24.4.1968, Iranshahr 38122 (45024-IRAN). Kohkilooye va Boyer Ahmad: Basht, Tol-chega, Deh-e Barabar to Sarcheshmeh, 1200 m, 30.4.1989, Moussavi, Delghandi & Fatehi (45233-IRAN). Kordestan: Kamyaran, Sirvan river, Palangan, 19.5.2006, Shirzadian, Eskandari & Bahramishad (45254-IRAN); Marivan, Uraman-e Takht, 20.5.2006, Eskandari, Shirzadian & Bahramishad (45253-IRAN). Lorestan: Khorramabad, Dougar, 1600 m, 14.5.1999, Veiskarami 23574 (TUH); Alashtar, Tang-e Kahman, 27.6.2007, Eskandari, Shirzadian & Bahramishad (45446-IRAN); Doroud to Andimeshk (along railway), Talezang to Shevy waterfall, 16.5.2004, Eskandari (45289-IRAN); Khorramabad, Makhmalkuh, 16.5.2004, Eskandari (45287-IRAN); Khorramabad, Nojian waterfall, 20.4.2002, Eskandari (45260-IRAN). Mazandaran: Karaj to Chalus, after Tunel-e Kandovan, hills near station Naharkhoran, 1600 m, 20.8.1999, Sh. Zarre 376 (TUH). Tehran: Nyavaran, Shahabad valley, 1170 m, 28.3.1959, Mobayen 28404 (TUH); Karaj, 1520 m, 6.3.1959, Mobayen 28405 (TUH). Khorasan: S of Bojnourd, Rein, Alkhas valley, SW slops, 37°23'51" N,57°2' 33" E, 1850-1920 m, 27.5.2006, Memariani & Zangooei 37745 (FUMH); Bojnourd, Darkesh to Nargesli, 15.3.2005, Memariani & Zangooei 35779 (FUMH); W of Bojnourd, between Darkesh and Haver, Roudkhaneh, 1300 m, 9.7.2001, Joharchi 33874 (FUMH); ibid., 1350 m, 13.6.2001, Joharchi 33786 (FUMH); NW of Bojnourd, between Quri Meydan and Dashtak, 650-700 m, 28.4.2001, Joharchi & Zangooei 33404 (FUMH); 5 km to Chelmir, after Dodanloo, on the mountain, 650 m, 26.5.1982, Zokaie 1362 (FUMH).

Only the tetraploid *Asplenium ceterach* subsp. *ceterach* is known with certainty in Iran, but diploid plants should be looked for.

28. *Asplenium lepidum* C. Presl subsp. *haussknechtii* (Godet & Reut.) Brownsey in Bot. J. Linn. Soc. 72: 261. 1976. (*Asplenium haussknechtii* Godet & Reut., *Asplenium hermanni-christii* Fomin). Will be treated as a mere variety by Reichstein & Viane in Flora Iranica. (Map 29).

Chaharmahal-o-Bakhtiari: Borujen, Sabzehkuh, 3330 m, 28.7. 1973, M. Riazi 10325 (TARI).

29. *Asplenium ruta-muraria* L., Sp. Pl.: 1081. 1753. (Fig. 24, 52C. Map 30).

Azarbaijan: Kalibar, Vaighan, Kuh-e Herreh Sar, 1500 m, 8.7.1978, Termeh, Moussavi & Habibi (45361-IRAN). Golestan: Golestan National Park, ca. 3 km NE of Dast-e Shah station, ca. 6 km E of Kondeskuh, southern slope of Shakha Mt., 1450-1500 m, 15.5.1995, Akhani 10650 (Hb. Akh.); 3 km E of Tang-e Gol, N of the road, W Abshar 780- 1000 m, 26.6.1995, Akhani 11470 (Hb. Akh.). Khorasan: Hezar Masjed Mt., Sistan forest, 2100 m, 10.6.1990, Joharchi & Faghihnia 18754 (FUMH); Mashhad, Akhlamad waterfall, 5.7.1980, Zokaei 1457 (FUMH); Bojnourd, between Haver and Kalat-e Zaman Soofi, 1600 m, 24.8.2003, Joharchi 35176 (FUMH); W of Darkesh, rock cliffs above Kani Mokhtar valley, 2100 m, 20.6.2004, Joharchi & Aydani 35602 (FUMH). Mazandaran: 30 km E of Pol-e Sefid, Sangdeh forest, 2000 m, 11.7.1974, Renz & Iranshahr 16816 (45057-IRAN); Nowshahr, 5.11.1960, Sabeti 38114 (45058-IRAN); Orim, 2100 m, 5.7.1959, Wendelbo 1066 (45056-IRAN).

In Iran, two subspecies are found: *Asplenium ruta-muraria* subsp. *ruta-muraria* (tetraploid) and subsp. *dolomiticum* Lovis & Reichst. in Brit. Fern Gaz. 9: 143. 1964 (diploid).

30. *Asplenium scolopendrium* L., Sp. Pl.: 1079. 1753 [*Phyllitis scolopendrium* (L.) Newman] (Fig. 25, 52D. Map 31).

Ardebil: Heyran, Agh Chai, 950 m, 13.9.2007, Eskandari & Torabi (45412-IRAN). Gilan: Asalem, 1200 m, 15.7.1968, Mirzayans 38176 (45176-IRAN); ibid., 1300 m, 15.5.1971, Iranshahr 38177 (45153-IRAN); Astara, Lavande-vil, Latoon (forest & waterfall), 900 m, 17.4.2006, Eskandari & Torabi (45223-IRAN); Loumir, 14.5.1967, Abaii 38175 (45178-IRAN); Talesh (Tavalesh) forest, ca. 30 km SW

Astara, 10 km W of Havigh, degradated lowland forests near Zoomureh village, 38˚6'35'' N, 48˚49'32'' E, 410-487 m, 8.9.2000, Akhani & Salimian 14330 (Hb. Akh.); Rezvanshahr, Pare-sar, Visadar, 100 m, 18.4.2006, Eskandari & Torabi (45224-IRAN); Rahimabad, 150 m, 24.3.1959, Torabzadeh 28411 (TUH). Rahim abad to Sefidab, ca. 3 km to Sefidab, near river, 200-400 m, 10.7.2001, Khoshravesh 18 (BBRL); 6 km Siahkal to Deylaman, 130 m, 16.5.2005, Agabeygi 38770 (45334-IRAN); Rudbar to Rasht, 5 km to Mirza Kuchak Khan forest, near Mazian village, 80 m, 28.10.1999, Sh. Zarre (TUH). Golestan: Gorgan, Naharkhoran, 8.9.1988, Delghandi, Tehrani & Karavar (45182-IRAN); ibid., 21.4.1974, Riedl & Ershad 15793 (45152-IRAN); ibid., 450 m, 21.7.1987, Termeh, Moussavi & Tehrani (45279-IRAN); Gorgan, Ringo forest, 30.5.2005, Eskandari (45137-IRAN); Gorgan, Shamushak, 10.5.2007, Eskandari, Shirzadian & Pahlevani (45351-IRAN); ibid., 30.8.1982, Zargani (45352-IRAN); Gorgan, Ziarat, 29.5.2005, Eskandari (45354-IRAN); Ziarat to Naharkhoran, 700 m, 27.7.1975, Moussavi & Karavar (45257-IRAN); Ziarat to Naharkhoran, 30.4.1948, Sharif 85 (45158-IRAN); Aliabad, Kabudwal forest, 1.9.2007, Eskandari (45110-IRAN); ibid., 14.9.2005, Eskandari (45135-IRAN); Jahan-Nama Protected Area, ca. 7 km after Kord Kuy towards Derazno, 36˚42'47'' N, 54˚05'53'' E, 1670-1750 m, 18.3.2005, S.M. Jafari 1548, 2443 (BBRL); Golestan National Park, 6 km E of Tangerah station towards Tang-e Gol, Darreh-Shahtiq (Shahtiq valley), 37˚22'60'' N, 55˚52' E, 560 m, 5.7.1994, Akhani 9335 (Hb.Akh); NW border of the park, SE of Zav, 37˚31' N, 55˚46' E, 900-1200 m, 14.8.1995, Akhani 12337 (Hb. Akh.); ca. 3 km E of Kondeskuh, in valley of Qez-Qaleh, 800-850 m, 37˚19' N, 55˚47' E, 5.8.1994, Akhani 9916 (Hb. Akh.); S of Tangerah, Kondeskuh road, 13.7.1987, Rezaei & Zangooei 15568 (FUMH); S of Moraveh Tappeh, E of Goli Dagh, 1150-1200 m, 5.8.2003, Joharchi 35087 (FUMH); forests of Ziarat valley, 1400-1525 m, 19.4.2005, Memariani 33831 (FUMH); Gorgan, Naharkhoran forest, W of river, 12.3.1988, Zinalli (30148-FUMH). Mazandaran: Ramsar to Javaherdeh, ca. 10 km after Ramsar, 400-800 m, 15.11.2001, Khoshravesh 21 (BBRL); Tonekabon, -20 m, 10.6.1970, Maleki 26497 (TUH); Chalus forest, 50 m, 5.4.1977, Moussavi & Termeh (45353-IRAN); Chalus Tal, 14.9.1966, Iranshahr (45156-IRAN); Chalus to Shahsavar, Abbasabad, 19.7.1981, Ershad & Izadyar 38174 (45177-IRAN); Chalus,

40 m, 7.1974, collector unknown 28410 (TUH); Motel Gho (Salmanshahr), 23.6.1982, Ghahraman & Aghustin 28412 (TUH); Shahsavar, Dani-khani to Jannat-Roudbar, 7.9.1976, Moussavi & Jannati 38171 (45180-IRAN); Tonekabon, Dohezar forest, 26.3.2003, Eskandari (45101-IRAN); Nowshahr, Kelarabad, 8.6.1956, Sabeti 38181 (45183-IRAN); ibid., Lajim, Rig-cheshmeh, 7.10.1956, collector unknown 38173 (45179-IRAN); ibid., Maadan-e sang, 10.9.1966, Iranshahr 38182 (45157-IRAN); ibid., Palangchal, 27.1.1960, Asefi 38178 (45155-IRAN); ibid., Salaheddin-kola, 15.10.1956, collector unknown 38172 (45181-IRAN); ibid., Shahrposht, 17.6.1955, Iranshahr 38180 (45154-IRAN); ibid., Sisangan forest, 6.11.2003, Aminirad & Sadeghi (45235-IRAN); Chelendar, 30 m, 25.3.1966, collector unknown 28408 (TUH); Aghamashad, Lajim, 750 m, 1.5.1965, collector unknown 28529 (TUH); Amol, 16.11.1949, Gharadaghi 38179 (45184-IRAN); Amol, Baliran, 15.7.2007, Aminirad (45445-IRAN); Behshahr, Sang-e-Now, 13.5.2007, Eskandari, Shirzadian & Pahlevani (45221-IRAN); Behshahr, Mahdirajeh, 22.5.2008, Eskandari & Pahlevani 45506 (IRAN).

31. *Asplenium septentrionale* (L.) Hoffm., Deutschl. Fl. 2: 12. 1796. (Figs 26, 53A. Map 32).

Ardebil: Hoor to Lader, 950 m, 13.9.2007, Eskandari & Torabi (45435-IRAN); Sardabeh, 1450 m, 14.9.2007, Eskandari & Torabi (45427-IRAN); Sardabeh waterfall, 1900 m, 3.6.2004, Eskandari & Aghabeigi (45283-IRAN). Mazandaran: Chalus road, Siah-Bisheh, 1700 m, 27.9.1989, Ghahraman 8534 (TUH).

Additional reports by WENDELBO (1976) and ASSADI (1987) include Azarbaijan: Kalibar Protected Area, between Makidi and Veinagh, 1500 m, Wendelbo & Assadi 17017 (TARI); between Doghroon Mt. and Saigram-Dagh, 2500-2700 m, Assadi & Sardabi 24209, and between Kharil and Makidi, ca. 2000 m, Assadi & Vosoughi 24875 (TARI). Gilan: Damesh, E of Rudbar, 2100 m, Wendelbo & Ala 18208 (TARI). Semnan: Kuh-e Ghafri (Kuh-e Abr), N of Shahroud, 2500 m, Wendelbo & Foroughi, 12914 (TARI). We were unable to check these specimens.

In Iran, two subspecies are found: *Asplenium septentrionale* subsp. *septentrionale* (tetraploid) and subsp. *caucasicum* Fraser-Jenk. & Lovis in Notes Roy. Bot. Gard. Edinburgh 38: 281. 1980 (diploid).

32. *Asplenium trichomanes* L., Sp. Pl.: 1080. 1753. (Figs 27, 53B, C. Map 33).
Ardebil: Heyran, 1800 m, 14.9.2007, Eskandari & Torabi (45415-IRAN); Heyran, Agh Chai, 950 m, 13.9.2007, Eskandari & Torabi (45436-IRAN); ibid., Veneh Bin, 1450 m, 14.9.2007, Eskandari & Torabi (45425-IRAN); Hoor to Lader, 1900 m, 16.9.2007, Eskandari & Torabi (45483-IRAN); Khalkhal, Andabil, Naav, 9.10.2007, (45423-IRAN); Sardabeh, 1920, 14.9.2007, Eskandari & Torabi (45430-IRAN); 20 km Khalkhal to Asalem, 1900 m, 21.5.1974, Termeh & Moussavi (45098-IRAN); ibid., 1500 m, 5.9.1977, Termeh & Matin (45362-IRAN). Azarbaijan: Kalibar, Vaighan, Ainalou forest, 1450 m, 7.7.1978, Moussavi, Termeh & Habibi (45332-IRAN). Gilan: Hashtpar, Shafaroud forest, 9.10.199, Delghandi (45295-IRAN); Loumir, 14.5.1967, Abai 12130 (45097-IRAN); Rezvanshahr, Pare-sar, Visadar, 100 m, 19.4.2006, Eskandari & Torabi (45220-IRAN); 14 km Asalem to Khalkhal, 300 m, 5.16.1977, Termeh & Matin (45360-IRAN); Astara to Hashtpar 25 km. N of Hashtpar forest, 1000 m, 14.7.1978, Moussavi, Termeh & Habibi 38772 (45330-IRAN); Astara, Lavandevil, Latoon (forest & waterfall), 17.4.2006, Eskandari & Torabi (45227-IRAN); Fouman, 5 km Masouleh forest, 2.8.1999, Eskandari & Termeh (45218-IRAN); Hashtpar to Astara, Lisar, 16.5.1971, Iranshahr 38116 (45296-IRAN); Talesh, Lisar, Ghaleh-e Salsal, 200 m, 19.4.2006, Eskandari & Torabi (45228-IRAN); Siahkal to Daylaman Balaroud, 539 m, 16.5.2005, Aghabeigi (45317-IRAN). Golestan: Azadshahr, Ramian, Shish-ab, 26.5.1982, Termeh & Zargani (45244-IRAN); Bandar-e Gaz, 28.8.1948, Esfandiari 83 (45294-IRAN); Jahan-Nama Protected Area, from Takht-e Mirza towards Yarali, 36˚42’22’’ N, 45˚14’32’’ E, 1820 m, 18.3.2005, S.M. Jafari 2439 (BBRL); ibid., Mazookash, 36˚40’32’ N, 54˚24’96’’ E, 2223 m, 17.4.2006, S.M. Jafari 1757 (BBRL); Gorgan, Naharkhoran, 21.4.1974, Riedle & Ershad 15795 (45095-IRAN); ibid., 450 m, 21.8.197, Termeh, Moussavi & Tehrani 39322 (45276-IRAN); Gorgan, Shast-kola, Eskandari (45343-IRAN); Gorgan, Ziarat, Eskandari (45344-IRAN); ibid., 11.5.2007, Shirzadian, Eskandari & Pahlevani (45471-IRAN); Golestan National

Park, 8 km W of Tangerah towards Tang-e Gol, Darreh-Golestan, 550-600 m, 4.7.1994, Akhani 9292 (Hb. Akh.); ibid., Loveh waterfall, 28.7.1972, Iranshahr & Zargani (45304-IRAN); ibid., 20.4.1974, Riedle & Ershad 15797 (45093-IRAN); ibid., Tang-e Gol, 600 m, 13.10.1976, Termeh & Matin (45241-IRAN); ibid., Tangerah to Tang-e Gol, 420 m, 4.6.1975, Termeh (45243-IRAN); ibid., ca.1 km S of Kondeskuh (off the Park), 1020-1180 m, 6.8.1994, Akhani 9991 (Hb. Akh.); ca. 3 km E of Kondeskuh in valley of Qez-Qaleh, 800-850 m, 5.8.1994, Akhani 6610 (Hb. Akh.); ibid., ca. 3 km NE of Dasht-e Shah station, 6 km E of Kondeskuh, southern slopes of Shakha Mt., around Shakha spring, 1450-1550 m, 15.5.1995, Akhani 10649 (Hb. Akh.); Gorgan, Ziarat valley forests, 1400-1525 m, 14.4.2005, Memariani 35835 (FUMH). Khorasan: W of Mashhad, Gong Mt., 1500-1600 m, 1.6.2005, Joharchi & Zangooei (35050-FUMH); Faruj, Esfajir, 1.5.2007, Eskandari, Javadi & Torabi (45467-IRAN); W of Darkesh, rock cliffs above Kani Mokhtar valley, 2100 m, 20.6.2004, Joharchi & Aydani 35593 (FUMH). Mazandaran: Ramsar to Javaherdeh, Seiqhal Mahalleh, near the waterfall, 1775 m, 30.7.2001, Khoshravesh 22 (BBRL); Ramsar, Jannat-Rudbar, 15.5.2007, Eskandari & Pahlevani (45468-IRAN); Chalus, Doab, Verysar, 1450 m, 9.7.1980, Termeh, Daneshpazhuh & Zargani (45363-IRAN); Abbasabad to Kelardasht, 15.5.2007, Shirzadian, Eskandari & Pahlevani (45470-IRAN); Kelardasht, 2 km Rudbarak towards Alamkuh, 1520 m, 18.4.1978, Termeh, Matin & Tehrani 38143 (45297-IRAN); Kelardasht, 4 km Rudbarak to Alamkuh, 1580 m, 18.4.1978, Termeh, Matin & Tehrani 38143 (45293-IRAN); Kelardasht, Ujabeyt, Asalak, 19.4.1978, Termeh, Matin & Tehrani (45099-IRAN); Tonekabon, Dohezar forest, 20.3.2003, Eskandari (45268-IRAN); Shahsavar, valley of Liresar, 580 m, 30.10.1967, Tregubov 28398 (TUH); Chelendar, 650 m, 30.3.1965, Mobayen 28397 (TUH); Nowshahr, Galanderoud, 12.6.1956, Sabeti 38115 (45299-IRAN); Haraz road, Zardman, 19.7.2007, Aminirad (45444-IRAN); Behshahr, Sang-e-Now, 13.5.2007, Shirzadian, Eskandari & Pahlevani (45469-IRAN); Orim, 2700 m, 5.7.1959, Wendelbo 1067 (45094-IRAN); Nashtaroud, -26 m, 23.7.1972, Maleki 26476 (TUH); Liwan, 10- 30 m, 18.6.1959, Dyezizey 28396 (TUH); Sangdeh, Dodangeh forest, 1100 m, 29.9.1984, Matin & Termeh (45305-IRAN); Pol-e Sefid, Sangdeh, Pachi, Dodangeh, forest, 1120 m, 2.9.1984, Matin & Termeh (45242-IRAN); 30 km

E of Pol-e Sefid, Sangdeh forest, 2000 m, 11.7.1974, Renz & Iranshahr 16817 (45096-IRAN). Semnan: Shahroud, Khosh Yeilagh, Gardaneh Olang, 1950 m, 18.8.1978, Termeh, Moussavi & Tehrani 39316 (45277-IRAN).

In Iran, two subspecies are found: *Asplenium trichomanes* subsp. *trichomanes* (diploid) and subsp. *quadrivalens* D.E. Mey. in Ber. Deutsch. Bot. Ges. 74: 456. 1962 (tetraploid).

33. *Asplenium viride* Huds., Fl. Angl.: 385. 1762. (Fig. 28. Map 34).

Gilan: Shah-e Shahidan, Siahdashtebon, Dorfak Mt., 2200 m, 21.5.2008, Eskandari & Pahlevani (45502-IRAN). Kerman: Kuh-e Lale-Zar, Zard valley, 3700 m, 17.6.1975, Foroughi & Assadi 16339 (TARI). Mazandaran: S of Ramsar between Baqh-e Dasht and Lapasar, 2800 m, 11.8.1976, Runemark & Maassumi 51755 (TARI).

34. *Asplenium fissum* Willd., Sp. Pl. 5 (1): 348. 1810.

This species is doubtfully listed by WENDELBO (1976) on the faith of an earlier report by NABELEK (1929). There is a specimen in TUH labelled Tehran: Chalus road, 20 km to Karaj, Aderan, 1700 m, 26.5.1959, Mobayen 28707 (TUH). It may belong to *Asplenium fissum*. Therefore, we have included this species in the key.

Woodsiaceae

35. *Athyrium filix-femina* (L.) Roth, Tent. Fl. Germ. 3: 65. 1799. (Figs 29, 54A. Map 35).

Ardebil: Heyran, Aghachai, 950 m, 13.9.2007, Eskandari & Torabi (45512-IRAN); Hoor to Lader, 900 m, 16.9.2007, Eskandari & Torabi (45453-IRAN). Gilan: 30 km Asalem to Khalkhal, 16.6.2007, Pahlevani & Asef (45511-IRAN); 20 km NW of Rezvanshahr towards Astara, Gisoum Forest Park, ca. 50 m, alluvial lowland forest, 5.11.1999, Akhani 13786 (Hb. Akh.); Rezvanshahr, Pare-Sar, Visadar, 100 m, 18.4.2006. Eskandari & Torabi (45514-IRAN); Asalem to Khalkhal (forest), 1200 m, 31.8.1987, Delghandi, Karavar & Tehrani (45515-IRAN); 14 km to Asalem in the road towards Khalkhal, 37°41’ N, 48°49’ E, 580-620 m, moist valley with *Acer*

velutinum trees, 23.11.2000, Akhani 14420 (Hb. Akh.); Astara to Ardebil, Heyran Pass, 29.6.1972, Maleki 26470 (TUH, as *Athyrium distentifolium*); Asalem, Lumir, 1000 m, 15.5.1967, Ahai 38118 (45164-IRAN); Asalem forest, 1200 m, 15.7.1968, Mirzaian 38119 (45162-IRAN); Asalem, 50 m, 24.6.1972, Maleki 26471 (TUH, as *Athyrium distentifolium*); 6 km After Siahkal to Deylaman, 86 m, 17.5.2005, Aghabeigi (45320-IRAN). Golestan: Lowe, 307 m, collector unknown, 28051 (TUH); Golestan National Park, N of Shakha Mt., 1750-1900 m, 4.7.1995, Akhani 11598 (Hb. Akh.); ca. 2 km S of Koilar, 1600-1750 m, 4.6.1995, Akhani 11236 (Hb. Akh.); western most of Qorghon Mt., NW slopes of Beilikuh, 12.10.1995, Akhani 12209 (Hb. Akh.). Mazandaran: Ramsar, Javaherdeh, Seighal Mahalle, near the water fall, 1770 m, 30.6.2001, Khoshravesh 3 (BBRL); 25 km to Nour, lowland forests close to the Caspian Sea coast, 24.7.1998, Akhani 13143 (Hb. Akh.); Kelardasht, Mazuchal, 14.5.2007, Eskandari & Pahlevani (45002-IRAN); Kiasar, forest, 1300 m, 10.7.1974, Renz & Iranshahr 16820 (45165-IRAN); Nour, Kolaychal, 2500 m, 14.9.1966, Iranshahr 12117 (IRAN); Amol, 36 m, 17.11.1949, Charachedaghi 38117 (45163-IRAN); S of Shahsavar, Liresar forest, 120 m, 28.10.65, Tregubov 28400 (TUH, as *Athyrium distentifolium*); Abbasabad to Kelardasht, 19.9.1972, Maleki 26473 (TUH); Kiasar, Pele forest, 1250-1600 m, 10.7.1974, Renz & Iranshahr 16820 (IRAN); Aghamashhad, 750-800 m, 16.5.1959, Mobayen 28402 (TUH); Lajim, Esrak, 750 m, 12.5.1966, Tregubov 28400 (TUH).

A very variable species. Based on field studies and study of ample specimens from N Iran, in particular from Golestan National Park, we found that morphological variation largely depends on the time of collection (AKHANI 1998). Usually, specimens collected during late growing season, in October, have ± undulate, finely dissected pinnules and remote pinnae, whereas those collected in the early growing season, in June, show shallowly divided, flat pinnules and closely set pinnae. *Athyrium distentifolium* Opiz, which occurs in Caucasia and Turkey but was not known so far from the Flora Iranica area, was recently reported by MAZOOJI *et al.* (2006) from Mazandaran: Abbasabad to Kelardasht, 10 km towards Kelardasht, 850-900 m, Mazooji 2001 (10845-IAUH). This specimen was a misidentification of *Dryopteris dilatata*. We found several specimens that were misidentified as *Athyrium distentifolium* in TUH but have the oblong sori and persistent indusium

typical of *Athyrium filix-femina*. We, therefore, regard the occurrence of *Athyrium distentifolium* in Iran as open to doubt.

36. *Cystopteris alpina* (Lam.) Desv. in Mém. Soc. Linn. Paris 6: 264. 1827 ("*C. regia*" auct., Denk 1998). (Fig. 30E. Map 36).

This species was reported by DENK (1998) under *Cystopteris regia*, from Central Alborz: Mazandaran: Sangdeh near Pol-e Safid, between Sangdeh and the Mt. Naro, 2200-2300 m. According to Denk, the pinnule teeth of "*Cystopteris regia*" are emarginate, the notch being fed by a vein, whereas in *Cystopteris fragilis* the vein ends in acute teeth. In extensive material we examined from Central Alborz, we were put hard to recognise this character (Fig. 30E). The only specimen which seems to fit *Cystopteris alpina* was collected in the subalpine zone on the Iranian side of Kopetdagh Mt. in Khorasan: 97 km N of Mashhad, between Karimabad and Hezar Masjed, 2450 m, 2.8.1987, Joharchi & Zangooei 15698 (FUMH).

37a. *Cystopteris fragilis* (L.) Bernh. in Neues J. Bot. 1 (2): 27. 1805.
subsp. ***fragilis***. (Figs 30 A-C, 54B. Map 37).
Ardebil: Hoor to Ladar (forest), 1900 m, 16.9.2007, Eskandari (45431-IRAN); Khalkhal, Kolour, Osbu Mt., 1700 m, 19.4.2006, Eskandari (45219-IRAN); Meshkinshahr, Ghotoursou, 2.6.2004, Eskandari (45273-IRAN); Ghotoursou, Kuh-e Sabalan, 2600 m, 13.7.1971, Termeh (45025-IRAN); Sabalan, Shirvan-Darreh, 980 m, 14.9.2007, Eskandari (45422-IRAN); Shabil, Sabalan, 3700 m, 16.8.2007, Eskandari (45456-IRAN); 4150 m, 16.8.2007, Eskandari (45458-IRAN); Meshkinshahr, Qotur Sou, Kuh-e Sabalan, 30.5.2005, Aghabeygi & Bahramishad (45303-IRAN); Namin, Anbaran-Olia, 950 m, 13.9.2007, Eskandari (45414-IRAN); Sardabeh, 1920 m, 14.9.2007, Eskandari (45429-IRAN); Sardabeh waterfall, 3.6.2004, Eskandari & Aghabeigi (45282-IRAN); ibid., 20.3.2003, Eskandari & Aghabeigi (45206-IRAN). Azarbaijan: Marand, Zunuz, between Zunuzegh and Kuhkamar, 2500 m, 25.6.1994, Ghahraman & Mozaffarian, *s.n.* (TUH); Arasbaran Protected Area, 6 km Oskulou to Ilankesh, 8.6.2007, Pahlevani & Eskandari (45459-IRAN); Tabriz, Varzaghan, Chichakli forest, 11.6.2007, Pahlevani & Eskandari (45460-IRAN); Bostanabad, Atmish-alti, Sahand, Kuh-e Darvish,

4.8.1984, Termeh & Moussavi (45237-IRAN); Kalibar, Ghaaleh-Babak, Kuh-e Javidan, 3.6.2004, Eskandari (45271-IRAN); Nabidjan, Kuh-e Kalan, 2400 m, 21.7.1978, Termeh & Moussavi (45210-IRAN); Vaighan, Aynalu forest, 1450-1650 m, 7.7.1978, Termeh & Moussavi (45359-IRAN); Yaralujeh, Gherkh-Bulagh, 4 km N of Yarralujeh, 30.6.1978, Termeh & Moussavi (45205-IRAN); Sarab, Kuh-e Bozghoush, 2500 m, 27.7.1970, Izadyar (45029-IRAN). Chaharmahal-o-Bakhtiari: Kouhrang, Ghare Yakhi, 2450 m, Eskandari, Torabi & A. Javadi 45511 (IRAN). Esfahan: ca. 25 km SW of Natanz, foothills of southern slopes of Karkas Mont, 33°25'22" N, 51°47'49" E, 3020 m, 24.7.2003, Akhani 17158 (Hb. Akh.). Gilan: Shah-e Shahidan, Siahdashtebon, Dorfak mont., 21.5.2008, Eskandari & Pahlevani (45496-IRAN). Golestan: Central part of Golestan National Park, Aq-Su valley, around and margin of river, 37°22’6" N, 55°59'19" E to 37°22’16" N, 55°59'30" E, 750-900 m 7.6.2000, Akhani 14108 (Hb. Akh.); 6 km E of Tang-e Gol, Golzar, 800-950 m, 9.7.1994, Akhani 9630 (Hb. Akh.); Eastern border of Shakha Mt., S of Lateh Tas, 37˚19’30’’ N, 55˚51’ E, 1850-1900 m, rocky S facing slope with shrubby vegetation, 5.7.1995, Akhani 11638 (Hb. Akh.); Chartongi and Besh Jakhdan area, 1950-2000 m, 19.8.1995, Akhani 12016 (Hb. Akh.); ca. 30 km SE of Gorgan, ca. 10 km NE of Chaharbagh, Pir-Gerdehkuh, 36° 39’19” N, 54°34’35” E, rocky steep to subvertical N-facing slopes, ca. 2500-2600 m, 10.9.1999, Akhani 13713 (Hb. Akh.); Gorgan, Ziarat, 11.5.2007, Eskandari, Shirzadian & Pahlevani (45324-IRAN). Hamedan: 5 km Ganjnameh to Tuyserkan, 21.2.2004, Eskandari (45358-IRAN). Khorasan: Mashhad, Akhlamad water fall, 1500 m, 22.6.1950, collector unknown 28677 (TUH); Chenaran, Akhlamad waterfall valley, 1550 m, 15.5.2001, Joharchi & Zangooei 33552 (FUMH); SW of Mashhad, Akhlamad, 1500 m, 5.6.1988, Joharchi & Zangooei 16778 (FUMH); Akhlamad valley, 30.5.1948, Rechinger, Esfandiari & Aellen 4641 (45108-IRAN); NE of Chenaran, N of Baghich Goshab, 30 km Baghich to Hezar Masjed, 1900 m, 17.6.200, Hojjati & Zangooei 32916 (FUMH); S of Dargaz, Qaraqat valley, 2500 m, 28.5.2001, Joharchi 33615 (FUMH); Dargaz to Quchan, 70 km E of Dargaz, 1600 m, 23.4.2001, Faghihnia & Zangooei 33335 (FUMH); N of Quchan, Alibolagh forest, 1800 m, 15.5.2000, Faghihnia & Zangooei 32826 (FUMH); N of Quchan, Hasalmeh, Asalme, 1800 m, 15.5.2000, Faghihnia & Zangooei 33302 (FUMH); Bojnourd, between Haver and

Kotal-e Zaman Soofi, 1400-1600 m, 24.8.2003, Joharchi 35177 (FUMH); W of Bojnourd, Between Haver and Barfandil, 37˚24' N, 56˚46' E, 1700-1900 m, 6.6.2004, Joharchi & Aydani 35481 (FUMH); W of Bojnourd, Darkesh, rocks cliffs above Kani Mokhtar valley, 37˚23' N, 56˚46' E, 2100 m, Joharchi & Aydani 35603 (FUMH); Hezar Masjed Mt., Sistan forest, 2100 m, 10.6.1990, Joharchi & Faghihnia 18755 (FUMH); Faruj, Esfajir, 1.5.2007, Eskandari, Javadi & Torabi 45269 (IRAN). Kohkilooye va Boyer Ahmad: 30 km S of Yasouj, Sisakht, 2100 m, 8.9.1971, Zargani 14906 (45027-IRAN); Yasouj to Ardakan, 2080 m, 25.8.1987, Termeh, Delghandi & Tehrani (45239-IRAN); Yasouj, Sisakht, Cheshmeh Beshou, 2500 m, 25.8.1987, Delghandi & Tehrani (45238-IRAN); Sisakht, Cheshmeh Mishi, 2700 m, 2,7.2008, Eskandari, Torabi & A. Javadi 45515 (IRAN). Kordestan: Saghez to Marivan, Bastam, 24.5.2006, Shirzadian, Eskandari & Bahramishad (45251-IRAN). Lorestan: Doroud to Andimeshk (along railway), Talezang to Shevy waterfall, 16.5.2004, Eskandari 45285 (IRAN). Mazandaran: Ramsar, Javaherdeh, Seiqhal-Mahalleh, near waterfall, 1770 m, 30.7.2001, Khoshravesh 4 (BBRL); 32 km after Gachsar towards Chalus, 36°16' N, 51°15' E, *Carpinus orientalis* dominated steep slopes, W of Naharkhoran Environmental Protection Station, 1300-1500 m, 13.5.1999, Akhani 13506 (Hb. Akh.); 30 km E of Pol-e Sefid, Sangdeh forest, 2000 m, 11.7.1974, Renz & Iranshahr 16818 (45031-IRAN); 10 km W of Rineh, Khomeh, 2900 m, 21.7.1980, Moussavi, Habibi & Tehrani 38787 (45209-IRAN); Larijan, 12 km NW of Rineh, Gousfand-sara, Kuh-e Damavand, 3500 m, 22.7.1980, Moussavi, Habibi & Tehrani 39786 (45208-IRAN); Gousfand-sara, Kuh-e Damavand, 20.6.1982, Moussavi, Habibi & Tehrani (45306-IRAN); Nour, Kalej Heli-Poshte, Sardabeh Mt., 8.7.1982, Termeh, Moussavi & Tehrani, (45308-IRAN). Semnan: Shahroud to Bastam, Tash-e Olia, Kuh-e Shavar, 13.8.1987, Moussavi, Delghandi & Tehrani (45240-IRAN); Shahroud, Khosh-Yeilagh, 3.4.1947, Rechinger, Esfandiari & Aellen 5439 (45030-IRAN), Shahroud, Mojen, 1700 m, 27.6.2006, Eskandari (45248-IRAN); Shahroud, Tash to Kuh-e Shavar, 2600 m, 31.7.1975, Moussavi & Karavar (45250-IRAN). Tehran: Karaj, Alborz Mt., 8.8.1966, Zargani 6899 (45032-IRAN); N of Tehran, Darrakeh valley, N of Palangchal, rock walls along the valley, 35°51' N, 51°23' E, 2400 m, 5.8.1999, Akhani 13687 (Hb. Akh.); 4 km N of Fasham, Dorouteh, 24.5.1984, Moussavi &

Karavar (45302-IRAN); Darband, Shirpala waterfall, 2800 m, 9.6.2006, Eskandari (45292-IRAN); Darbandsar, Siah-ghar, 30.7.1981, Moussavi (45281-IRAN); Dizin, Pey-kamar, 2650 m, 22.6.1982, Moussavi, Habibi & Tehrani (45307-IRAN); Gadouk, Kuh-e Nizva, 3000 m, 29.2.1948, Behboudi & Aellen (45026-IRAN); Karaj to Chalus, Gajereh to Dizin, Darreh-Varangroud, 17.5.1977, Riedl & Habibi 37224 (45211-IRAN); Passghaleh, 27.6.1947, Sharif 106 (45028-IRAN). Zanjan: Mahneshan, Alam-Kandi, Darreh-Alagows, 1900 m, 1.8.1983, Mossavi, Habibi & Tehrani 45212 (IRAN).

37b. *Cystopteris fragilis* subsp. *dickieana* (Sim) Hook. f., Student Fl. Brit. Isl.: 464. 1870. (*Cystopteris dickieana* R. Sim, Gard. Farmers' J. 2: 308. 1848). (Fig. 30D. Map. 38).

Khorasan: Neyshaboor, Shahzadeh Hossein Asghar, 1600 m, 4.8.1992, Faghihnia & Zangooei 22363 (FUMH).

Cystopteris fragilis subsp. *fragilis* and subsp. *dickieana* are very similar taxa, distinguished only by their spore morphology. The former is characterized by echinulate spores and the latter by almost smooth, slightly verrucose or rugose spores (BRECKLE 1987; see also Fig. 30C, D). In Afghanistan, where both taxa occur with a high frequence, subsp. *dickieana* prefers the higher elevations of Hindu Kush Mt., but the ranges overlap in several areas (BRECKLE 1987). The Flora Iranica treatment (Reichstein & Viane, ined.) has several more Iranian specimens, at altitudes ranging between 2215-3800 m. Azarbaijan: W slopes of Almas pass between Navroud (Asalem) and Khalkhal, 2150 m, Wendelbo & Assadi 18454. Kuhha-ye Sabalan, 3800 m, Harrington 225. Kerman: Kuh-e Jupar, 3400 m, Bornm 4487, 4487. Khorasan: Gulul Sarani Protected Area, Kopet Dagh at check post, between *Juniperos*, 2300 m, Rech. 53335, S of Kuh-e Reza, N of Shirvan, 2500 m, Fraser-Jenk. 6177. Mazandaran: Siah-Bisheh, 2360 m, Foroughi 381, Mt. Damavand: 10-12 km from Rineh, 2900 m, Moussavi *et al.* 39787-E; Lar valley above Polur, 1520 m, Archibald 2571. Tehran: Mt. Damavand, 2640 m, Gilli 2020. S slopes of Mt. Damavand near Ab-e Garm, 2200 m, Aell. 2955. Yazd: S of Deh Bala, Mt. Sarkuh, 3000 m, Foroughi & Assadi 18005 (Map 38).

38. *Woodsia alpina* (Bolton) Gray, Nat. Arr. Brit. Pl. 2: 17. 1821. (Fig. 31. Map 39).

Ardebil/Gilan: 20 km Khalkhal to Asalem, Kuhha-ye Kerman, 13.5.1975, Termeh & Matin *s.n.* (45481-IRAN); Gardaneh Almas, highest pass on the road from Asalem to Khalkhal, 2350- 2400 m, 16.7.1975, Wendelbo & Assadi 18492 (TARI).

Thelypteridaceae

39. *Thelypteris limbosperma* (All.) H.P. Fuchs in Amer. Fern J. 48: 144. 1959. (*Oreopteris limbosperma* (All.) Holub, *Thelyopteris oreopteris* (Ehrh.) Slosson). (Fig. 32. Map 40).

Gilan: Lasak valley, side valley of Kash-e Khaleh, 5 km from Emamzadeh-Ebrahim, 750-100 m, 19.7.1975, Wendelbo & Assadi 18607 (45055-IRAN); Anzali wetland, Selke Protected Area, 20.5.2008, Eskandari & Pahlevani (45513-IRAN); Rahimabad to Sefidab, ca. 3 km to Sefidab, near to river, 300-400 m, 10.8.2001, Khoshravesh 25 (BBRL).

40. *Thelypteris palustris* Schott, Gen. Fil.: ad t. 10. 1834. (In Iran only: var. *palustris*). (Fig. 33, 55A. Map 41).

Gilan: Between Lahijan and Langeroud, 10.7.1970, collector unknown, 26500 (TUH); Mordab-e Langeroud (wetland), 8.1958, collector unknown, 38199 (45117-IRAN); Anzali wetland, -30 m, 27.6.1967, Mobayen 28041 (TUH). Kordestan: Marivan, Zarivar Lake, 1300-1500 m, 2.7.1970, collector unknown 28043 (TUH), ibid., 20.5.2006, M. Eskandari *s.n*. (IRAN).

Blechnaceae

41. *Blechnum spicant* (L.) Roth in Ann. Bot. (Usteri) 10: 56. 1794. (Fig. 34. Map 42).

Gilan: Tavalesh, 1300 m, 2.4.1965, Maleki 28042 (TUH); Lask valley, side valley of Kash-e-Khale, 5 km from Emamzadeh-Ebrahim, 750-1000 m, 19.7.1975, Wendelbo & Assadi 18607 (IRAN).

Onocleaceae

42. *Matteuccia struthiopteris* (L.) Tod. in Giorn. Sci. Nat. Econ. Palermo 1: 235. 1866. (Figs 35, 55B-D. Map 43).

Gilan: 14 km to Asalem in the road towards Khalkhal, 37°41' N, 48°49' E, 580-620 m, moist valley with *Acer velutinum* trees, 23.11.2000, Akhani 14472 (Hb. Akh.); 20 km to Asalem in the road towards Khalkhal, 37°39' N, 48°49' E, 1200-1220 m, *Fagus orientalis* forest, 23.11.2000 Akhani 14451 (Hb. Akh.); Asalem, 1200 m, 15.7.1968, Mirzayans (45160-IRAN); ibid., 1000 m, 15.5.1971, Iranshahr (45161-IRAN); Tavalesh, Asalem forest, 1100 m, 9.6.1968, Tregubov 28680 (TUH); Lahijan, 10 m, 20.9.1970, Maleki 26492 (TUH); Mordab-e Amir-kolayeh, Hassan-Bekandeh, 120 m, 1975, Ghahraman & Aghustin 28642 (TUH); Rahimabad to Sefidab, ca. 3 km to Sefidab near the river, 300-400 m, 10.8.2001, Khoshravesh 16 (BBRL). Golestan: Golestan National Park, Sulukli, 1380 m, 37˚29'30'' N, 55˚46'20'' E,15.8.1995, Akhani 11993 (Hb. Akh.). Mazandaran: Behshahr, 20 m, 14.4.1959, Tregubov 28425 (TUH).

Dryopteridaceae

43. *Dryopteris affinis* (Lowe) Fraser-Jenk. in Fern Gaz. 12: 56. 1979. (*Dryopteris borreri* Newman). (Fig. 36. Map 44).

Ardebil: Hoor to Lader, 1900, 16.9.2007, Eskandari & Torabi (45452-IRAN); Ardebil to Astara, Damiroghlikishi forest, 100 m, 12.7.1978, Moussavi, Habibi & Termeh (45350-IRAN). Gilan: 20 km to Asalem in the road towards Khalkhal, 1200 m, 23.11.2000, Akhani 14453 (Hb. Akh.); Talesh to Asalem, 580 m, 30.10.1956, Wendelbo 38153 (IRAN); Talesh, Asalem, 1000 m, 15.5.1981, Iranshahr (45039-IRAN). Golestan: Gorgan, Shamushak, 10.5.2007, Eskandari, Shirzadian & Pahlevani (45104-IRAN); Golestan National Park, western most of Qorghon Mt., NW slopes of Beilikuh, 12.10.1995, Akhani 12210 (Hb. Akh.).

Mazandaran: Ramsar, Javaherdeh, Leibi-e Tale-Kash, 1600-1800 m, 1.8.2000, Khoshravesh 11 (BBRL); Abbasabad to Kelardasht, 2000 m, 5.7.1971, Maleki 26458 (TUH); Tonekabon, Dohezar forest, 12.3.2003, Eskandari (45274-IRAN); Nowshahr, 11.5.1960, Sabeti 38148 (45041, 45042-IRAN); Kiasar, forest, 10.7.1974, Renz & Iranshahr 16820 (45105-IRAN); Kheiroud-Kenar, 8.9.1985,

Ghahraman 28703 (TUH); Qaemshahr, Orim, 580 m, 30.10.1956, Wendelbo 38153 (TUH).

FRASER-JENKINS (1980) provided a detailed treatment of the apomictic species *Dryopteris affinis,* from Macaronesia to Iran. He described three taxa from the Caspian forests, *Dryopteris affinis* subsp. *coriacea* Fraser-Jenk. var. *coriacea*, *Dryopteris affinis* subsp. *coriacea* var. *gigantea* Fraser-Jenk. and *Dryopteris affinis* subsp. *persica* Fraser-Jenk. He characterised the latter taxon as very similar to *Dryopteris filix-mas* but with more parallel-sided pinnules, distinctive petiole scales and thicker, more bulging indusia of a very pale brown colour.

All specimens cited above were identified by the authors as to species, without trying to determine their infraspecific classification. In the IRAN herbarium there are some specimens which were checked by Fraser-Jenkins and assinged by him to subspecies:

***Dryopteris affinis* subsp. *persica* Fraser-Jenk. in Willdenowia 10: 113. 1980**

Mazandaran: Lajim, Rig-Cheshmeh, 450 m, 7.10.1956, Sabeti 38149 (45043-IRAN); Orim, 7.10.1956, Sabeti 38154 (45107-IRAN); ibid., 30.10.1956, Sabeti 38155 (45046-IRAN); Nowshahr, Kusichal, 31.9.1956, Sabeti 38147,12054 (45040, 45050-IRAN).

***Dryopteris affinis* subsp. *borreri* (Newman) Fraser-Jenk. in Willdenowia 10: 110. 1980.** (*Dryopteris pseudomas* (Woll.) Holub & Pouzar.).

Mazandaran: Nowshahr, Shahrposht, 17.9.1955, Pishkari 38151 (45103-IRAN); Orim, 30.10.1956, Tregobov & Tregobov 38153 (45102-IRAN); Kelardasht to Abbasabad, 500 m, 24.8.1969, Nazmi & Afshar 38150 (45044-IRAN).

44. *Dryopteris caucasica* (A. Braun) Fraser-Jenk. & Corley in Brit. Fern Gaz. 10: 222. 1972. (Figs 37, 56A. Map 45).

Azarbaijan: Kalibar, Nabijan, Kuh-e Kalan, 27.6.1978, Termeh, Moussavi & Habibi 38773 (45207-IRAN); SW of Kalibar, 1300 m, 19.7.1971, Termeh 38152 (45106-IRAN); SW of Kalibar, 1300–2000 m, 19.7.1971, Termeh 38157 (45047-IRAN). Gilan: Above Damesh, E of Rudbar, 1900 m, 22.6.1975, Wendelbo & Ala, 18167 (TARI); E of Pol-e Sefid, Sout-kola, 1400 m, 24.5.1967, Tregubov 28701 (TUH).

Golestan: Gol-Loveh, 28.7.1972, Iranshahr & Zargani (45519-IRAN); E of Gonbad-e Kavus, Lowe, 1400 m, 17.5.1968, Tregubov 28702 (TUH); Golestan National Park, Chartongi and Besh Jakhdan area, 1750-1950 m, 16.6.1995, Akhani 11263 (Hb. Akh.); ca. 9-11 km NW of Soolegerd, 1150-1200 m, 5.9.1995, Akhani 11235 (Hb. Akh.); ca. 4 km SE of Tangerah, Lateh-Khodaqoli, 900-950 m, 3.7.1995, Akhani 11596 (Hb. Akh.); ca. 8 km NE of Tangerah, Qorghan forest, NE of Khajeh Galadi, 1150-1580, 30.6.1995, Akhani 11522 (Hb. Akh.); eastern corner of Kamarhay-e Qorghon (Qorghon cliffs) above Suleraqa, 1980-2010 m, 19.8.1995, Akhani 12033 (Hb. Akh.); ca. 2 km N of Dast-e Shah station, ca. 5-6 km E of Kondeskuh, southern slopes of Shakha montain, 1350–1450 m, 14.5.1994, Akhani 10594 (Hb. Akh.); Sulukli Lake, 37°29'41" N, 55°46'20" E, 1349 m, 12.7.2003, Akhani 17068 (Hb. Akh.). Mazandaran: Nowshahr, Orim, 20.9.1956, Sabeti 12053 (45518-IRAN).

FRASER-JENKINS (1980: 113) stated that *Dryopteris caucasica* is a frequent species along the Caspian forests in Iran, which is borne out by several specimens seen by the second author in W The species is also reported as being common on forest floor in the montane forests of Golestan National Park (AKHANI 1998, 2005). Recently, FALLAHIAN & MAZOOJI (2007) claimed *Dryopteris caucasica* as a new record for Iran, without any reference to these earlier publications.

45. *Dryopteris dilatata* (Hoffm.) A. Gray, Manual: 631. 1848. (Fig. 38. Map 46).

Mazandaran: Lajim, Esrak, 750 m, 12.5.1966, Tregubov 26678 (TUH); Nowshahr, Veisar, 1200 m, 17.5.1965, Mobayen 26679 (TUH); Abbasabad to Kelardasht, 10 km towards Kelardasht, 850-900 m, Mazooji 2001 (10845-IAUH) (named as *Athyrium distentifolium*).

46. *Dryopteris filix-mas* (L.) Schott, Gen. Fil.: ad tab. 9. 1834. (Map 47).

Gilan: Asalem-Khalkhal road, forest zone, 1100 m, 15.7.1975, Wendelbo & Assadi 18381 (TARI); Laushan, Damesh, 1700 m, 2.7.1974, Wendelbo 13502 (TARI); Damesh, E of Rudbar, 1700 m, 27.6.1975, collector unknown, 18254 (TARI). Mazandaran: Nowshahr, Kheyroud Kenar forest, 400 m, 15.9.1980, Assadi 33403 (TARI); Damavand, Rineh, 2430 m, 8.8.1971, S. Athari 2458 (TARI).

47. *Dryopteris pallida* (Bory) Maire & Petitm. in Bull. Séances Soc. Sci. Nancy, ser. 3, 9: 480. 1908. In Iran only following subspecies occurs:

***Dryopteris pallida* subsp. *raddeana* (Fomin) Nardi in Webbia 32: 97. 1977.** (Figs 39, 56B-C. Map 48).

Gilan: Between Astara and Ardebil, 18.7.1971, Maleki 26483 (TUH); Asalem, 50 m, 16.8.1972, Maleki 26479 (TUH); Astara, -19 m, 11.7.1972, Maleki 26480 (TUH); Hashtpar to Astara, Lissar, -22 m, 16.5.1971, Iranshahr 38156 (45051-IRAN); between Lahijan and Langeroud, Abshahr, -10 m, Maleki 26482 (TUH). Golestan: Jahan-Nama Protected Area, Dorrie, 36˚40’19’’ N, 54˚18’25’’ E, 1840 m, 7.3.2006, S.M. Jafari 2397 (BBRL). Golestan National Park, 7 km E of Tang-e Gol, Golzar valley, 900–1150 m, 1.8.1995, Akhani 11955 (Hb. Akh.); SE of Zav, 950-1200 m, 14.8.1995, Akhani 11955 (Hb. Akh.). Mazandaran: Ramsar to Javaherdeh, ca. 10 km after Ramsar, 400-800 m, 15.9.2001, Khoshravesh 19 (BBRL); Javaherdeh, Seiqhal Mahalleh, 1770 m, 30.7.2001, Khoshravesh 5 (BBRL); Tonekabon, Valiabad, -31 m, 14.7.1972, Maleki 28499 (TUH); Chalus valley, 8.12.1966, Tregubov 28705 (TUH); Nowshahr, Galanderoud, 1.6.1959, collector unknown (45045-IRAN); Nowshahr, Maadan-e Sang, 10.9.1966, Iranshahr 14903 (45048-IRAN); Nowshahr, Palangchal, 31.3.1960, Fouroughi 38158 (45005-IRAN); ibid., 27.1.1960, Asefi 38159 (45052-IRAN); Behshahr, Sang-e-Now, 13.5.2007, Eskandari, Shirzadian & Pahlevani (45004-IRAN).

48. *Polystichum aculeatum* (L.) Roth, Tent. Fl. Germ. 3: 79. 1799. (Figs 40, 57A, Map 49).

Ardebil: 22 km Asalem to Khalkhal, 1100 m, 10.9.2007, Eskandari & Torabi (45437-IRAN); Heyran, Agh Chai, 950 m, 13.9.2007, Eskandari & Torabi (45439-

IRAN); Hoor to Lader, 1900 m, 16.9.2007, Eskandari & Torabi (45440 & 45454-IRAN). Gilan: Asalem, 8.5.1965, Safavi & Dezfoulian 14904 (45014-IRAN); Talesh, Heyran pass, 1900-2000 m, 25.7.1970, Maleki 26484 (TUH); Asalem to Khalkhal, 900 m, 15.6.2006, Ghanbari (45402-IRAN); Tavalesh, 1100 m, 9.6.1968, Tregubov 28669 (TUH); Hashtpar, Lumir, 1000 m, 14.5.1967, Allai (IRAN); Rezvanshahr, Pare-sar, Visadar, 100 m, 8.4.2006, Eskandari & Torabi (45375-IRAN); Rudbar to Rasht, 30 km to Rasht, 5 km to Mirza Kuchak-Khan forest, forest near Mazian village, 80 m, 28.10.1999, Sh. Zarre (TUH). Golestan: Gonbad-Kavoos, Mobayen 28385 (TUH); Gorgan, Naharkhoran, 307 m, 21.4.1974, Riedl & Ershad 15799 (45013-IRAN); Gorgan, Ringo forest, Eskandari (45485-IRAN); Gorgan, Shamushak, 10.5.2007, Eskandari, Shirzadian & Pahlevani (45476-IRAN); Ziarat valley, 1400-1525 m, 19.4.2005, Memariani 35839 (FUMH); ibid., 11.5.2007, Eskandari, Shirzadian & Pahlevani (45474-IRAN); Azad-Shar to Chehel Dokhtar, Gharieh Jouzchal (Forest); 1350 m, 24.7.1975, Moussavi & Karavar (45379-IRAN); Jahan-Nama Protected Area, Atshan rocks towards Iman Verdi hill, 36˚40’59’’ N, 54˚16’29’’ E, 1753 m, 18.6.2006, S.M. Jafari 2308 (BBRL); ibid., ca. 7 km after Kord Kuy towards Derazno, 36˚42’47’’ N, 54˚05’53’’ E, 1670-1750 m, 18.3.2005, S.M. Jafari 1546 (BBRL); Golestan National Park, 6 km E of Tangerah station towards Tang-e Gol, 1 km S of main road, Darreh-Shahatiq, 560-670 m, 4.7.1994, Akhani 92401 (Hb. Akh.); ibid., Tangerah, 12.10.1976, Termeh & Matin (45377-IRAN); ibid., ca. 3 km E of Kondeskuh, in valley of Qaz-Qaleh, 800-850 m, 5.8.1995, Akhani 9917 (Hb. Akh.); ibid., ca. 2 km to Koilar, 1600-1750 m, 4.6.1995, Akhani 11234 (Hb. Akh.); ibid., eastern parts of Alubagh Mt., above Cheshmeh Sardar, montane forest, 37°20’17” N, 55°56’7” E, 1940 m, 13.7.2003, Akhani 17093 (Hb. Akh.); ibid., NW of Tangerah, Loveh waterfall, 900 m, Faghihnia, Rafeie & Zangooei 25500 (FUMH); S of Moraveh Tappeh, E of Golidagh, 1150-1200 m, Joharchi 35088 (FUMH). Mazandran: Ramsar, Javaherdeh, Seiqal-Mahalle, above water fall, 1770 m, 30.7.2001, Khoshravesh 2 (BBRL); Shahsavar, Liresar, 500 m, 24.3.1966, Tregobov 28671 (TUH); Tonekabon, Dohezar forest, 500 m, 10.11.2005, Ghanbari (45387&45393-IRAN); Tonekabon, -20 m, 8.9.1968, Maleki 26488 (TUH); ibid., 23.3.1971, Maleki 26457 (TUH); Tonekabon, Valiabad, 31 m, 14.7.1972, Maleki 26486 (TUH); Chalus road, Siah-Bisheh, 27.6.1957, 28053

(TUH); Nowshahr, Chelendar, 20 m, 28.6.1956, Sabeti, *s.n.* (IRAN); Kelardasht, Mazuchal, 14.5.2007, Eskandari & Pahlevani (45475-IRAN); ibid., Rudbarak, 14.5.2007, Eskandari & Pahlevani (45473-IRAN); Orim, 200 m, 6.7.1959, Wendelbo (IRAN); Nowshahr, Galanderoud, 28.6.1956, Jalali (45015-IRAN); Orim to Taru, 2000 m, 6.2.1959, Wendelbo 1127 (45300-IRAN); Lajim, Aghamashad, 800 m, Tregubov 28670 (TUH); E of Pol-e Sefid, Darzi-kola, 1300 m, 25.5.1967, Tregubov 28668 (TUH); Darzi-kola, E of Pol-e Sefid, 1300 m, 25.5.1967 Tregobov 28668 (TUH). Semnan: Shahroud to Chehel Dokhtar, Gharieh Ghatri, 23.7.1975, Moussavi & Karavar (45019& 45382-IRAN).

Maleki 26484 was labelled as *Polystichum lonchitis*. It is a young, immature specimen of *Polystichum aculeatum*.

49. *Polystichum braunii* (Spenn.) Fée in Mém. Soc. Mus. Hist. Nat. Strasbourg 5: 278. 1852. (Figs 41. Map. 50).

Gilan: Astara, Lavande-Vil, Latoon forest, 900 m, 17.4.2006, Eskandari & Torabi (45392-IRAN); Asalem, 15.6.2006, Ghanbari (45395-IRAN); Astara, Lavande-vil, Latoon (forest & waterfall), 900 m, 17.4.2006, Eskandari & Torabi (45384-IRAN); Tavalesh, Asalem forest, S of Rombi, 1100 m, 9.6.1968, Tregubov 28667 (TUH); Road fram Asalem to Khalkhal, 1080 m, 22.10.1974, Wendelbo & Shirdelpur 14898 (TARI); Asalem to Khalkhal, 800-1000 m, 29.5.1978, Wendelbo & Assadi 27736 (TARI); Lasak valley side valley of Kash-e Khaleh, 5 km from Emamzadeh-Ebrahim, 750-1000 m, 19.7.1975, Wendelbo & Assadi (TARI); Between Lahijan and Langeroud, Abshar, 19.7.1972, Maleki 26487 (TUH). Golestan: Gorgan, Ziarat, 1.6.2005, Eskandari (45348-IRAN); Golestan National Park, Tang-e Rah, 700 m, 19.10.1976, Termeh & Matin (45386- IRAN); ibid., 12.10.1976, Termeh & Matin (45472-IRAN). Mazandaran: Abbasabad to Kelardasht, Maleki 26489 (TUH, as *Polystichum setiferum*); Kahroud, 980-1250 m, 17.7.1972, Maleki 26485 (TUH, as *Polystichum setiferum*); Nowshahr, Galanderoud, 5.11.1956, Sabeti 38186 (45301-IRAN); Pol-e Sefid, Sangdeh, 1600-2600 m, 20.6.1995, collector unknown, 37642 (TARI); Neka to Gharieh Estakhrposht (forest), 900 m, 27.7.1975, Moussavi & Karavar (45385-IRAN).

50. *Polystichum lonchitis* (L.) Roth. Tent. Fl. Germ. 3: 71. 1799. (Figs 42, 57B. Map 51).

Gilan: Deylaman, Shah-e Shahidan, Siahdashtebon, Dorfak Mt., 2500 m, 21.5.2008, Eskandari & Pahlevani (45507-IRAN).

According to field observations by Eskandari, this plant was severely grazed in the mentioned locality, where only few individuals were found, growing in a cliff habitat (Fig. 57B). See also recently published note by ESKANDARI *et al.* (2008).

51. *Polystichum woronowii* Fomin in Věstn. Tiflissk. Bot. Sada 18: 21. 1911. (Figs 43, 57C-D. Map 52).

Ardebil: Astara to Ardebil, Heyran, 2.8.1972, Maleki 26464 (TUH); Heyran, Agh Chai, 1450 m, 7.7.1978, Termeh, Moussavi & Habibi (45410-IRAN); Khalkhal, Ardebil, Naav, 10.9.2007, Eskandari & Torabi (45438-IRAN). Gilan: 22 km from Asalem to Khalkhal, 1100 m, 10.9.2007, Eskandari & Torabi (45442-IRAN); Asalem, 15.6.2006, Ghanbari (45010-IRAN); ibid., 1200 m, 15.7.1968, Mirzayans (45397-IRAN); ibid., 30 m, 11.8.1970, Maleki, 26462 (TUH); between Astara and Ardebil, 9.1978, Maleki 26463 (TUH); 15 km Asalem towards Khalkhal, 250 m, 17.10.1977, Zargari *s.n.* (FUMH); Lumire, 14.5.1967, Abaii 38188 (45378-IRAN); Rezvanshahr, Pare-sar, Visadar, 100 m, 18.4.2006, Eskandari & Torabi (45376-IRAN); 20 km NW of Rezvanshahr towards Astara, Gissum forest park, 3 km S of the road, 50 m, 22.11.2000, Akhani 14430 (Hb. Akh.); Talesh (Tavalesh) forests, ca. 30 km SWS. Astara, 10 km W of Havigh, degradated lowland forests near Zoomureh village, 38°6'35" N, 48°49'32" E; 410-487 m, 8.9.2000, Akhani & Salimian 14331 (Hb. Akh.). Golestan: Gorgan, Ziarat valley forests, 1400-1525 m, 19.4.2005, Memariani 35832 (FUMH); Bandar-e Gaz, -13 m, 28.5.1948, Sharif 38189 (45012-IRAN); Gorgan, Shamushak, 10.5.2007, Eskandari, Shirzadian & Pahlevani (45394-IRAN); Aliabad, Kabudwal forest, 14.9.2005, Eskandari (45383-IRAN). Mazandaran: Ramsar, Jannat-Rudbar, 15.5.2007, Eskandari & Pahlevani (45477-IRAN); Kheiroud-Kenar, 20 m, 30.4.1965, Ghahraman 28672 (TUH); Tonekabon, Dohezar forest, 12.3.2003, Eskandari (45265-IRAN); Tonekabon, 20 m, 5.9.1972, Maleki 26460 (TUH); Abbasabad to Kelardasht, 12.11.2006, Ghanbari (45406-

IRAN); ibid., 24.11.2006, Ghanbari (45398-IRAN); Chalus to Shahsavar, Abbasabad, 120 m, 19.8.1971, Dehyar & Habashi 14905 (45011-IRAN); Ramsar to Javaherdeh, ca. 10 km after Ramsar, 400-800 m, 15.9.2001, Khoshravesh 24 (BBRL); Tonekabon, Dohezar forest, 21.2.2003, Eskandari (45380-IRAN); ibid., 12.11.2006, Ghanbari (45396-IRAN); Cheshmestan, 5 km to Vaz Tange village, 30.6.2008, Amini-Rad (45494-IRAN); Kheiroud-Kenar, 8.11.1985, Ghahraman 28673 (TUH); Nowshahr, Galanderoud, 620 m, 11.5.1956, Sabeti (IRAN); Chelendar, 30 m, collector unknown, 28387 (TUH); Aghamashad, 800 m, 30.4.65, collector unknown, 28672 (TUH); Aghamashad, 800 m, 30.5.1965, Mobayen *s.n.* (TUH).

Polystichum setiferum (Forssk.) Woynar was reported by some authors from Iran (MOBAYEN 1980, MAZOOJI 2003). It is very similar to *Polystichum woronowii,* which explains their misidentification.

Polypodiaceae

52. *Polypodium interjectum* Shivas in J. Linn. Soc., Bot. 58: 29. 1961. (Fig. 44. Map 53).

Gilan: 20 km NW of Rezvanshahr towards Astara, Gisoum Forest Park (Dr. Dorostkar forest), ca. 50 m, alluvial lowland forest, 5.11.1999, Akhani 13787 (Hb. Akh.); Rudbar to Rasht 30 km to Rasht, 5 km to Mirza Kuchak-Khan forest, near Mazian villag, 80 m, 28.10.1999, Sh. Zarre (TUH). Golestan: Gorgan, 28.5.1949, Sharif 815 (45018-IRAN); ibid., Naharkhoran, 21.4.1974, Riedl & Ershad 15794 (45017-IRAN); Jahan-Nama Protected Area, ca. 2 km after Ziarat village, 36˚41’01” N, 54˚27’45” E, 1177 m, 17.3.2005, S.M. Jafari 1536 (BBRL); Golestan National Park, ca. 3 km to Kondeskuh, in valley of Qez-Qaleh, 37˚19’ N, 55˚47’ E, 800-850 m, 5.8.1994, Akhani 9914 (Hb. Akh.); ibid., western border the park (off the park), near Kondeskuh, 37˚18’ N, 55˚46’ E, 1000 m, 5.8.1994, Akhani 9986 (Hb. Akh.); ibid., SE of Zav, 37˚31’ N, 55˚46’ E, 950-1200 m, 14.8.1995, closed lowland forest, Akhani 11953 (Hb. Akh.); ibid., 7 km E of Tang-e Gol, Golzar valley, 37˚21’ N, 56˚1’E, 900–1150 m, 1.8.1995, Akhani 11857, (Hb. Akh.); ibid., W of Kor-e Meklan valley, 1100-1200 m, 16.8 1995, Akhani 12000 (Hb. Akh.); NW parts of the park, the way between Sulukli Lake and Mountain, E of Zav, 37˚30’5” N,

55˚46’10” E, 1256 m, 12.7.2003, Akhani 17072 (Hb. Akh.); ibid., SE of Zav, 37˚31’ N, 55˚46’ E, 900 m, 14.8.1995, Akhani 12335 (Hb. Akh.); S of Kord Kuy, Forests between Kord Kuy and Ardakan, 300-600 m, 18.4.2005, Memariani & Zangooei 35819 (FUMH). Mazandaran: Ramsar, Tang-Darreh, 150-300 m, 16.9.2001, Khoshravesh 23 (BBRL); Tonekabon, Dohezar forest, 12.3.2003, Eskandari (45267-IRAN); Nowshahr, Salahedin-kola, -3 m, 15.10.1956, 38183 (45116-IRAN); Nowshahr, -21 m, 27.12.1960, Asefi 38185 (45022-IRAN); Behshahr, Sang-e-Now, 13.5.2007, Eskandari, Shirzadian & Pahlevani (45008-IRAN); Neka, 24.11.1949, collector unknown 38184 (45115-IRAN).

53. *Polypodium vulgare* L., Sp. Pl.: 1085. 1753. (Fig. 45. Map 54).

Ardebil: Heyran, 980 m, 14.9.2007, Eskandari & Torabi (45417 & 45421-IRAN); ibid., Agh Chai, 950 m, 13.9.2007, Eskandari & Torabi (45413-IRAN); Hoor to Lader, 1900 m, 16.9.2007, Eskandari & Torabi (45432-IRAN); Sardabeh, 1920 m, 14.9.2007, Eskandari & Torabi (45428-IRAN); ibid., 3.6.2004, Eskandari & Aghabeigi (45272-IRAN). Azarbaijan: Kalibar, Vaighan, Ainalou forest, 7.7.1978, Moussavi, Termeh & Habibi 38765 (45336-IRAN); Kalibar, Vaighan, Kuh-e Kalan, 27.6.1978, Moussavi, Termeh & Habibi 38774 (45337-IRAN). Gilan: Astara, Lavande-Vil, Latoon (forest & waterfall), 900 m, 17.4.2006, Eskandari (45230-IRAN); Talesh, Lisar, Ghaleh-e Salsal, 200 m, 16.4.2006, Eskandari & Torabi (45229-IRAN). Golestan: Gorgan, Naharkhoran, 450 m, 8.9.1988, Delghandi, Tehrani & Karavar (45021-IRAN); ibid., 450 m, 21.8.1978, Termeh, Musavai & Tehrani 39323 (45278-IRAN); Ziarat, 5.11.2007, Eskandari, Shirzadian & Pahlevani (45263-IRAN); Jahan-Nama Protected Area, Mazookash, 36˚40’ N, 54˚24’ E, 2223 m, 17.4.2006, S.M. Jafari 1756 (BBRL); ibid., beginning of Tarkat from Jahan-Nama environment building, 36˚40’59” N, 54˚18’43” E, 1535 m, 15.4.2006, S.M. Jafari 1678 (BBRL); Golestan National Park, eastern corner of Kamarha-ye Qorghon (Qorghon cliffs), above Suleraqa, 55˚51’20”N, 37˚28’20”E, 1680-1200 m, 19.8.1995, Akhani 12024 (Hb. Akh.); ibid., northern slopes of Alu-Baq Mt., 37˚20’ N, 55˚54’ E, 9.10.1995, Akhani 12192 (Hb. Akh.); ibid., SE of Zav, 37˚31’ N, 55˚46’ E, 900 m, 14.8.1995, Akhani 12336 (Hb. Akh.). Mazandaran: Ramsar, Javaherdeh, Leibi-e Tal-e Kash, 1600-1800 m, 3.8.2001, Khoshravesh 13 (BBRL);

Tonekabon, Dohezar forest, 25.3.2003, Eskandari (45259-IRAN); ibid., Dohezar forest, 1950 m, 12.2.2003, Eskandari (45270-IRAN); between Tonekabon and Chorti, Hariz forest, 13.4.1978, Ghahraman & Aghustin *s.n.* (TUH); Chalus, 40 m, 25.3.1959, Nowruzy, *s.n.* (TUH); Abbasabad to Kelardasht, 15.5.2007, Eskandari, Shirzadian & Pahlevani (45007-IRAN); Kelardasht, Ujabeyt, Asalak forest, 1400 m, 19.3.1978, Termeh. Matin & Tehrani 38146 (45114-IRAN); Sangdeh, 30 km E of Pol-e Sefid in forest, 2000-2500 m, 11.7.1974, Renz & Iranshahr 16819 (45020-IRAN).

CULTIVATED SPECIES

Based on personal observation and photographic documentation (M. Eskandari) a few fern species such as *Platycerium bifurcatum* (Cav.) C. Chr. (Fig. 57E) and *Nephrolepis exaltata* (L.) Schott are cultivated as ornamental indoor plants in Tehran and some other cities of Iran. *Dryopteris affinis*, apparently gathered from nature, is widely used in flower shops in Tehran and Northern Iran to decorate flower bunches.

DOUBTFUL AND EXCLUDED RECORDS

Three books and one dissertation report several additional species of pteridophytes from Iran. In spite of our efforts, we were unable to see any herbarium vouchers confirming these reports. They are listed here for the sake of completeness, and for further consideration:

1. PARSA & MALEKI (1978), in their English version of Flora of Iran, included most of the European and Caucasian species contending that they may be found one day in Iran. They are not mentioned here. However, there are several other species for which these authors report their occurrence in Iran. We have studied all specimens of Parsa and Maleki present in the herbaria of University of Tehran and Faculty of Pharmacy, but failed to find any voucher supporting their claims. The species in question are:

Equisetum heleocharis Ehrh. (Azarbaijan, Khoy), *Equisetum pratense* Ehrh. (Caspian area), *Equisetum hyemale* L. (Caspian area), *Thelypteris dryopteris* (L.) Sloss. (synonym of *Gymnocarpium dryopteris* (L.) Newman) (Heyran pass between

Astara and Ardebil, Asalem to Haroabad, Maleki), *Phyllitis sagittata* (DC.) Guinea & Heywood (Khuzestan, Dasht-e Mishan, Maleki); *Athyrium distentifolium* Opiz (Mt. Heryan between Astara and Ardebil; Asalem to Haroabad, and Abshar between Lahijan and Langeroud), *Cystopteris montana* (Lam.) Bernh. (W and NW of Kordestan and Azarbaijan), *Woodsia ilvensis* (L.) R. Br. (Mt. between Haroabad, Khalkhal and Asalem, Maleki), *Polystichum setiferum* (Forssk.) Woynar (Mazandaran, Kahrasang; Gilan, Polardijan; between Langeroud and Qazvin); *Dryopteris abbreviata* (DC.) Newman (Gilan, Asalem, way to Haroabad), *Dryopteris carthusiana* (Vill.) H.P. Fuchs (Gilan: Abshar between Lahijan and Langeroud, Maleki), and *Marsilea strigosa* Willd. (Gilan, in rice swamps, Pahlavi, Astara).

2. None of the following species, which are listed in the manual of identification of Flora of Iran (Rostanihaye Iran) by MOBAYEN (1980, in Persian), was found among his collection in Central Herbarium of University of Tehran (TUH):
Equisetum fluviatile L. (Azarbaijan, Khoy), *Allosorus crispus* (L.) Röhl. (synonym of *Cryptogramma crispa* (L.) Hook.) (borders with Turkey and Iraq), *Pteris arguta* L. (Nowshar, Khiroud-Kenar), *Asplenium fissum* Willd. (Bushehr), *Dryopteris villarii* (Bellardi) Schinz & Thell. (Lahijan), *Polystichum setiferum* (Forssk.) Woynar and *Polystichum illyricum* Hahne (Kolahgardan forest).

3. In a recent book entitled "Flora of Gilan" [Gilan], vol. 1. by GHAHREMANINEJAD (1999), the following species were said to occur in Gilan Province. We were unable to see any specimens that would support their presence in the area.
Dryopteris abbreviata (DC.) Newman, *Dryopteris villarii* (Bellardi) Schinz & Thell., *Dryopteris carthusiana* (Vill.) H.P. Fuchs, *Gymnocarpium dryopteris* (L.) Newman, *Woodsia ilvensis* (L.) R. Br., *Polystichum setiferum* (Forssk.) Woynar, *Athyrium distentifolium* Opiz, and *Marsilea strigosa* Willd.

4. The following species were reported by MAZOOJI (2003) in an unpublished PhD dissertation and subsequent abstracts and notes based on that dissertation, such as MAZOOJI & FALLAHIAN (2005) and MAZOOJI *et al.* (2006). Any assessment of these reports requires access to Mazooji's collection, which was not granted during the preparation of this book. However, during the final production of this

publication we could shortly see some of his specimens. Accordingly, some cases were clarified and some cases need further studies (see also notes under *Dryopteris caucasica*).

Asplenium cuneifolium Viv. (Gilan: Massouleh, rock cliffs, 900 m, Mazooji 2024, reported with doubt) (*Asplenium adiantum nigrum* s.l.); *Asplenium onopteris* L. (Golestan: Bandar-e Gaz, 1300 m, Mazooji 2039; Mazandaran: Haraz road, 10 km to Amol, 1500 m, Mazooji 2040; Gilan: Asalem to Khalkahl, 100 m, Mazooji 2041; Lahijan to Siahkal 250 m, Mazooji 2042) (*Asplenium adiantum nigrum* s.l.); *Athyrium distentifolium* (Mazandaran: Abbasabad to Kelardasht, 900 m, Mazooji 10845 (IAUH) (*Dryopteris dilatata*), *Dryopteris carthusiana* (Vill.) H.P. Fuchs (Mazandaran: Ramsar to Javaherdeh, 200-300 m, Mazooji 2077; Nowshar to Kheiruod-Kenar, 350 m, Mazooji 2078; Haraz road, near Amol, 100-200 m, Mazooji 2079; Gilan: Asalem to Khalkhal, 550 m, Mazooji 2080 m) (*Dryopteris pallida*); *Dryopteris expansa* (C. Presl) Fraser-Jenk. & Jermy (Mazandaran: Ramsar to Javaherdeh, 700 m, Mazooji 2076) (*Dryopteris pallida*); *Dryopteris oreades* Fomin (Golestan: Aliabade Katool, 1580 m, Mazooji 2063); *Dryopteris remota* (Döll) Druce (Mazandaran: Chalus road, after Marzanabad, 100 m, Mazooji 2070; Alamdeh to Marzanabad, 300 m, Mazooji 2071); *Dryopteris submontana* (Fraser-Jenk. & Jermy) Fraser-Jenk. (Mazandaran: Nowshahr, Khiroudkenar, 350 m, Mazooji 2067); *Polystichum setiferum* (Forssk.) Woynar (Golestan: Aliabad-e Katool, 1580 m, Mazooji 2106); Abbasabad to Kelardasht, 900 m, Mazooji 2107; Sari, Haji-kola, 650 m, Mazooji 2108; Gilan: Asalem to Khalkhal, 450 m, Mazooji 2109; Siahkal, 500 m, Mazooji 2110).

See also notes under *Asplenium fissum*, *Equisetum ramosissimum*, *Athyrium filix-femina* and *Polystichum aculeatum*.

ACKNOWLEDGMENTS

This book was partly supported by the Research Council, University of Tehran, under the project "Geobotanical Studies in Different Parts of Iran IV" and a travel grant for the first author to attend at a meeting in Pakistan during April 2008. We thank the curators, staff members and private collections for loan of material or for allowing us to study their specimens. In particular, we wish to acknowledge the curators of IRAN (Dr. M. Abbasi and Dr. S. Shirzadian), FUMH (Mr. M.R. Joharchi), SHIRAZ (Dr. A.R. Khosravi) and IAUH (Dr. A. Mazooji) for their generous help and open mind to scientific collaboration, which made the compilation of this publication possible. The SEM images of the spores of two subspecies of *Cystopteris fragilis* were kindly provided by the staff of the Laboratory of Electron Microscopy of the College of Science, University of Tehran, Tehran, Iran.

Fig. 1. Map of Iran, showing administrative devision used in this paper.

Illustrations, Photographs and Distribution Maps

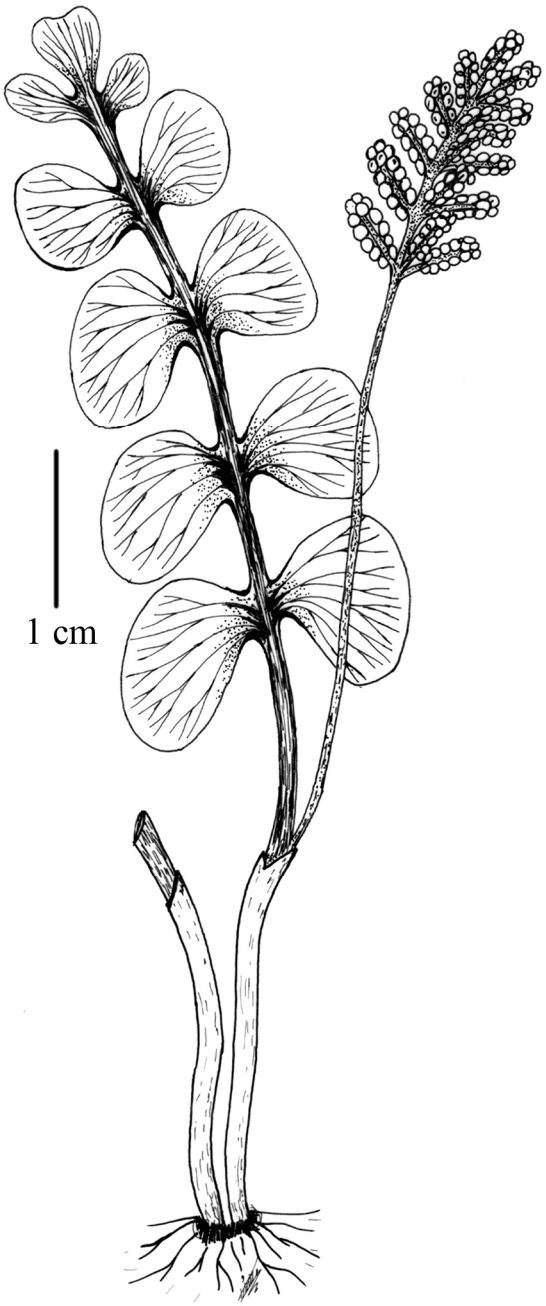


Fig. 2. *Botrychium lunaria* — Akhani 11271.

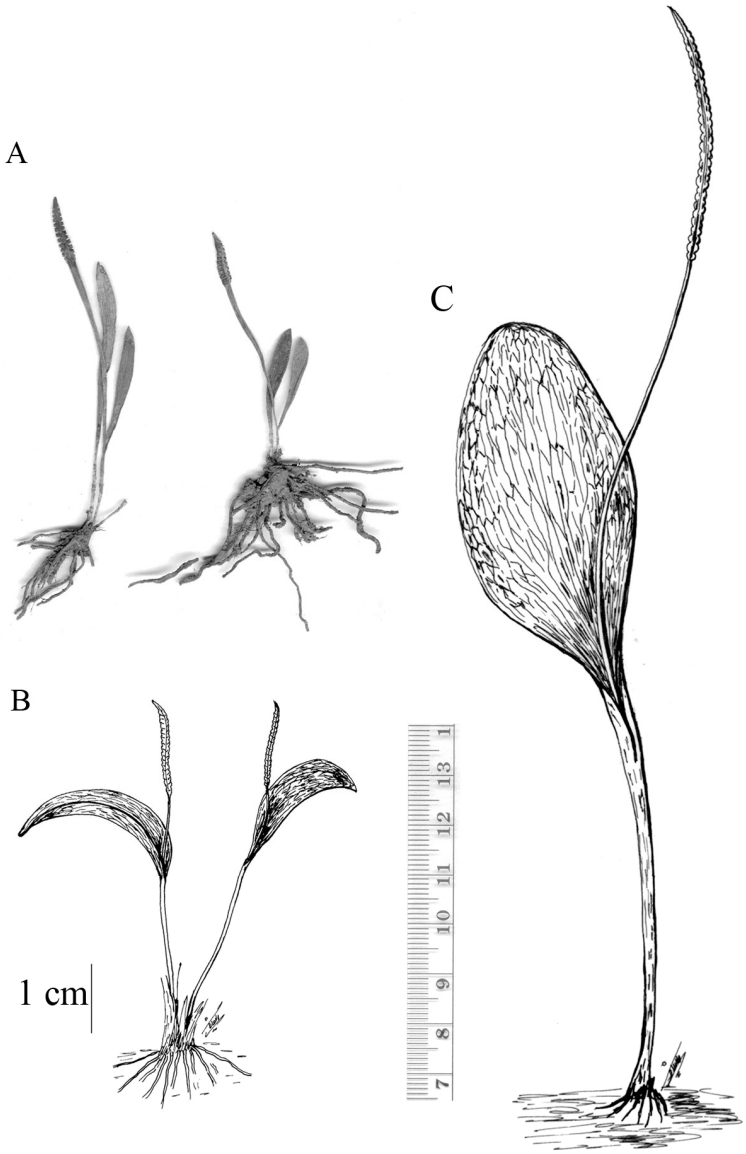


Fig. 3. A. *Ophioglossum lusitanicum* — Naqinezhad 33472, B. *Ophioglossum polyphyllum* — Termeh & Moussavi 35290, C. *Ophioglossum vulgatum* — Renz & Iranshahr (45326-IRAN).

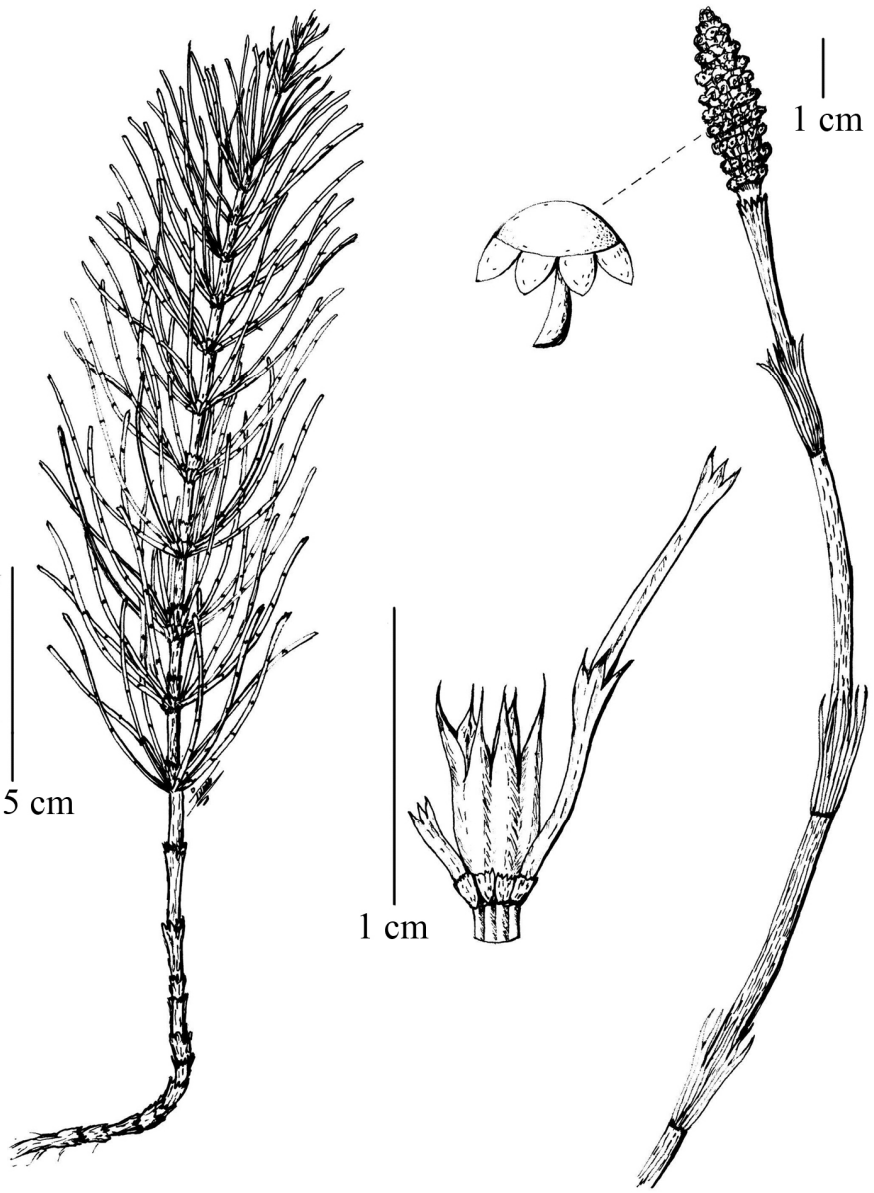


Fig. 4. *Equisetum arvense* — Khoshravesh 07.

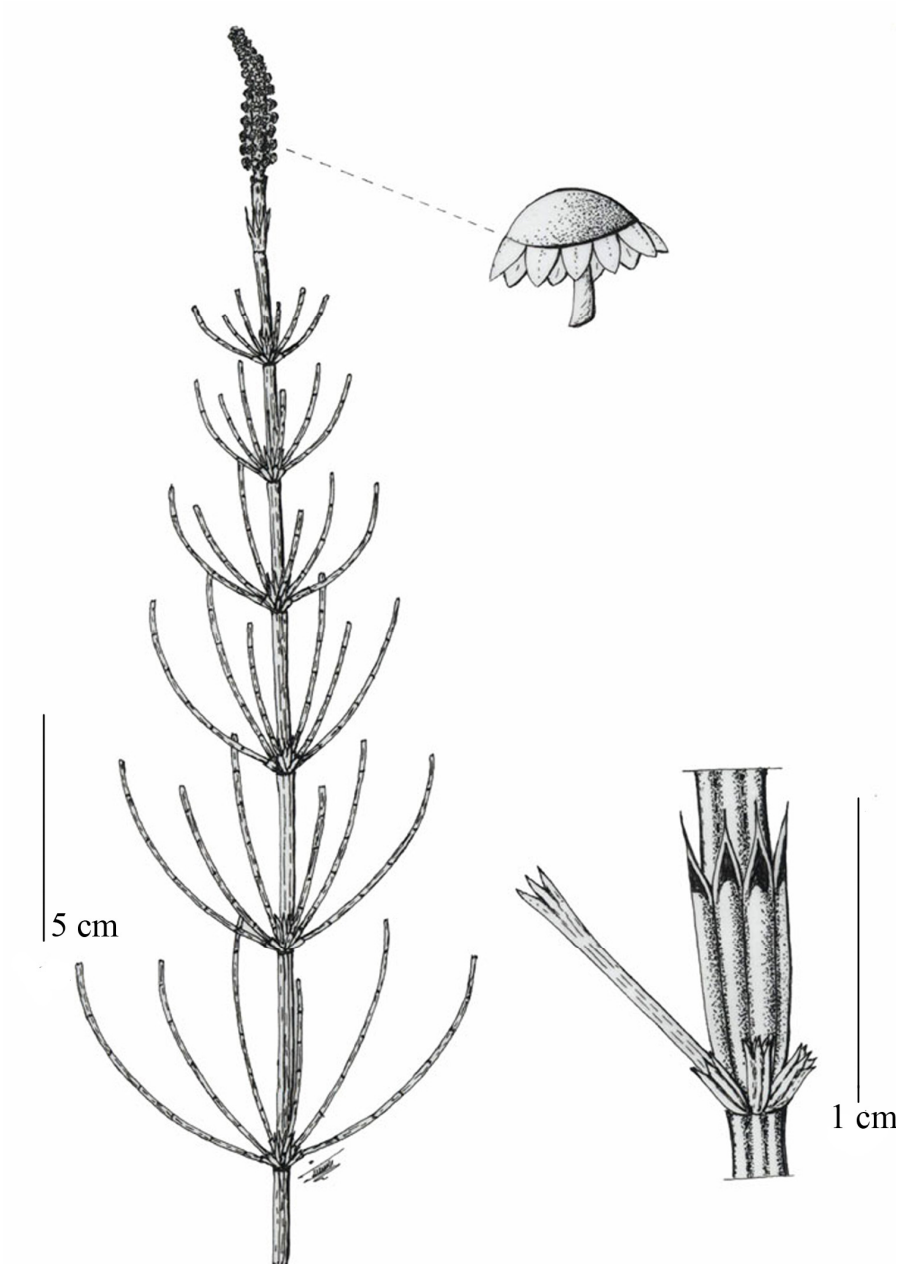


Fig. 5. *Equisetum palustre* ─ Iranshahr 6.6.1971.

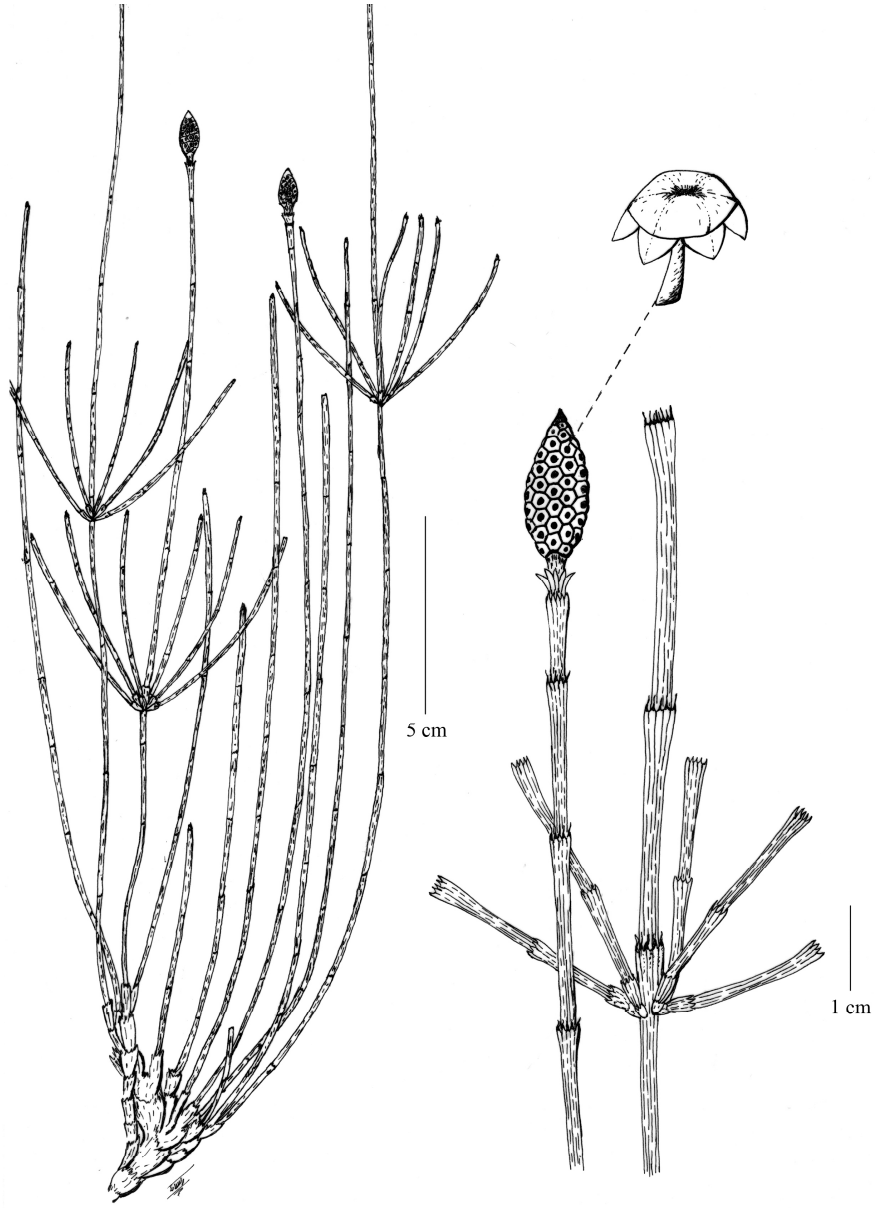


Fig. 6. *Equisetum ramosissimum* — Akhani 9499.

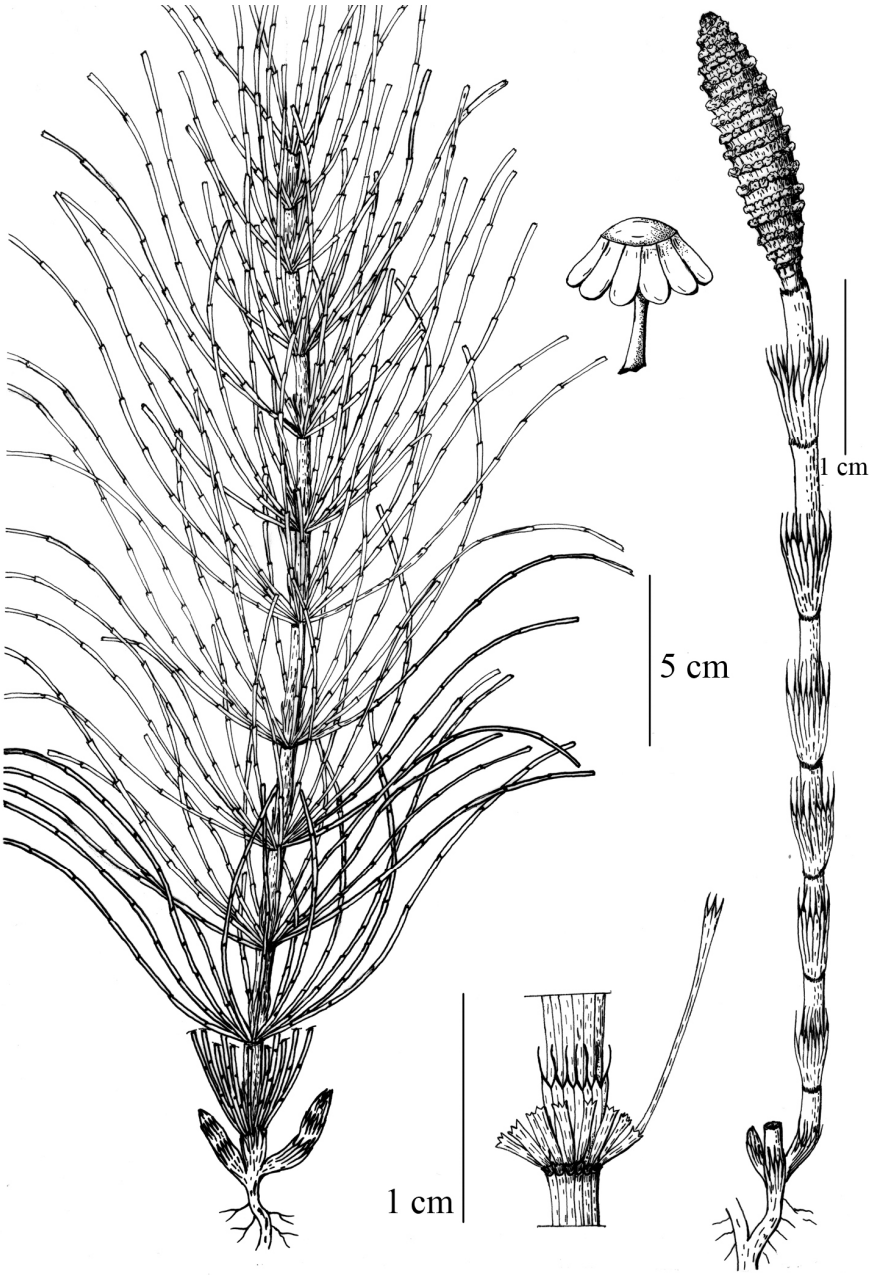


Fig. 7. *Equisetum telmateia* — Akhani 18022 & 13376.

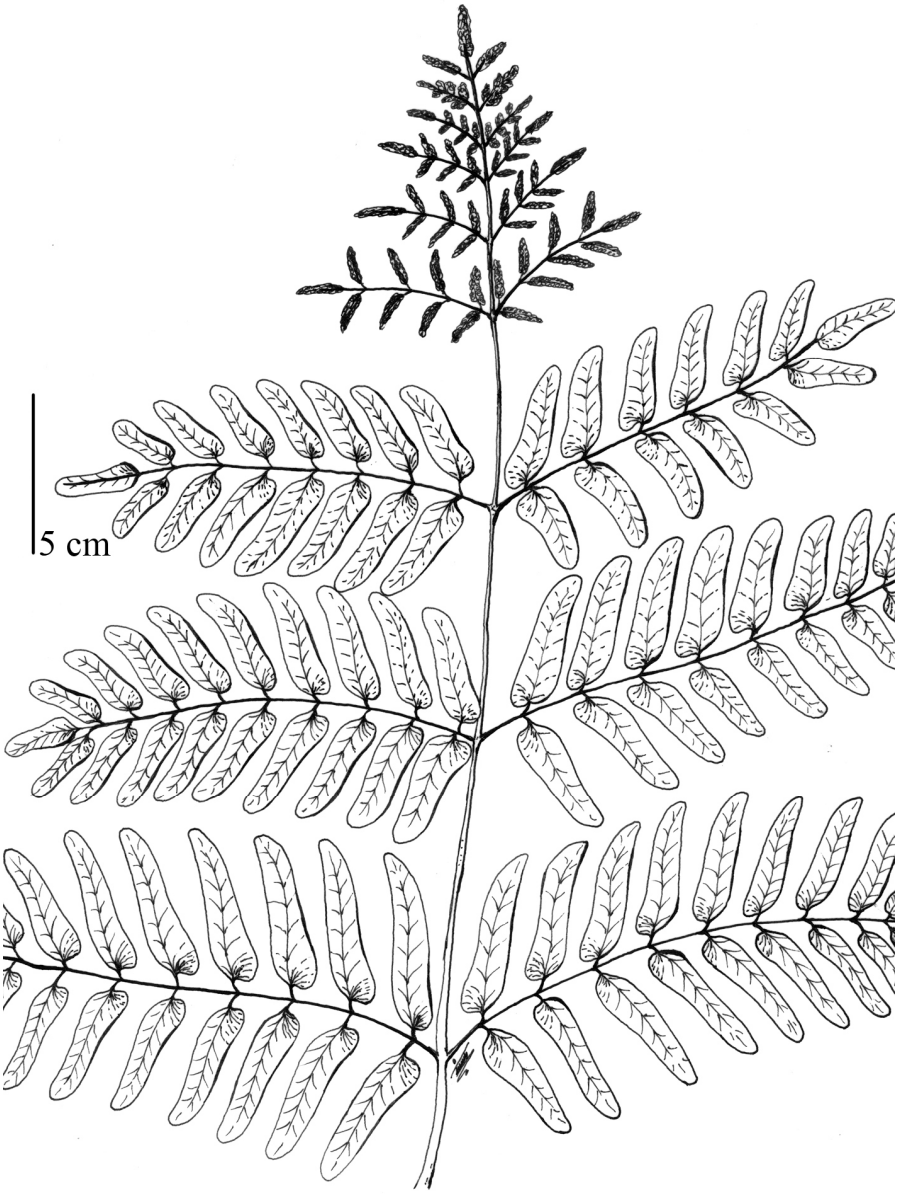


Fig. 8. *Osmunda regalis* — Maleki 28384.

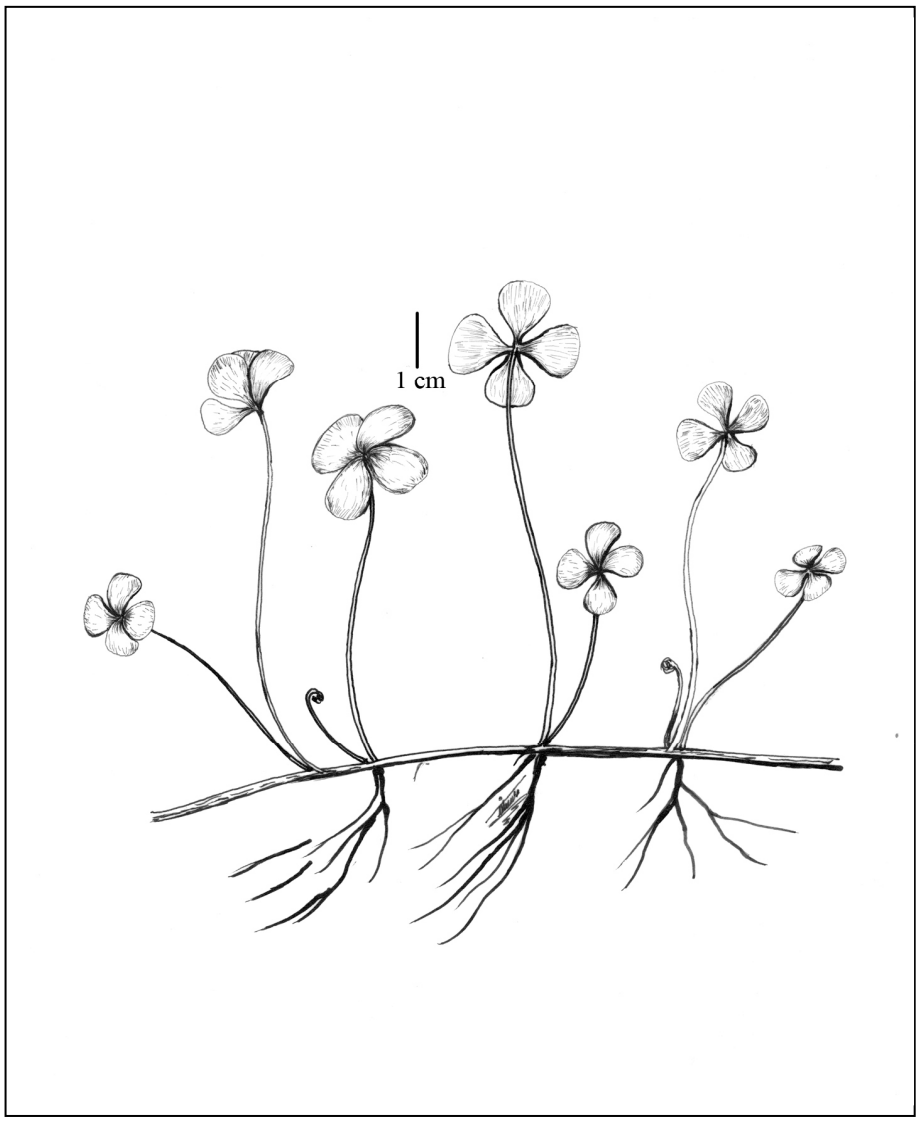


Fig. 9. *Marsilea quadrifolia* — Akhani 15469.

Fig. 10. *Azolla filiculoides* — Akhani 13780.

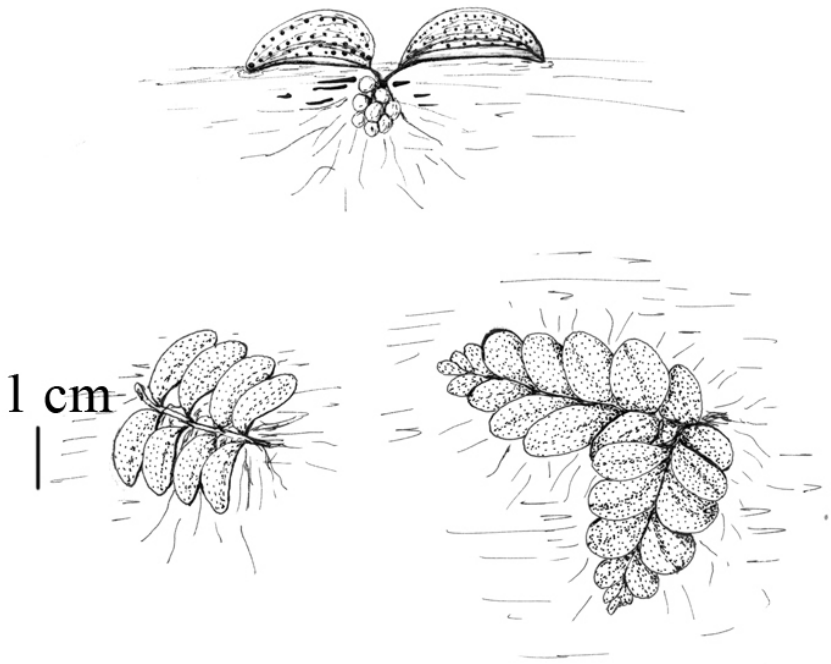


Fig. 11. *Salvinia natans* — Naghinejad 21415.

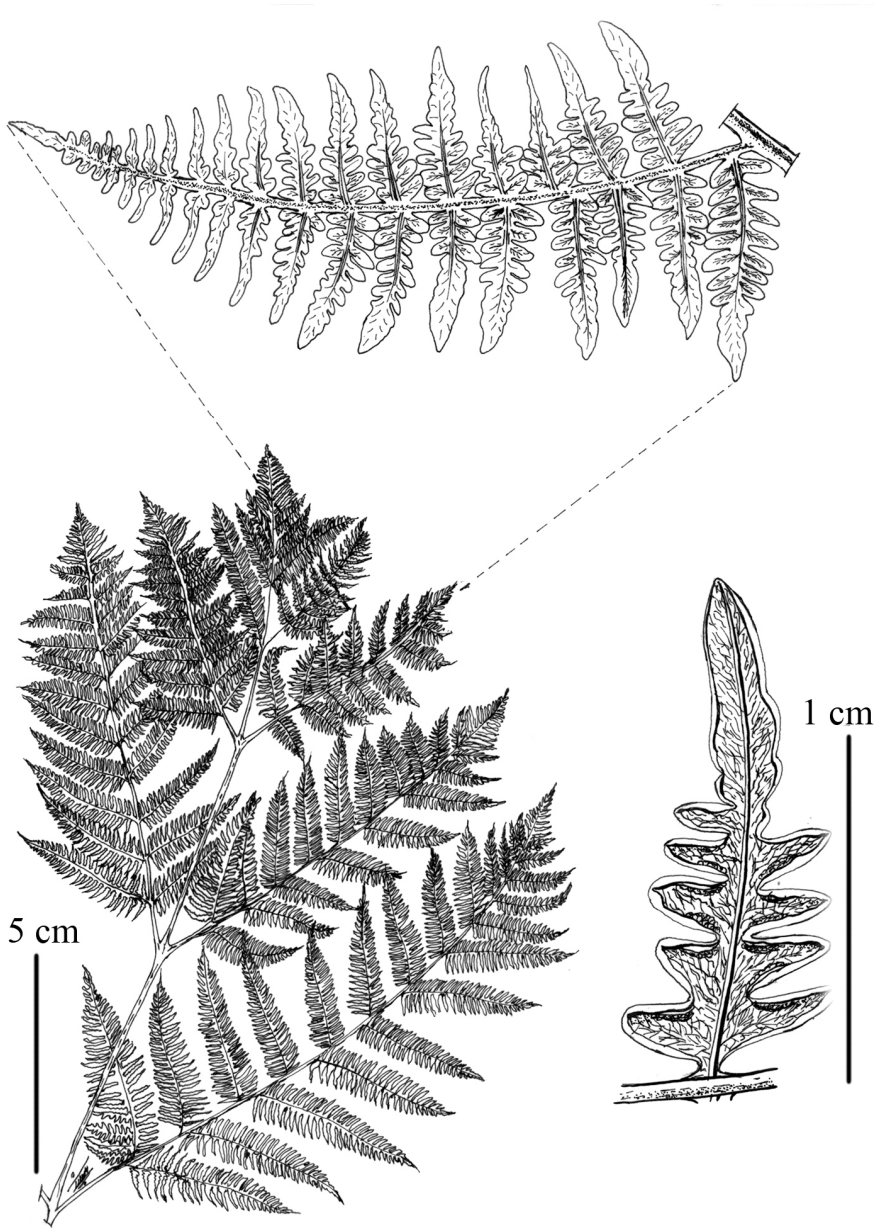


Fig. 12. *Pteridium aquilinum* ─ Akhani 11810.

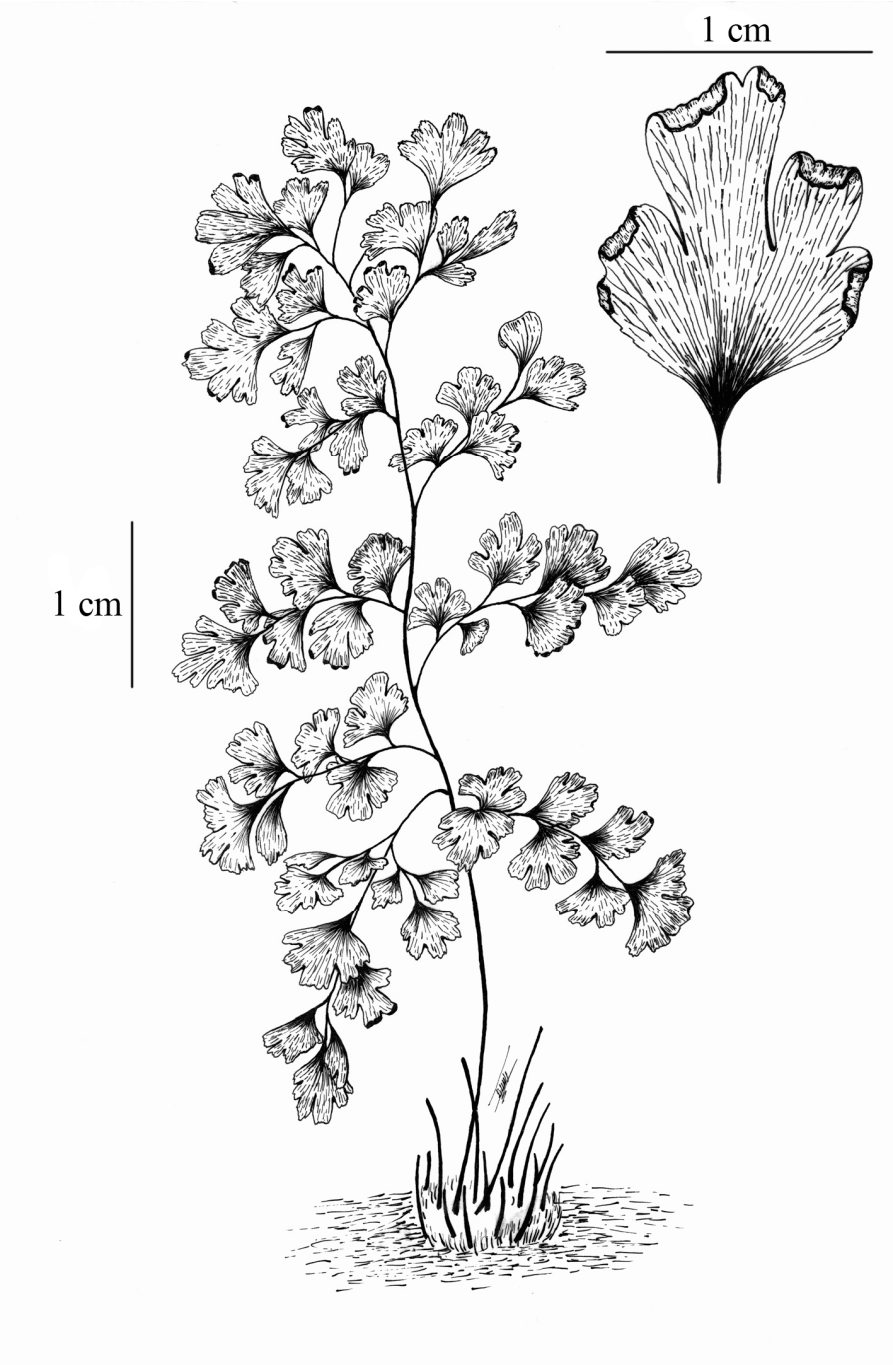


Fig. 13. *Adiantum capillus-veneris* — Khoshravesh 20.

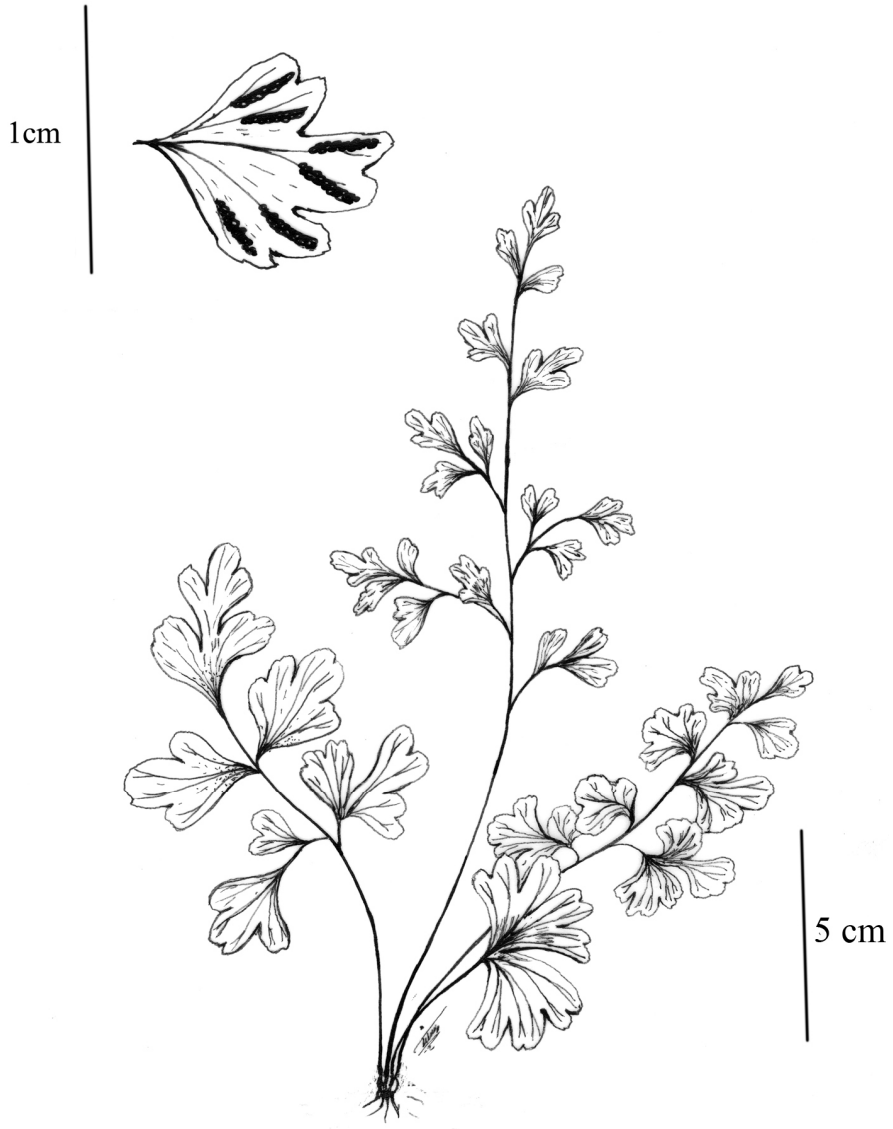


Fig. 14. *Anogramma leptophylla* — Iranshahr 38099.

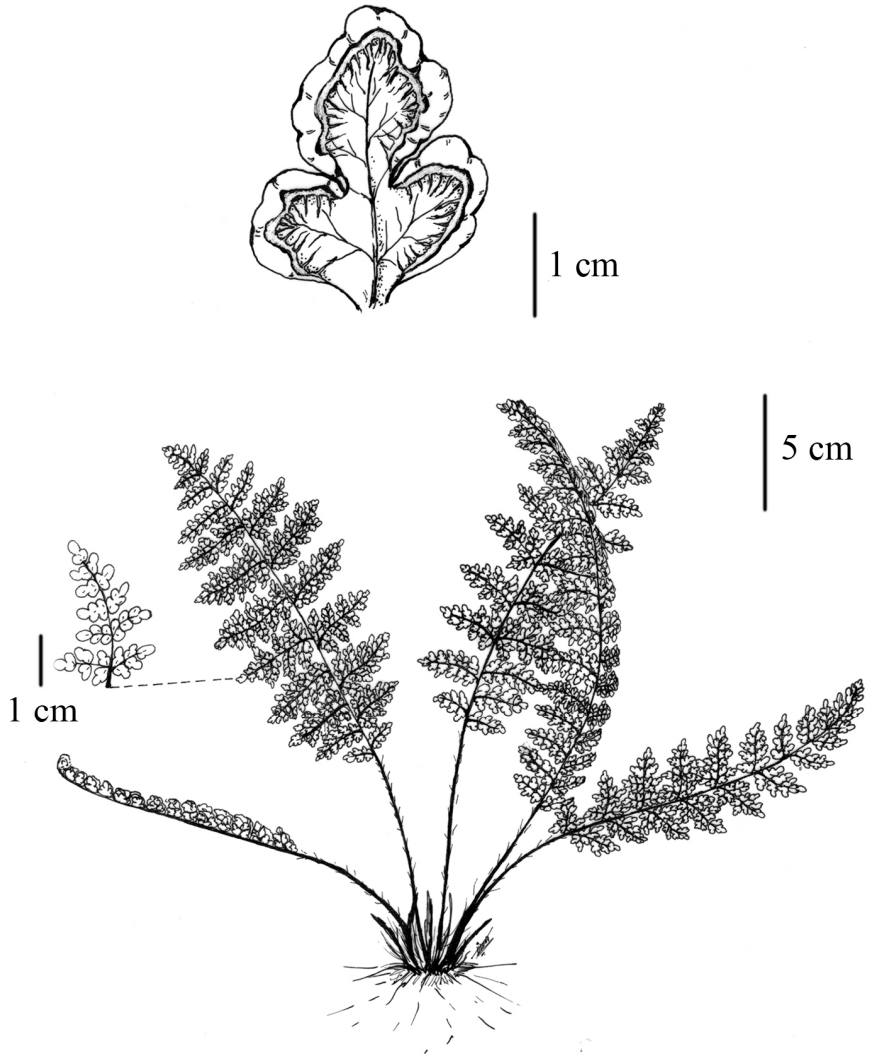


Fig. 15. *Cheilanthes acrostica* — Iranshahr 38139.

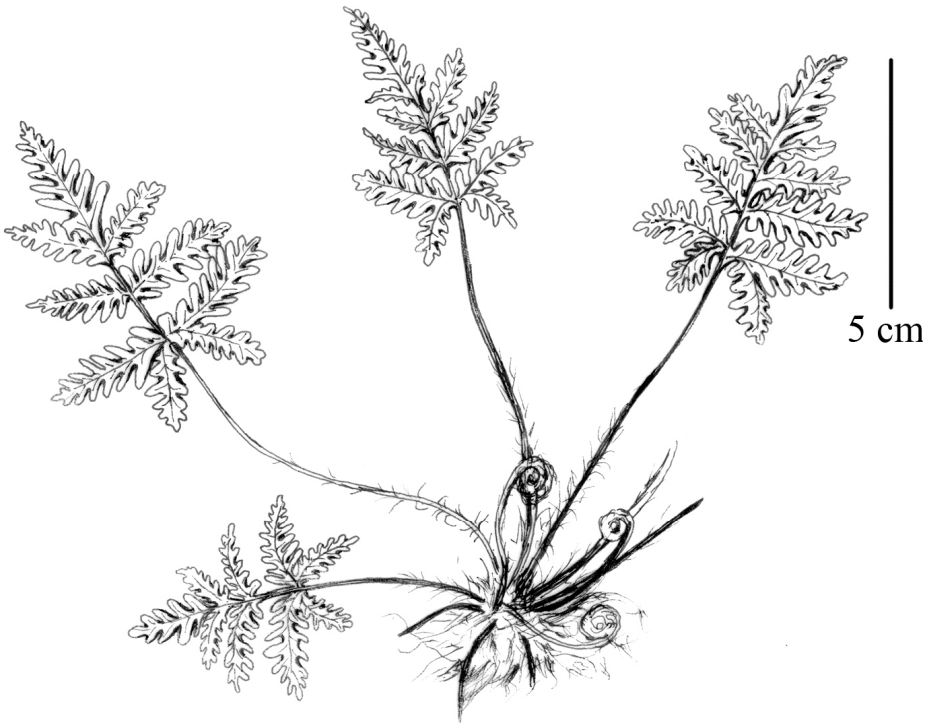


Fig. 16. *Cheilanthes coriacea* — Khosravi & Nikookar 1228.

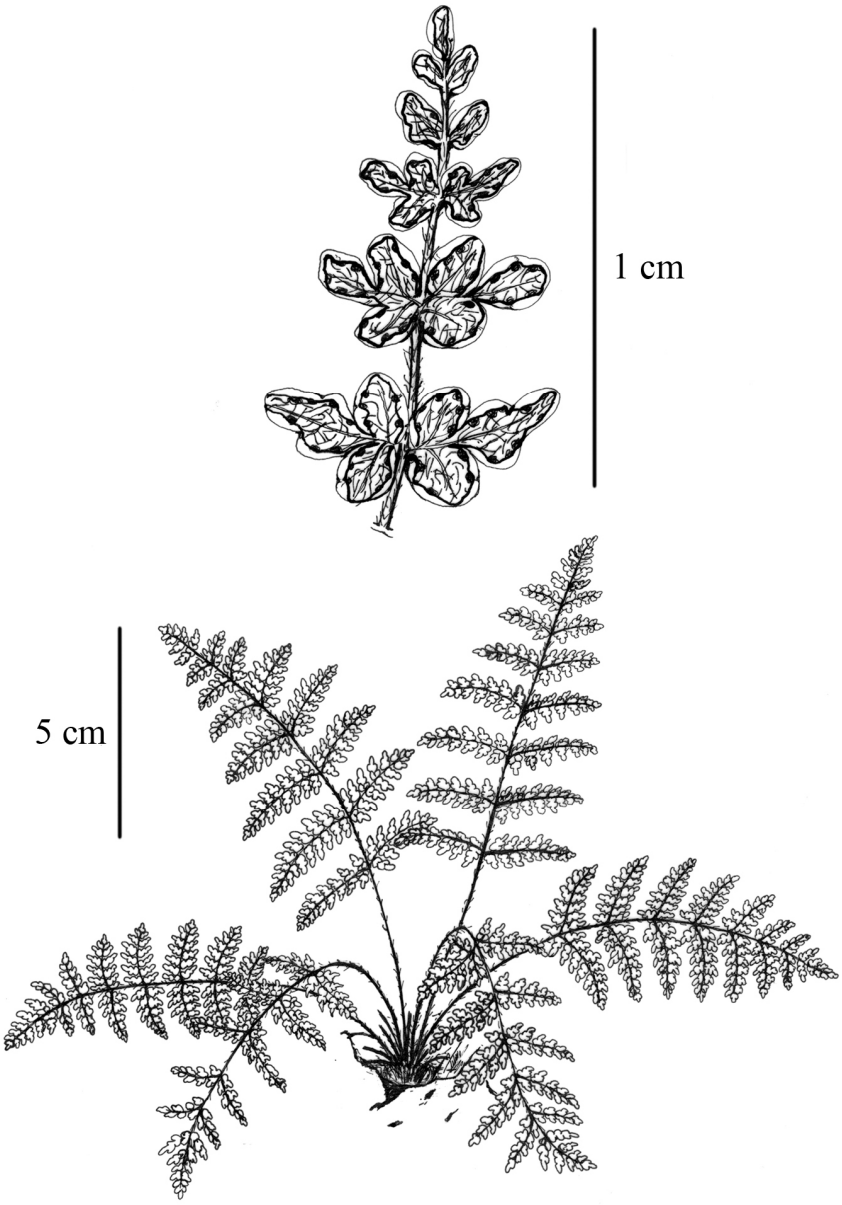


Fig. 17. *Cheilanthes persica* — Akhani 10533.

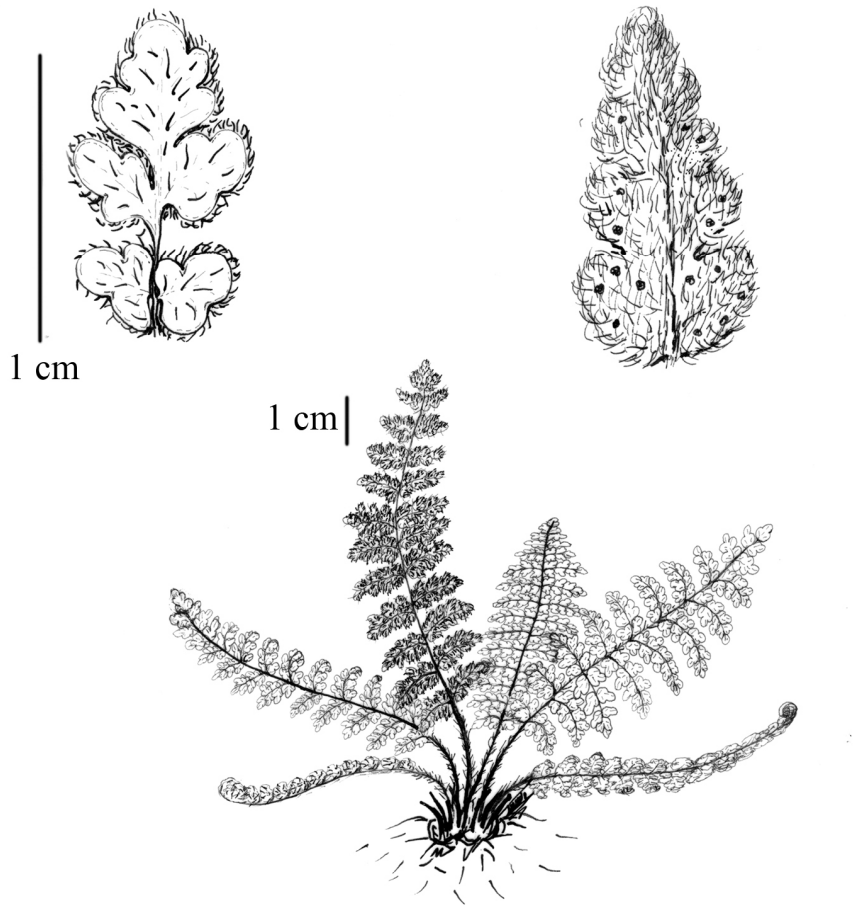


Fig. 18. *Cosentinia vellea* ─ Iranshahr 38129.

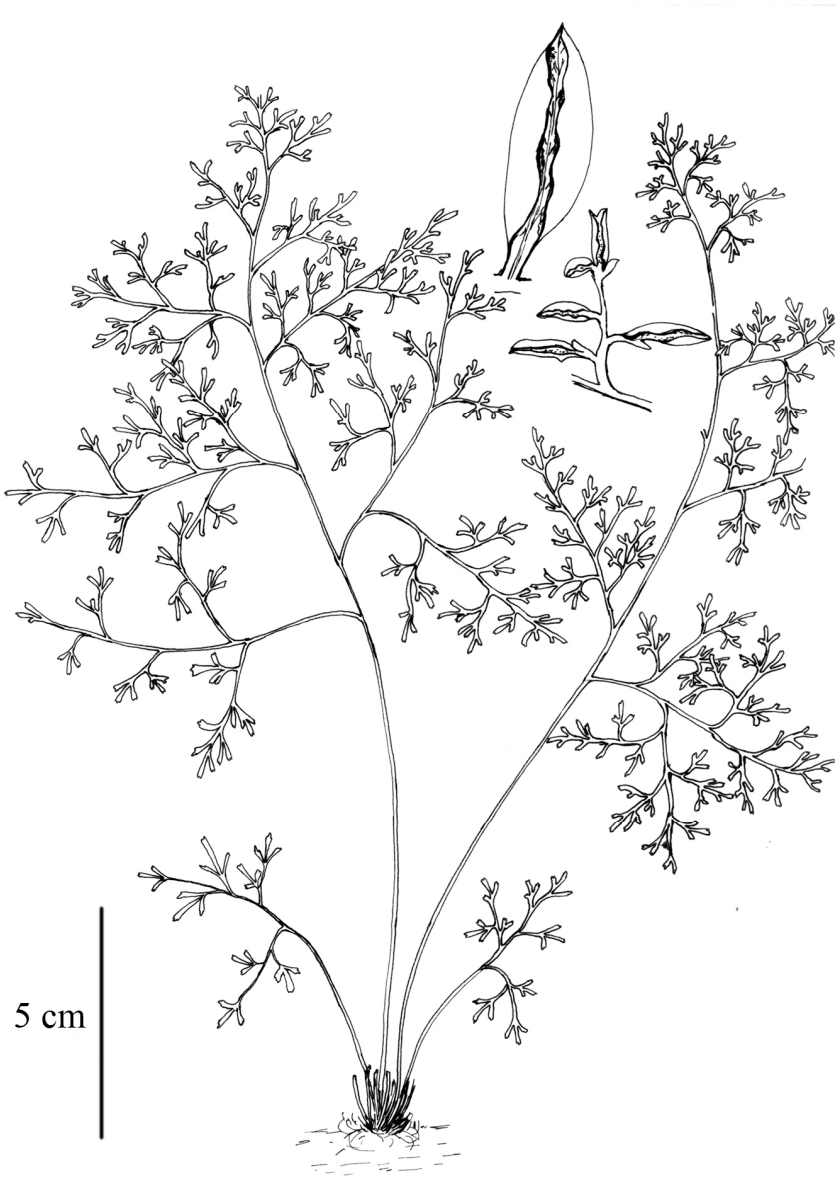


Fig. 19. *Onychium divaricatum* — Akhani 16143.

Fig. 20. *Pteris cretica* — Khoshravesh 17.

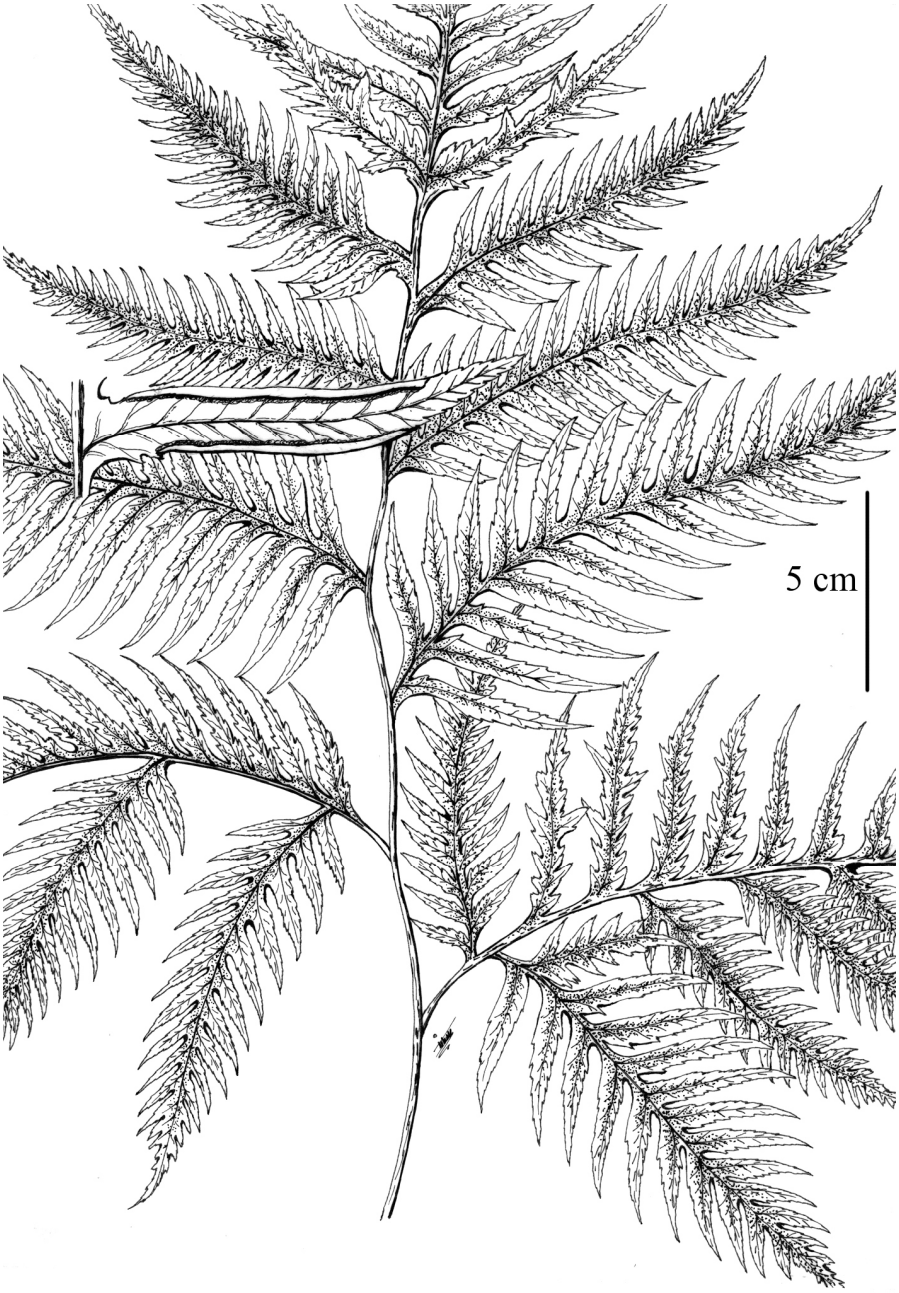


Fig. 21. *Pteris dentata* subsp. *flabellata* ─ Akhani 14428.

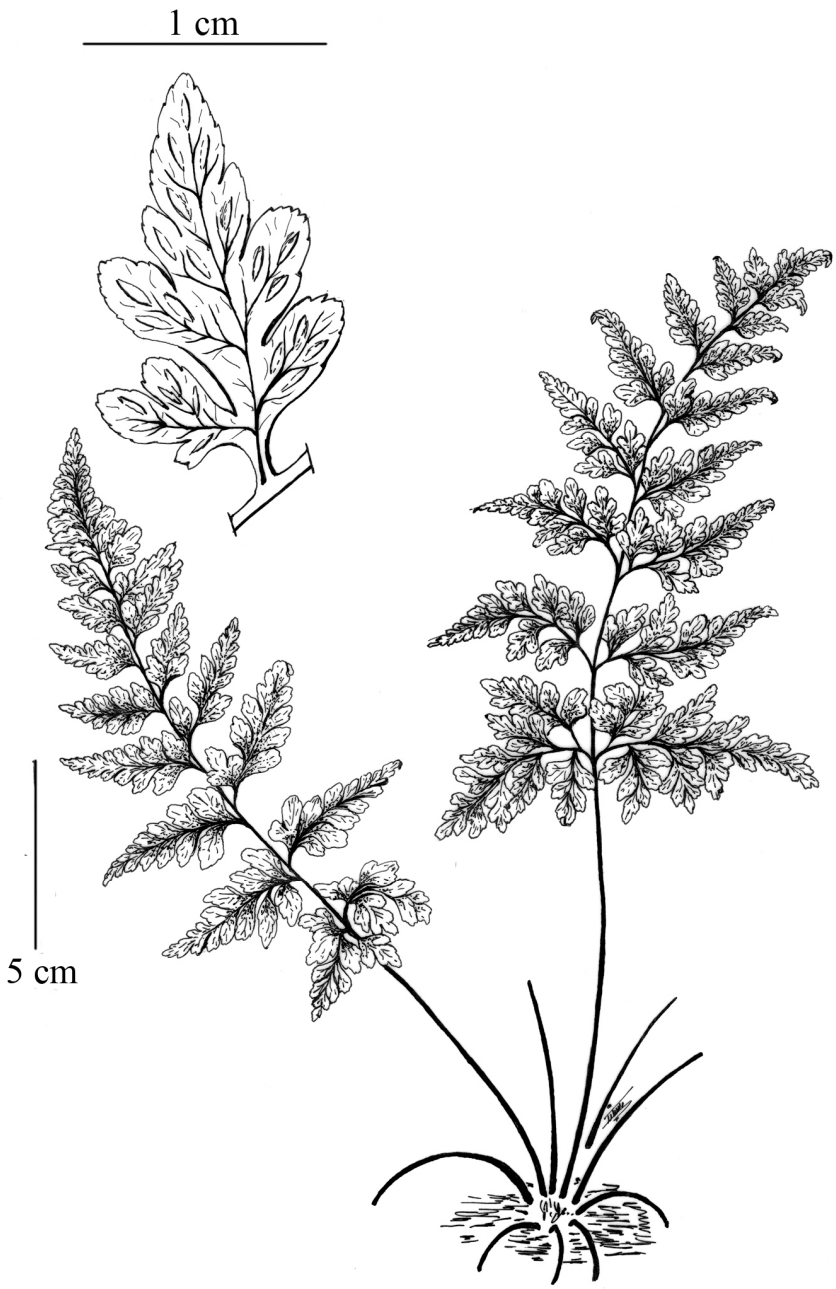


Fig. 22. *Asplenium adiantum-nigrum* ─ Khoshravesh 15.

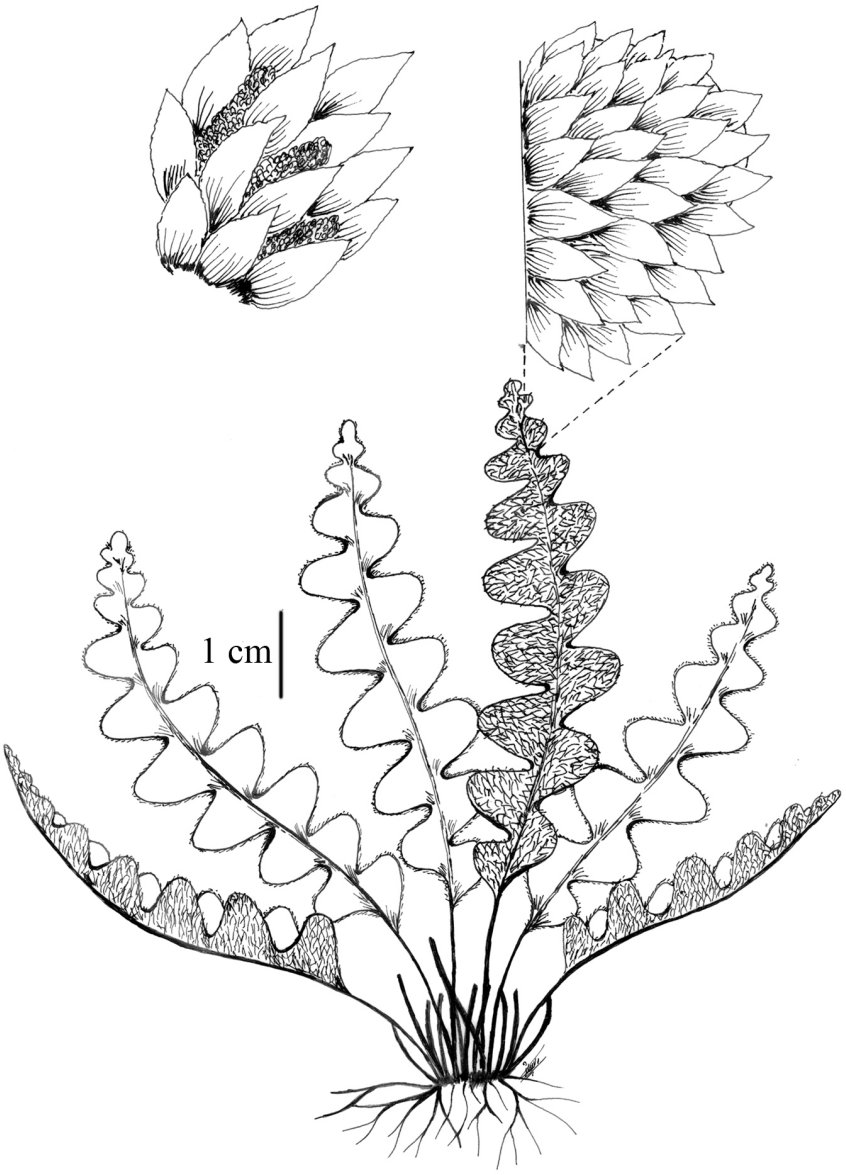


Fig. 23. *Asplenium ceterach* — Akhani 9969.

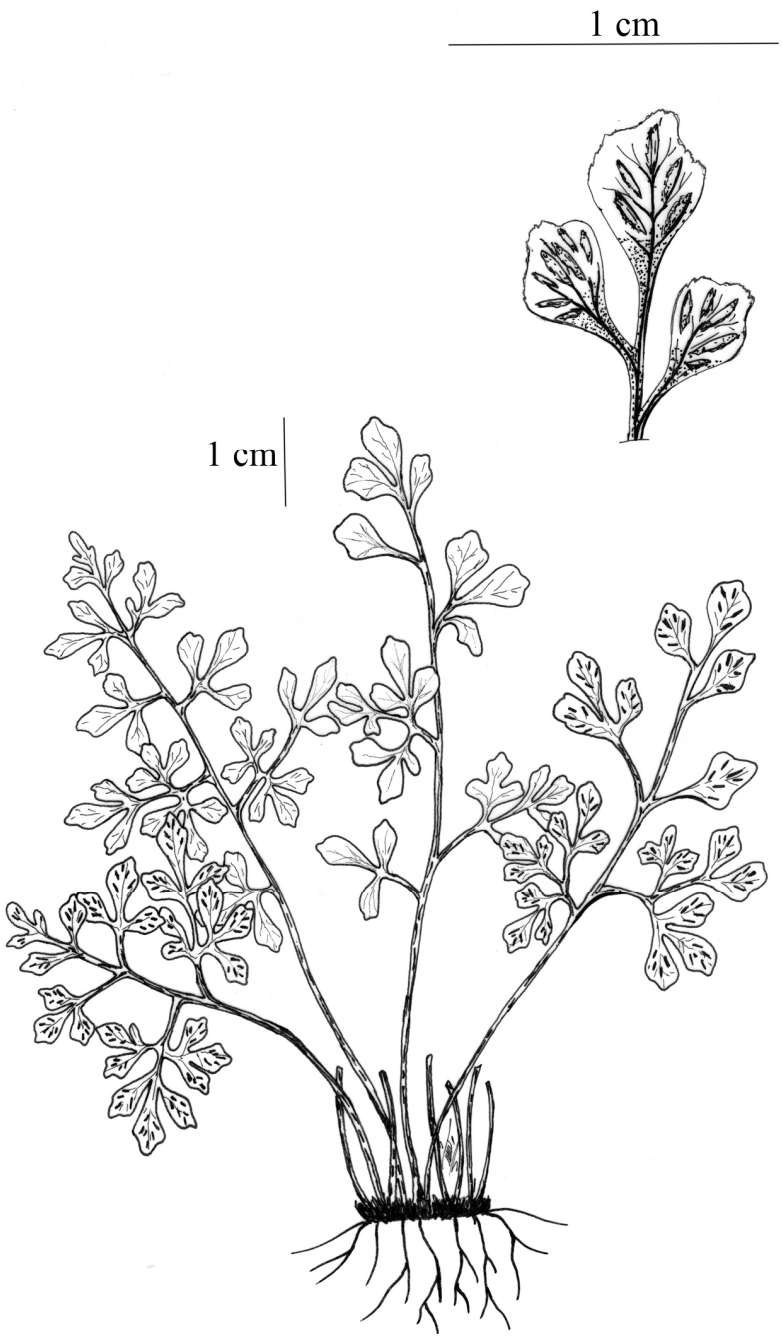


Fig. 24. *Asplenium ruta-muraria* — Akhani 11470.

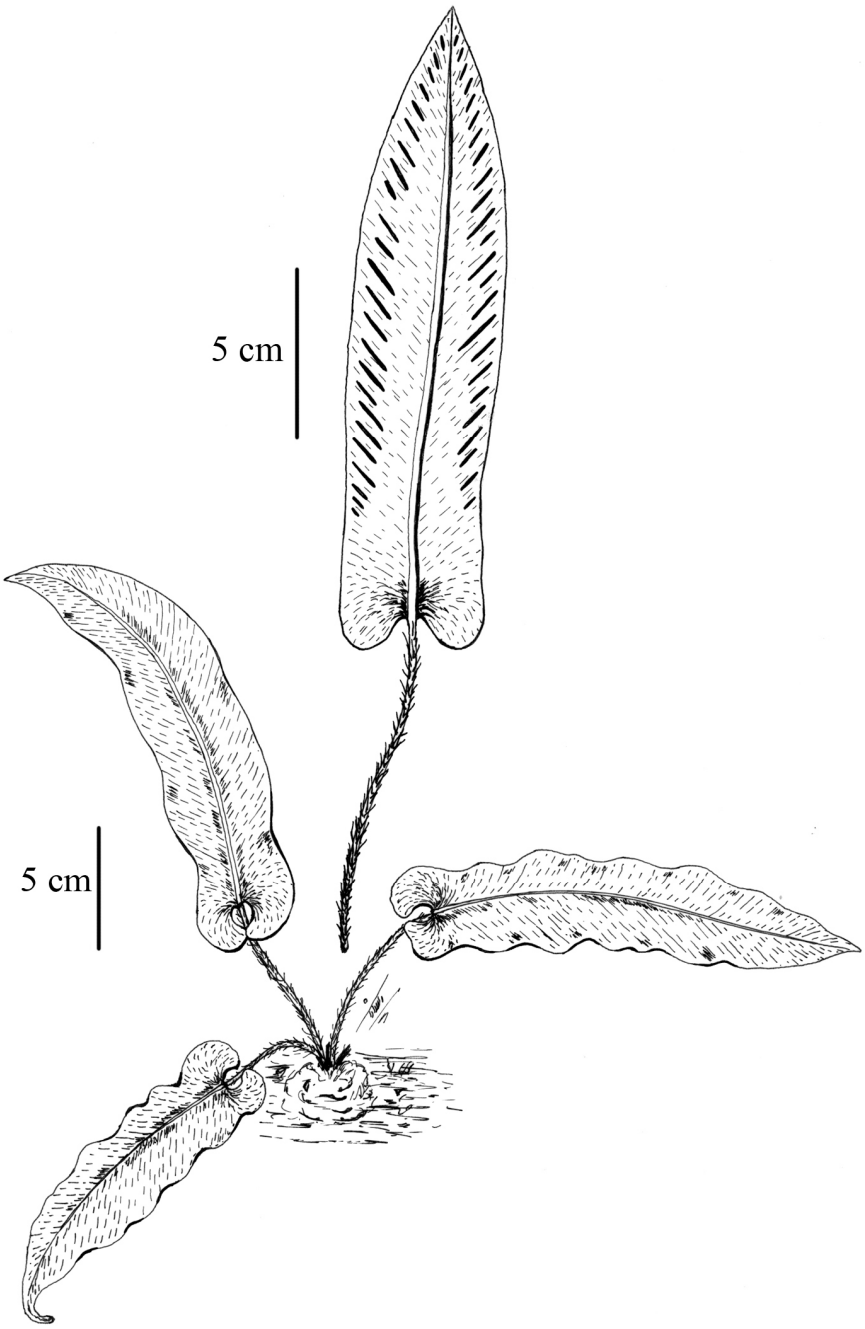


Fig. 25. *Asplenium scolopendrium* — Khoshravesh 18.

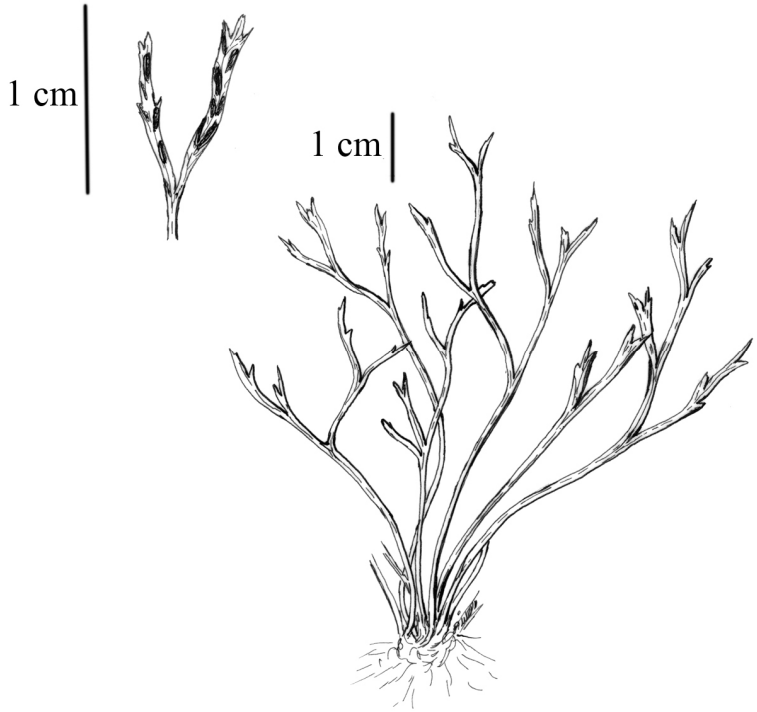


Fig. 26. *Asplenium septentrionale* — Ghahraman 5834.

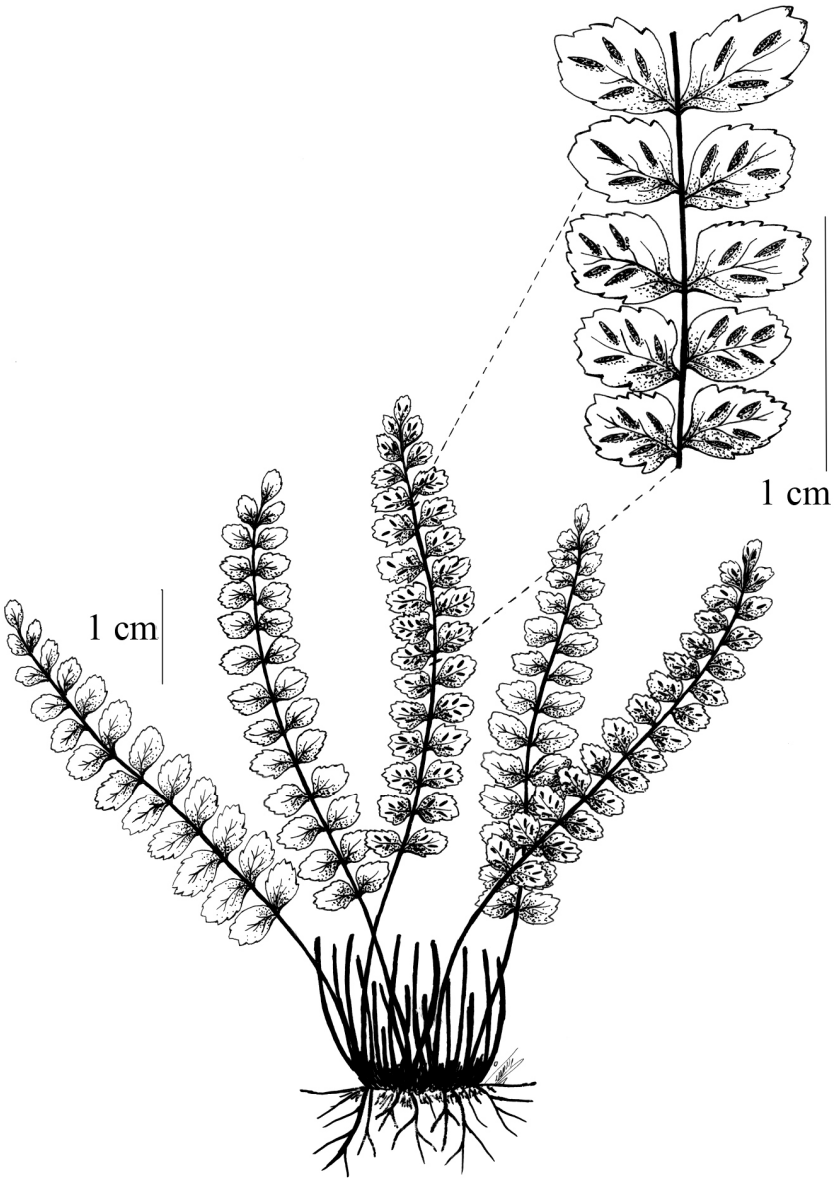


Fig. 27. *Asplenium trichomanes* — Khoshravesh 22.

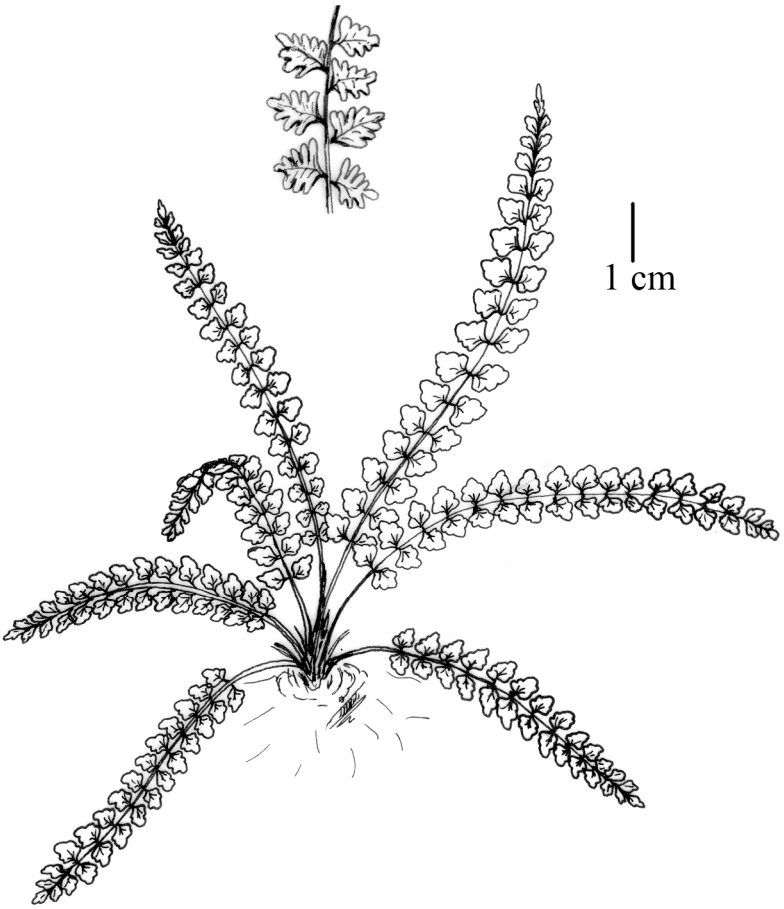


Fig. 28. *Asplenium viride* — Runemark 21755.

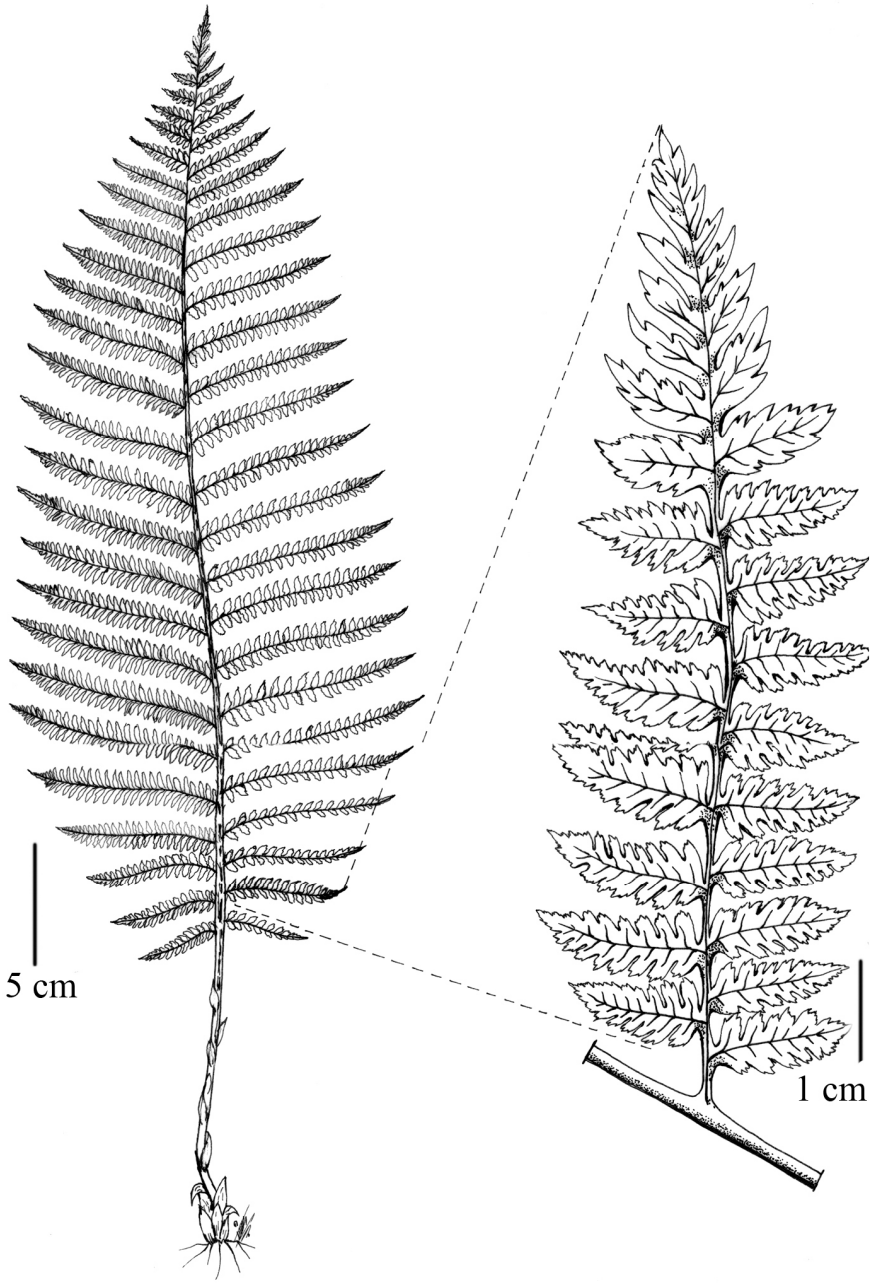


Fig. 29. *Athyrium filix-femina* — Akhani 11598.

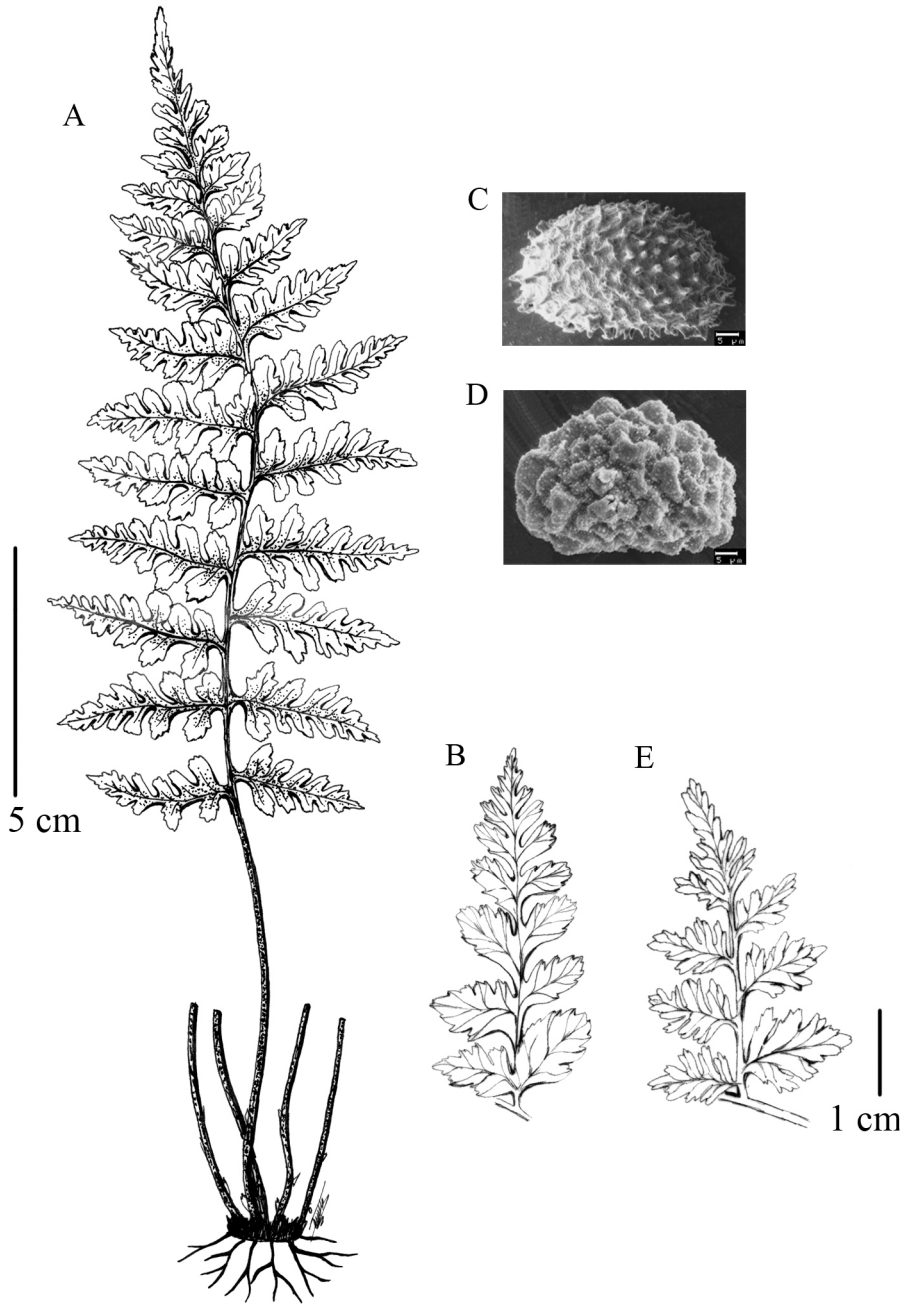


Fig. 30. A-C. *Cystopteris fragilis* subsp. *fragilis* (C, SEM of spore) - Akhani 11638, D. SEM spore of *Cystopteris fragilis* subsp. *dickieana* - Faghihnia & Zangooei 22363, E. *Cystopteris alpina* (Joharchi & Zangooei 15698).

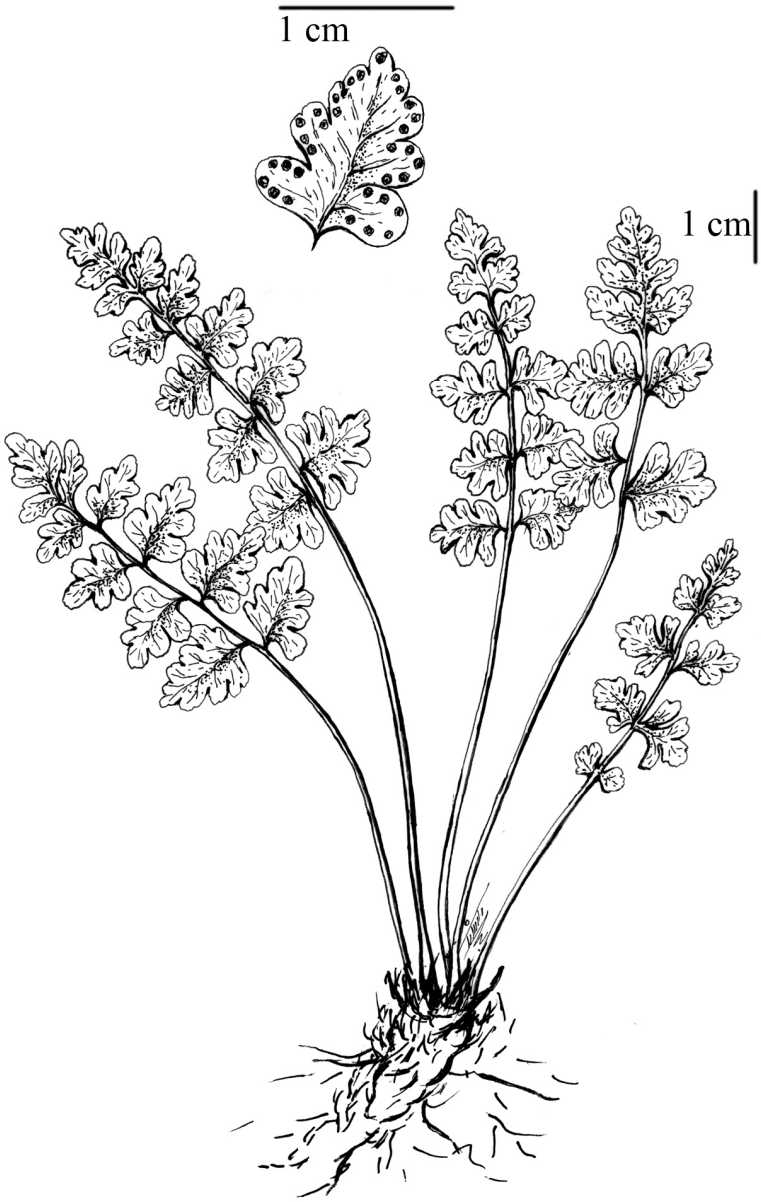


Fig. 31. *Woodsia alpina* — Wendelbo & Assadi 18492.

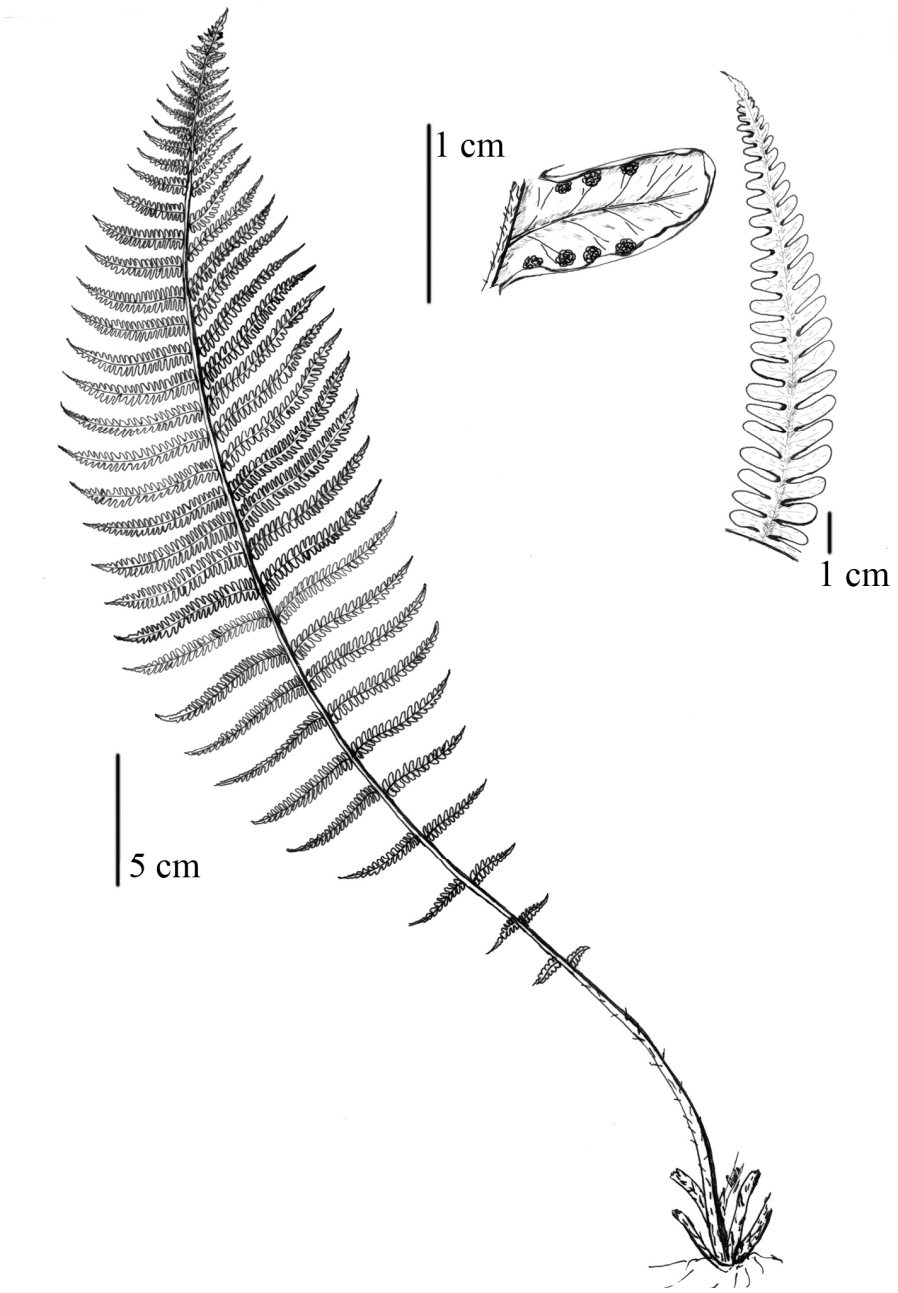


Fig. 32. *Thelypteris limbosperma* ─ Wendelbo & Assadi 1860.

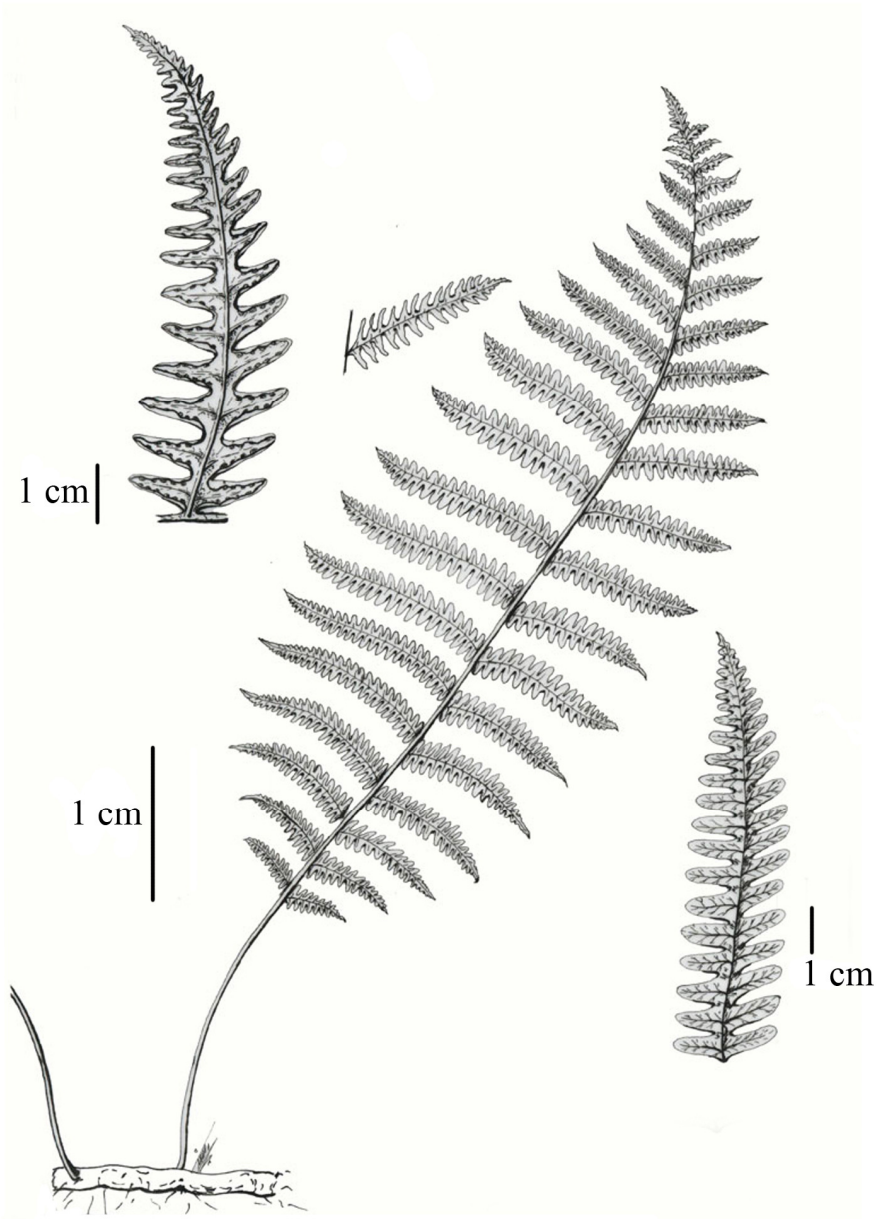


Fig. 33. *Thelypteris palustris* ─ Mobayen 28401.

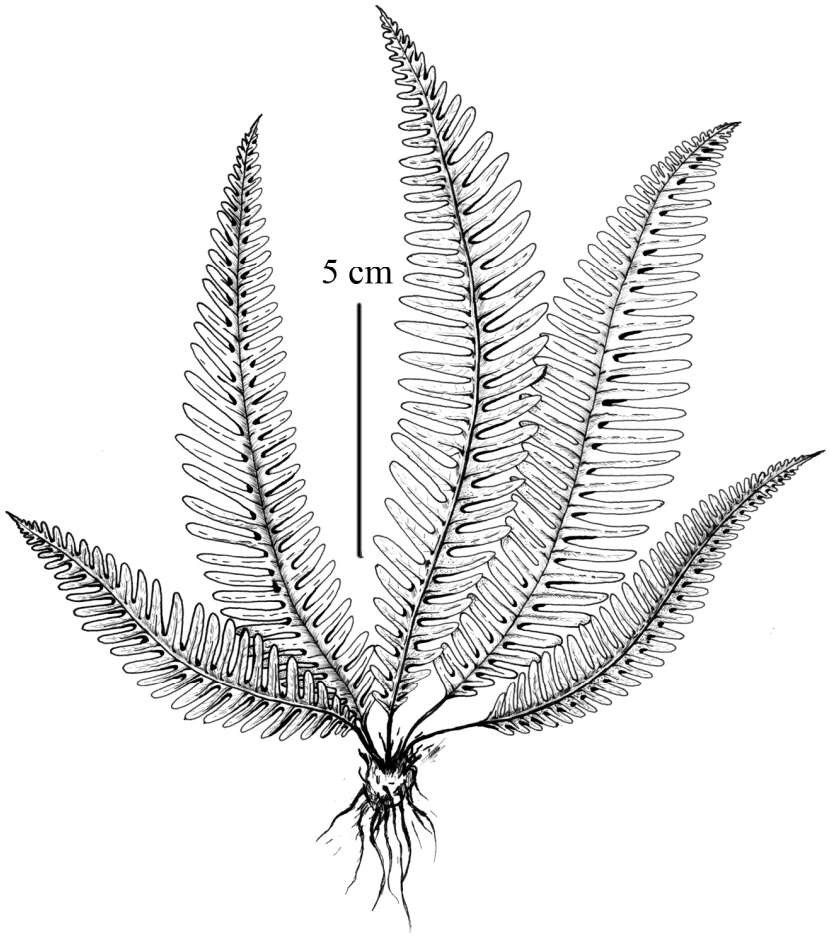


Fig. 34. *Blechnum spicant* ─ Wendelbo & Assadi 18607.

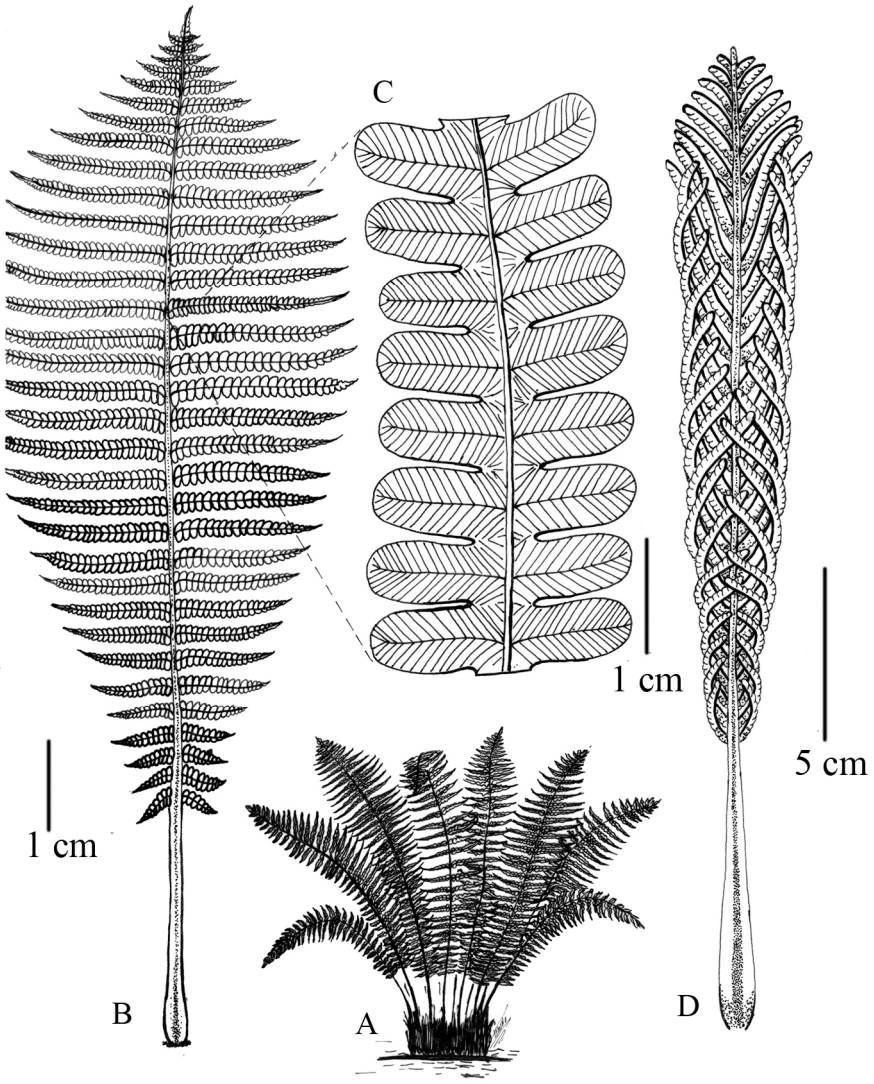


Fig. 35. *Matteuccia struthiopteris* (A, Habit; B-C, Sterile frond; D, Fertile frond); — Akhani 11993.

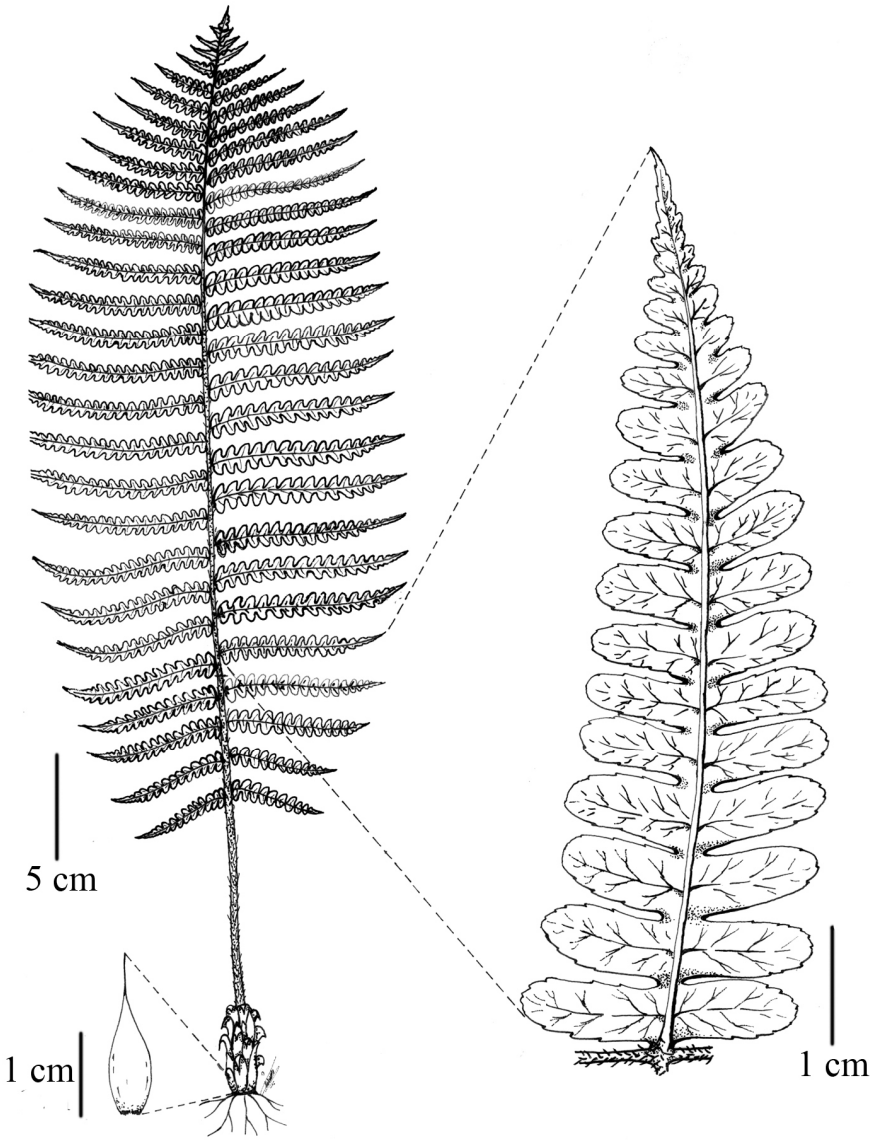


Fig. 36. *Dryopteris affinis* — Akhani 12210.

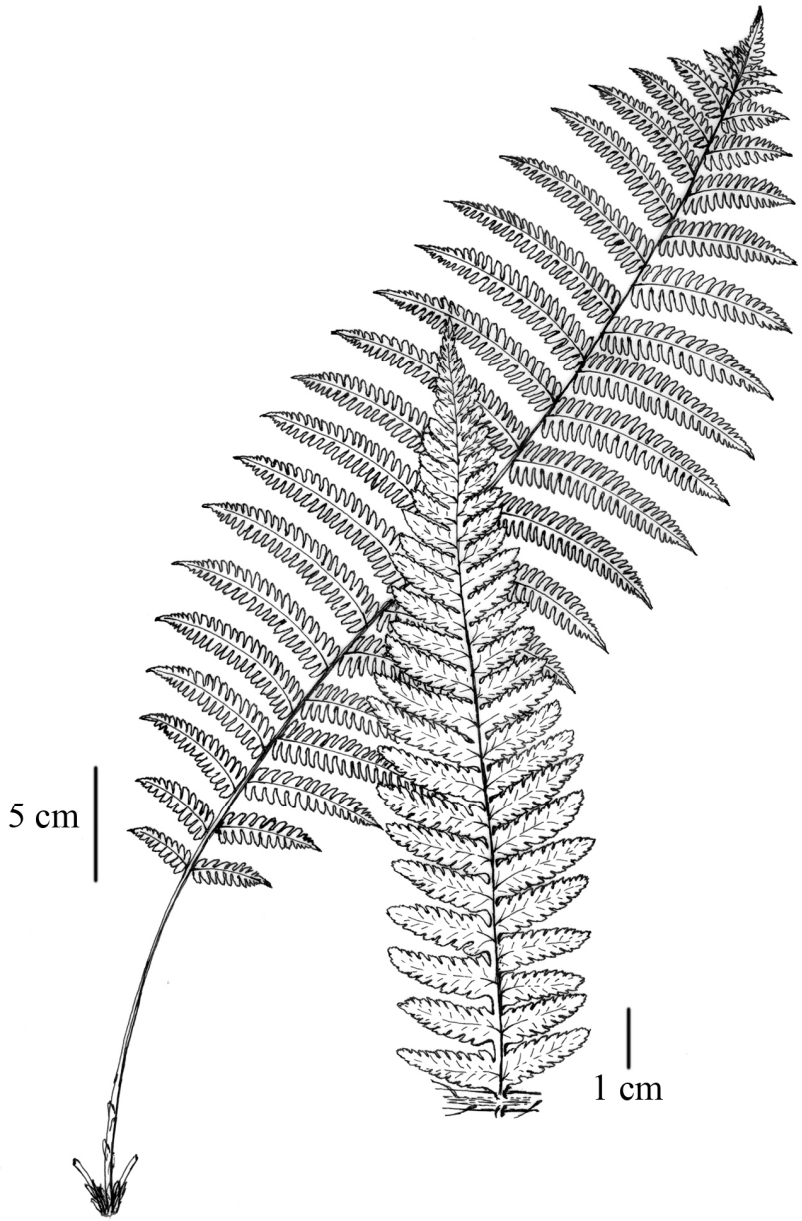


Fig. 37. *Dryopteris caucasica* — Akhani 11263.

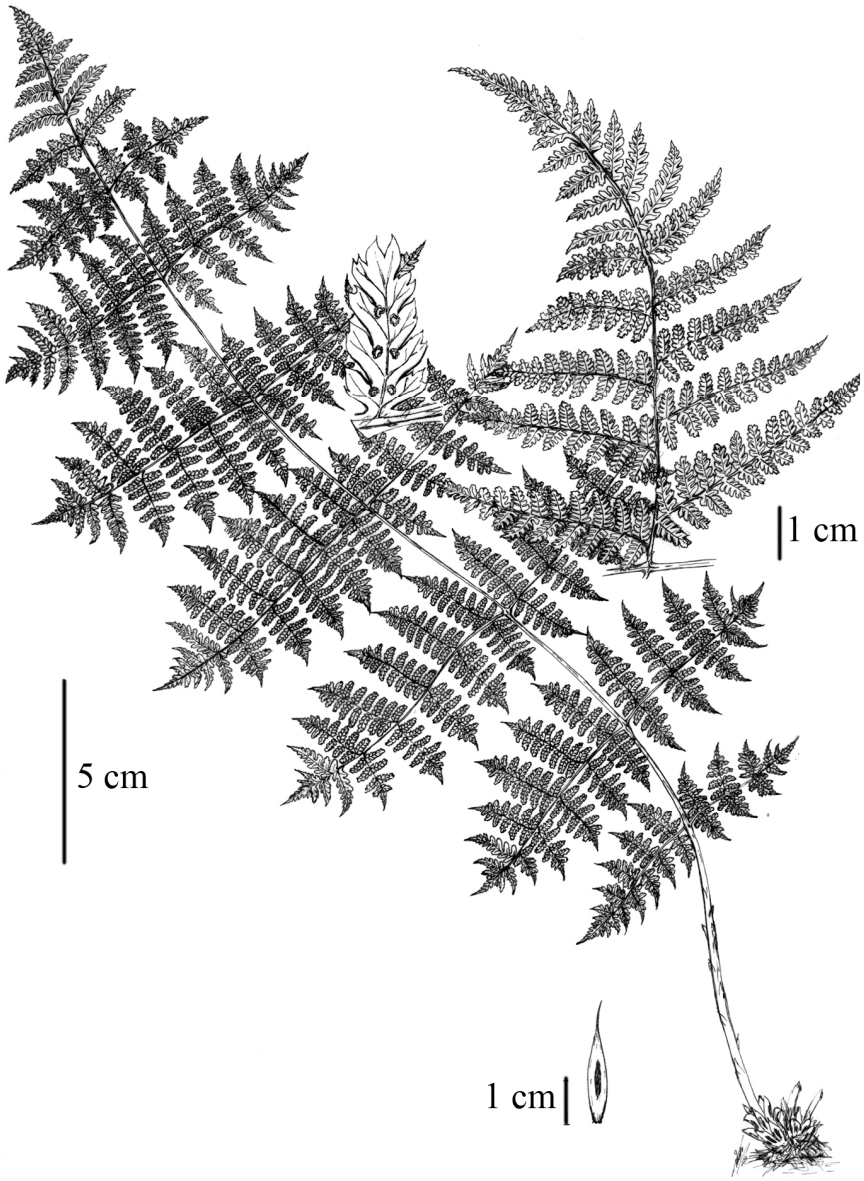


Fig. 38. *Dryopteris dilatata* — Mobayen 28679.

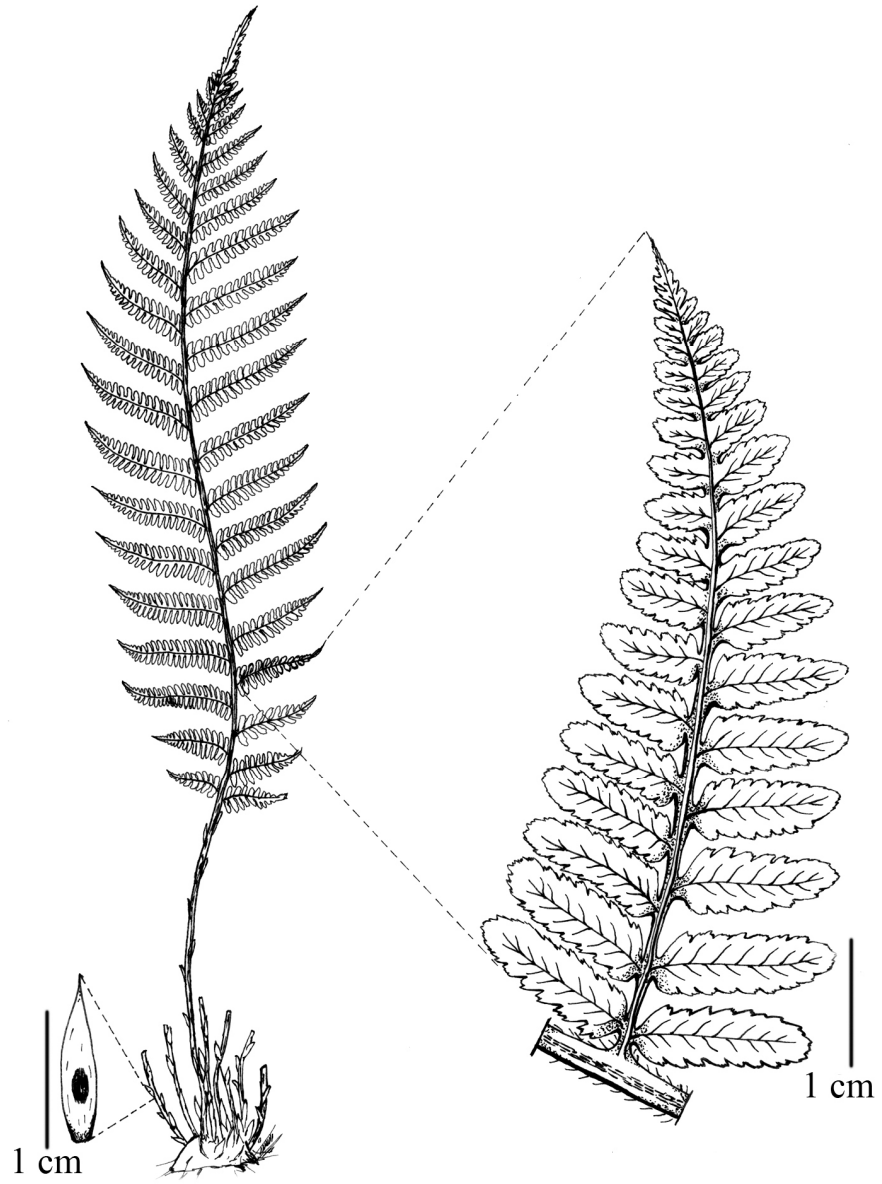


Fig. 39. *Dryopteris pallida* — Akhani 11955.

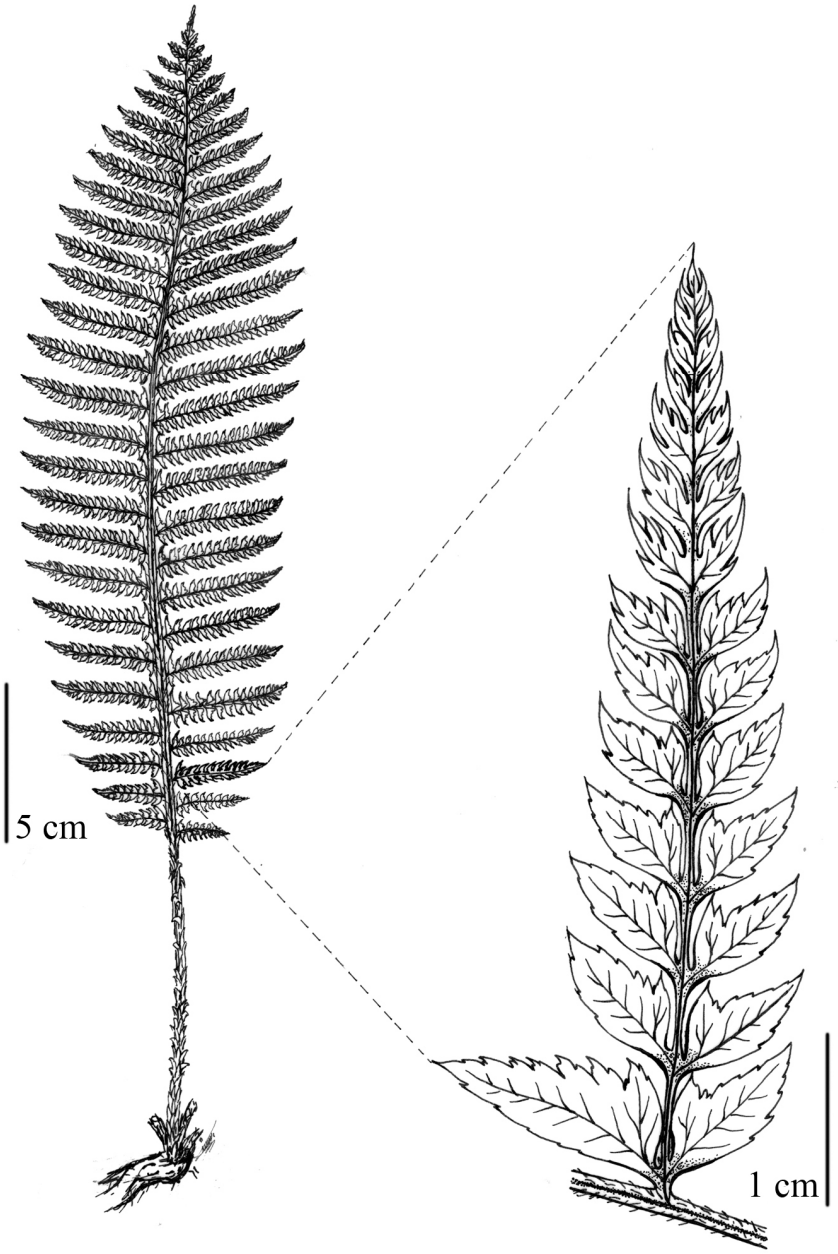


Fig. 40. *Polystichum aculeatum* — Akhani 9240.

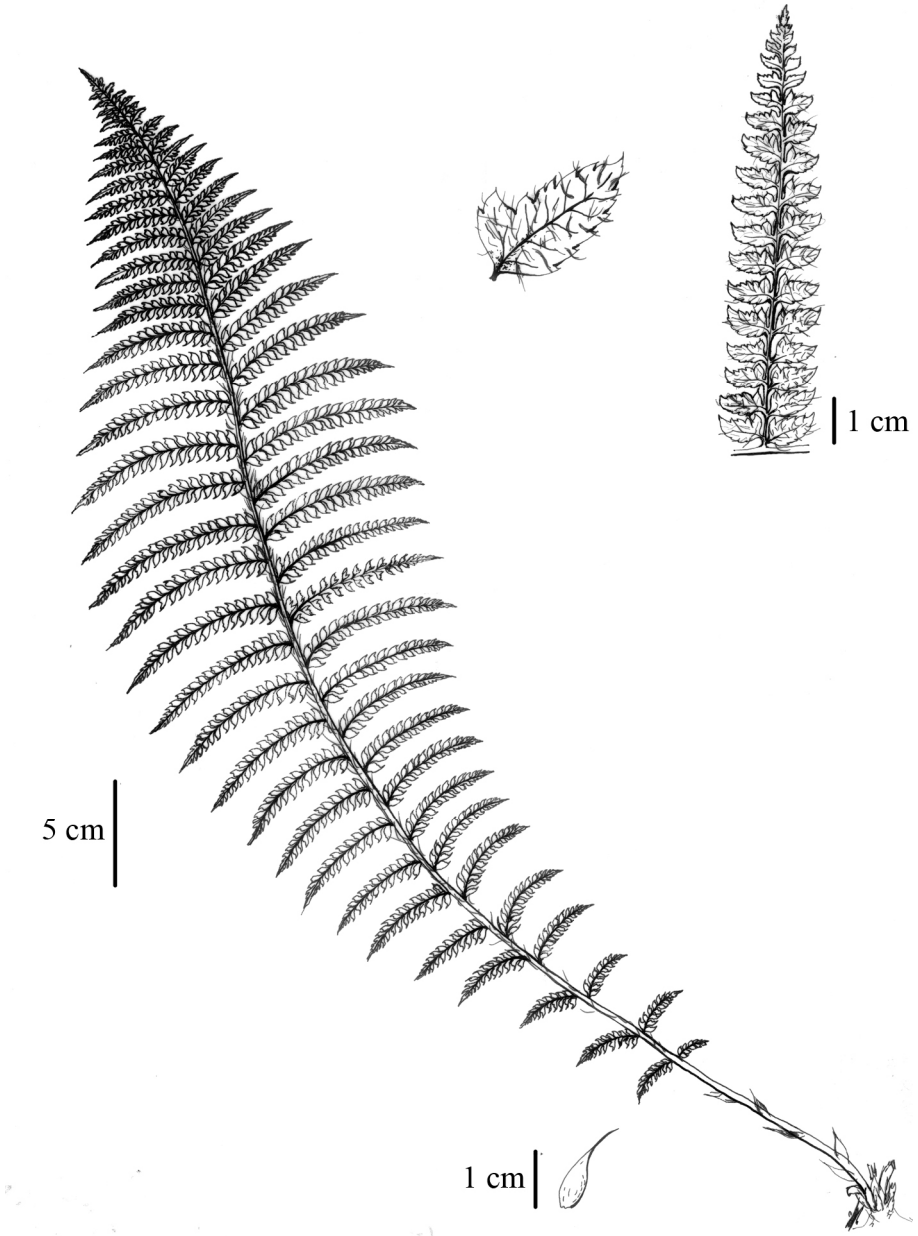


Fig. 41. *Polystichum braunii* — Wendelbo & Assadi 27736.

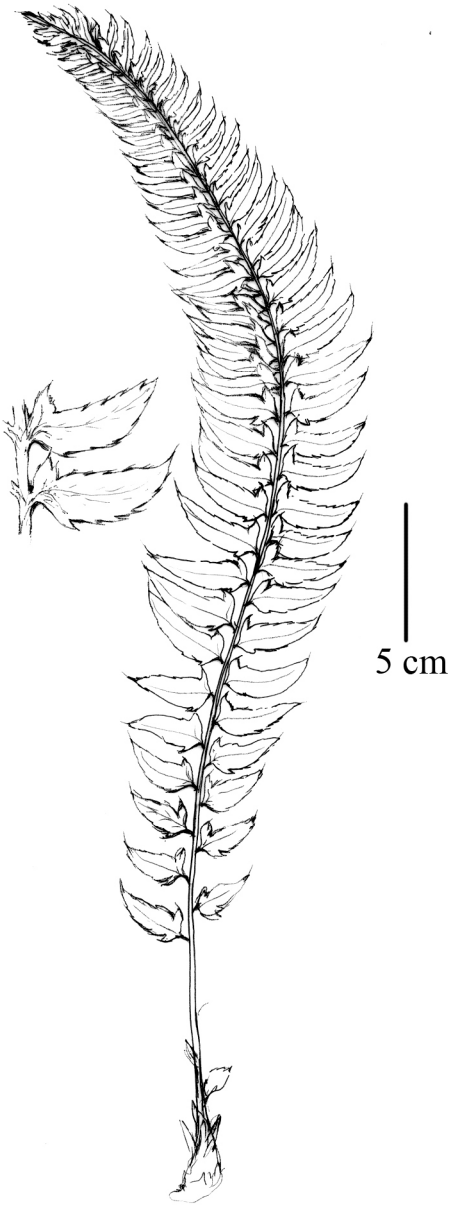


Fig. 42. *Polystichum lonchitis* ─ Eskandari & Pahlevani 45507.

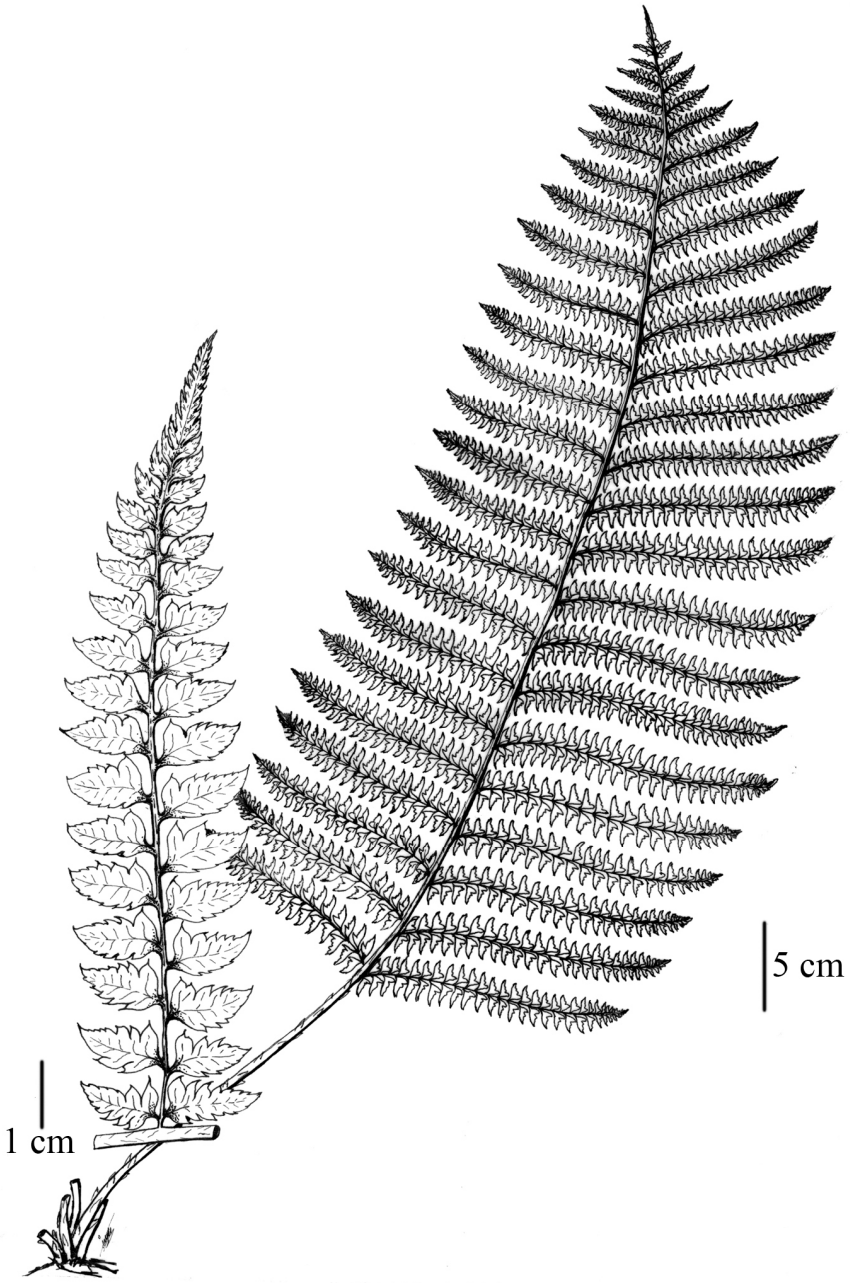


Fig. 43. *Polystichum woronowii* — Akhani 14451.

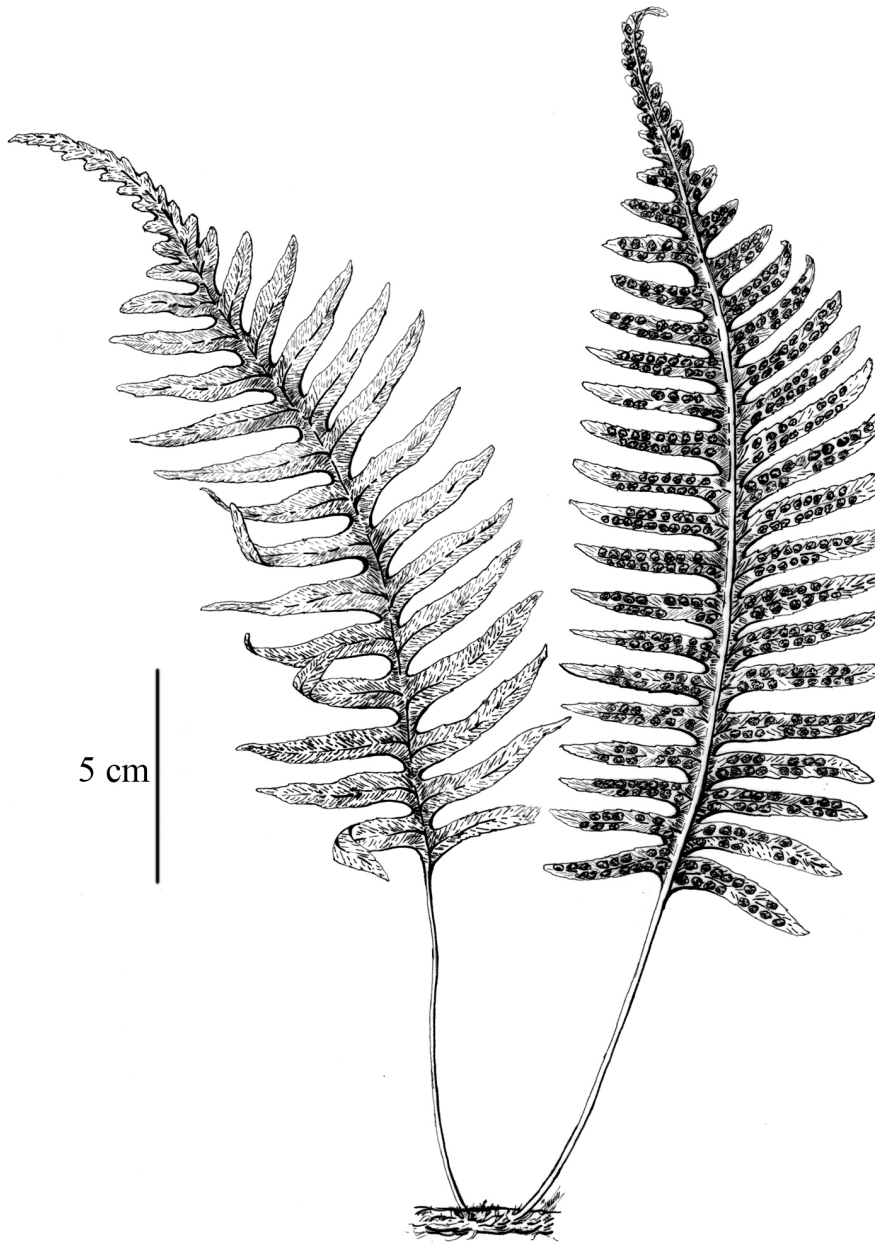


Fig. 44. *Polypodium interjectum* ─ Khoshravesh 23.

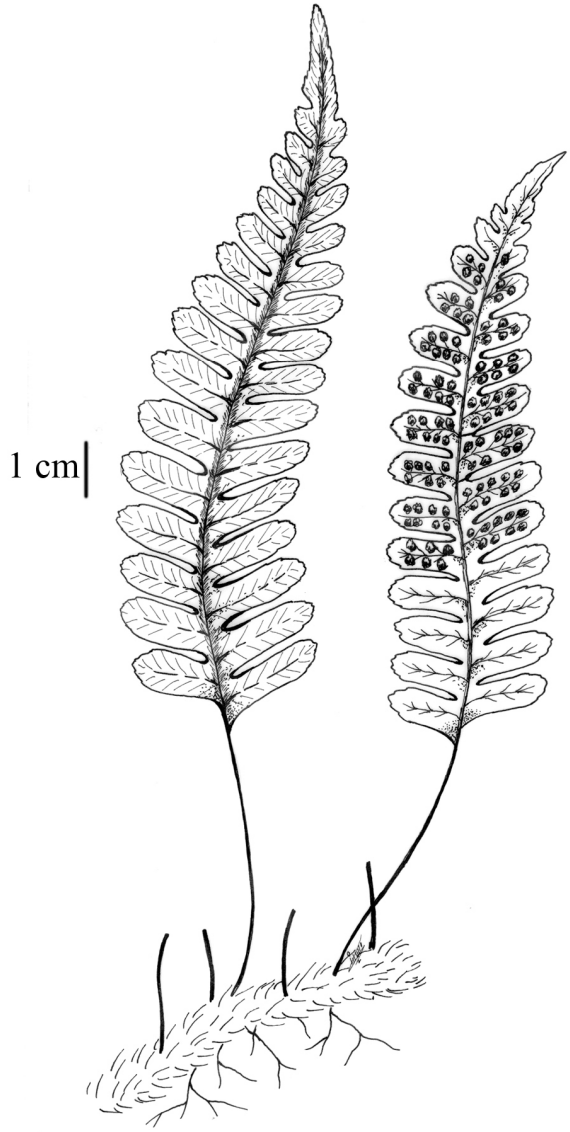


Fig. 45. *Polypodium vulgare* — Akhani 12024.

Fig. 46. A. *Ophioglossum vulgatum*, B. *Psilotum nudum*, epiphyte on *Parrotia persica*, C. Habitat of *Psilotum nudum* behind of hotel Ramsar (Mazandaran Prov.).

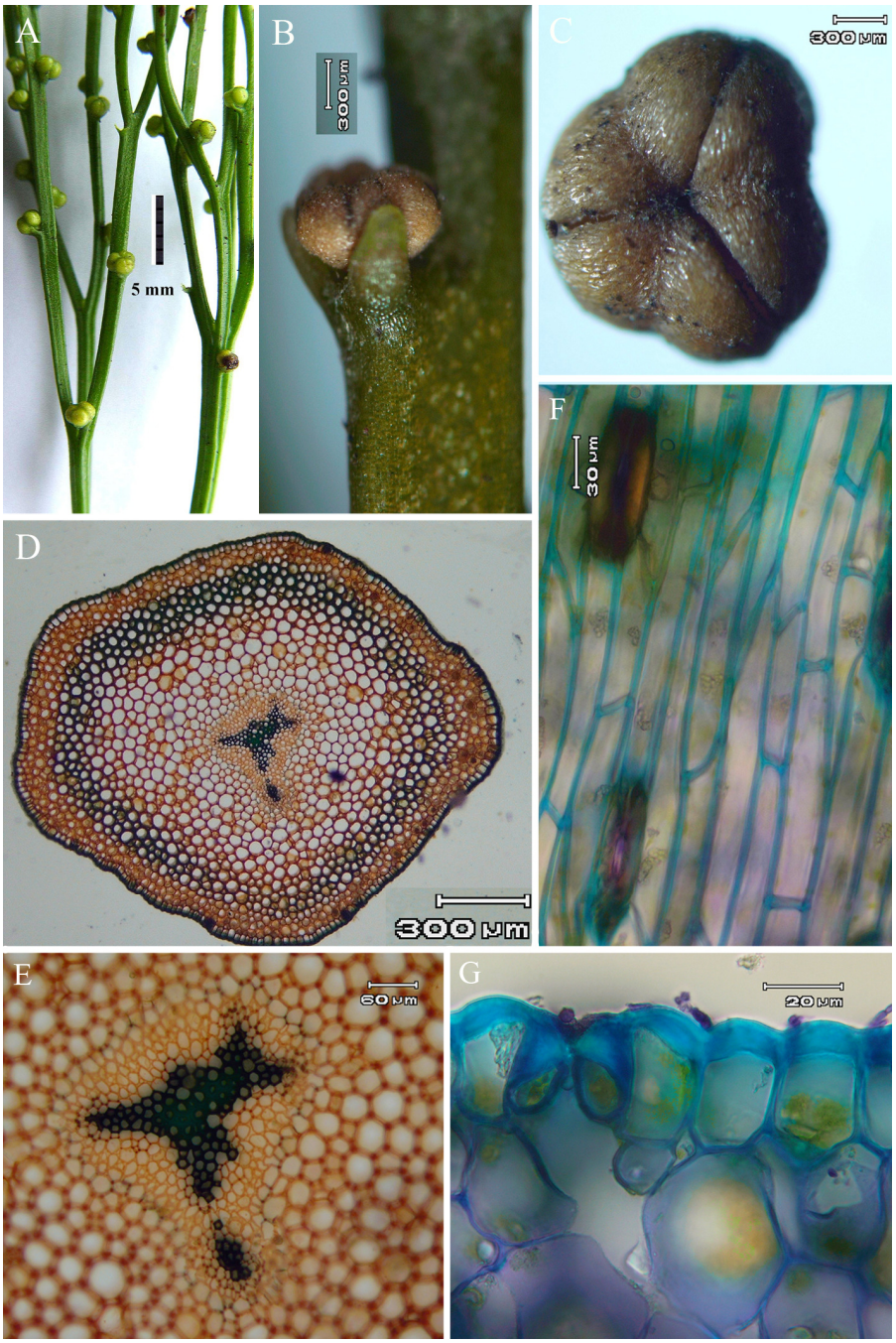


Fig. 47. A-G. *Psilotum nudum*; A-B. Sporangium bearing branches; C. Sporangium; D. Transverse section of stem, showing epidermis, cortex and vascular bundle, E. Detail of vascular bundle showing protostele; F. Epidermis; G. transverse section of epidermis showing stomata.

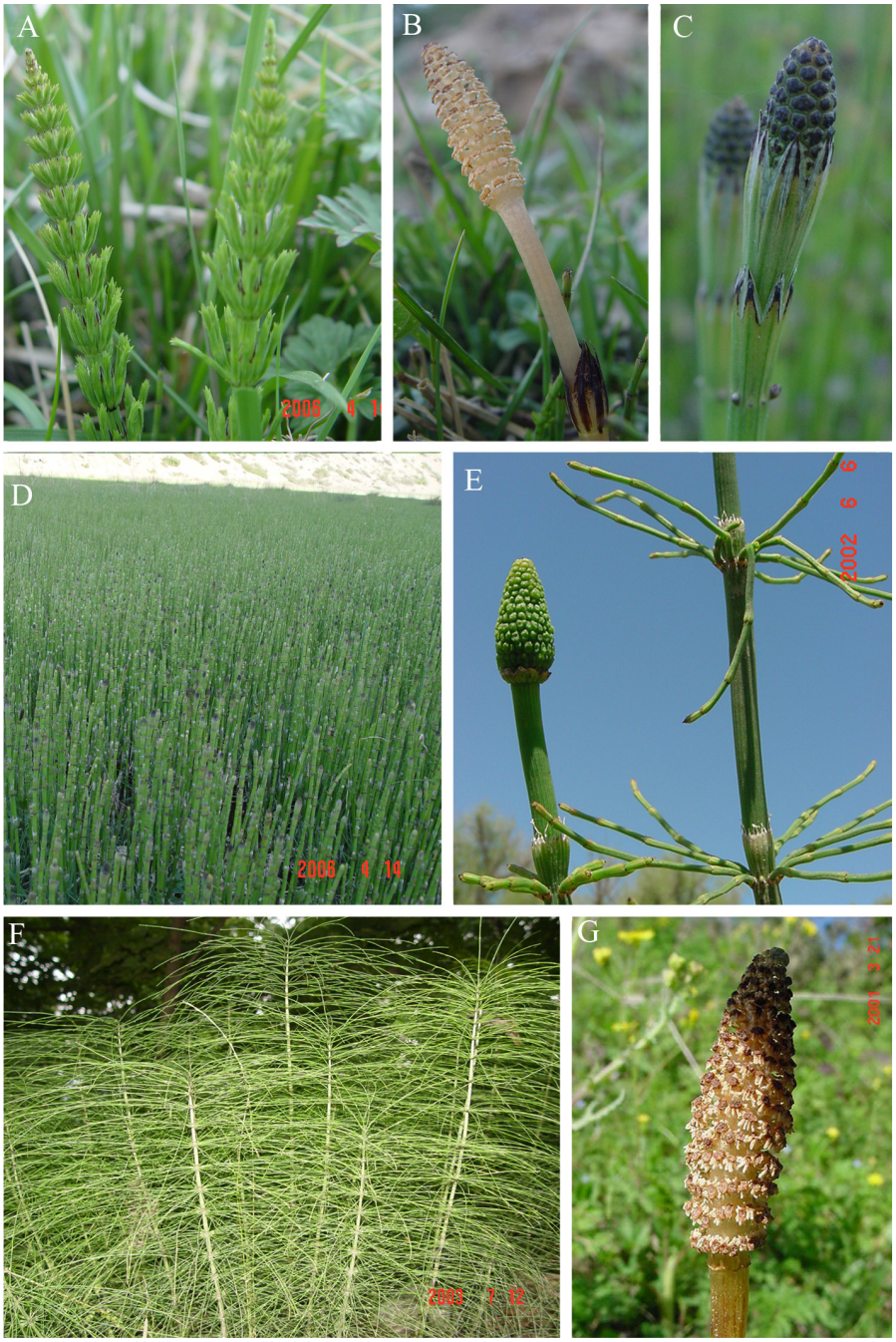


Fig. 48. A-B. *Equisetum arvense*, C-D. *Equisetum palustre*, E. *Equisetum ramosissimum*, F-G. *Equisetum telmateia* (by H. Akhani).

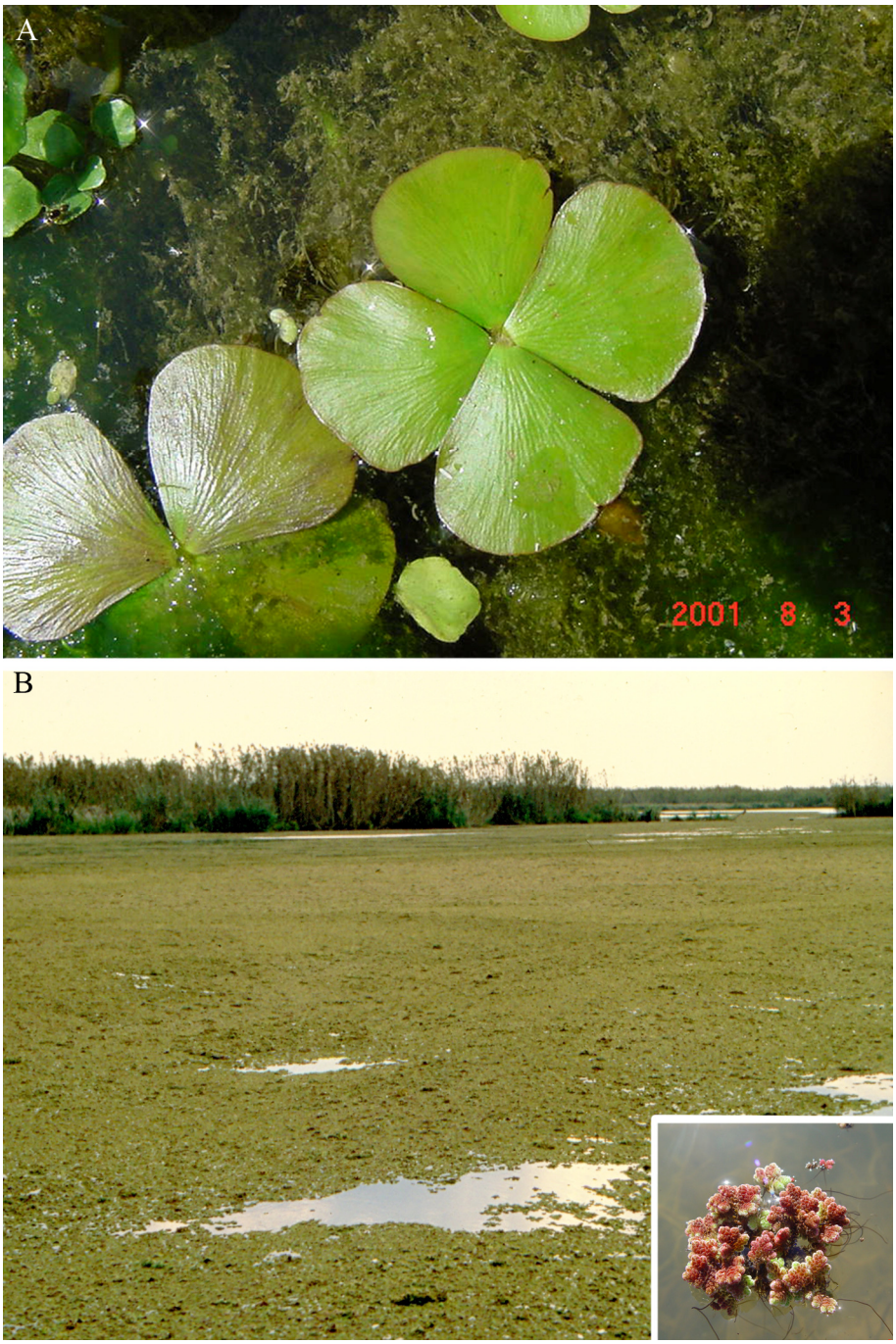


Fig. 49. A. *Marsilea quadrifolia*, B. *Azolla filiculoides*, large photo shows total covering of the water surface by *Azolla* in Anzali wetland (Gilan Prov.), and inset shows close ups of a small mass of *Azolla* (by H. Akhani).

Fig. 50. A. *Pteridium aquilinum*, Golestan National Park (Golestan Prov.), B. *Adiantum capillus-veneris*, C. *Anogramma leptophylla* (A by H. Akhani, B & C by M. Eskandari).

Fig. 51. A. *Cheilanthes coriacea*, B. *Cheilanthes persica*, C. *Onychium divaricatum*, D-E. *Pteris cretica* (A by M. Eskandari, B & E by H. Akhani).

Fig. 52. A. *Asplenium adiantum-nigrum*, B. *Asplenium ceterach*, C. *Asplenium ruta-muraria*, D. *Asplenium scolopendrium* (A & D by H. Akhani, B & C by M. Eskandari).

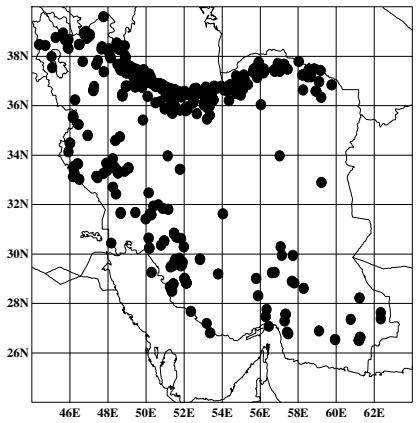
Fig. 53. A. *Asplenium septentrionale*, B-C. *Asplenium trichomanes* (A by M. Eskandari, B & C by H. Akhani).

Fig. 54. A. *Athyrium filix-femina*, B. *Cystopteris fragilis* subsp. *fragilis* (by H. Akhani).

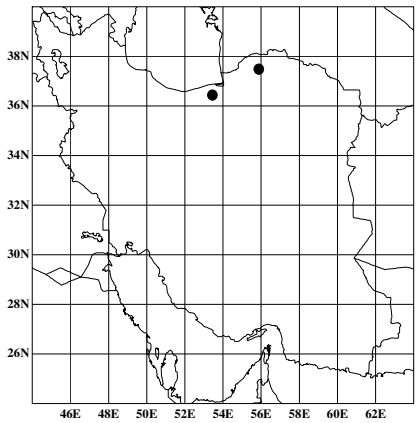
Fig. 55. A. *Thelypteris palustris* in Telkeh Protected Area, showing habitat on shallow water and one frond as inset, B-D. *Matteuccia struthiopteris*, showing habit (B), close ups of part of vegetative frond, and spore bearing frond (D) (A by M. Eskandari, B-D by H. Akhani).

Fig. 56. A. *Dryopteris caucasica*, B-C. *Dryopteris pallida* (by H. Akhani).

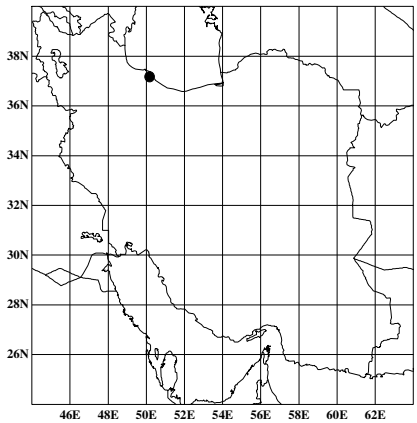
Fig. 57. A. *Polystichum aculeatum*, B. *Polystichum lonchitis*, C-D. *Polystichum woronowii*, E. *Platyserum bifurcatum* (A, C & D by H. Akhani, B & E by M. Eskandari).



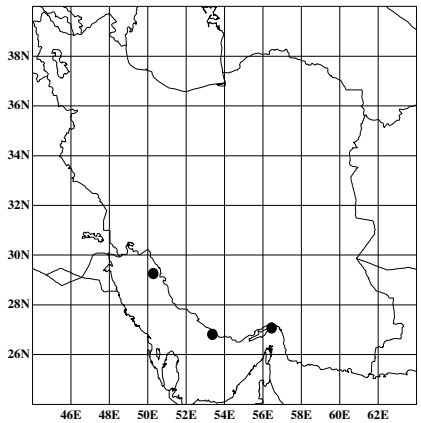
Map 1. Distribution of all species



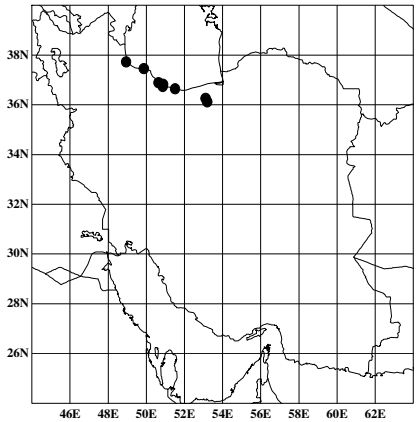
Map 2. *Botrychium lunaria*



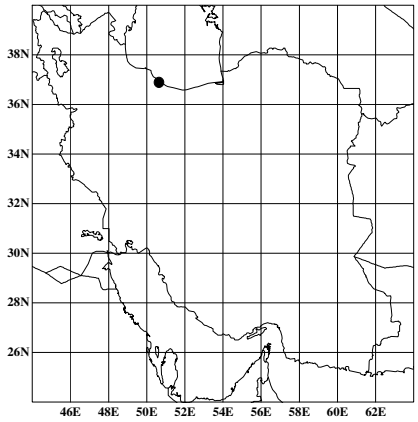
Map 3. *Ophioglossum lusitanicum*



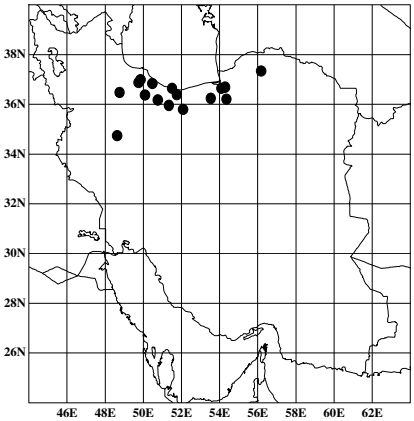
Map 4. *Ophioglossum polyphyllum*



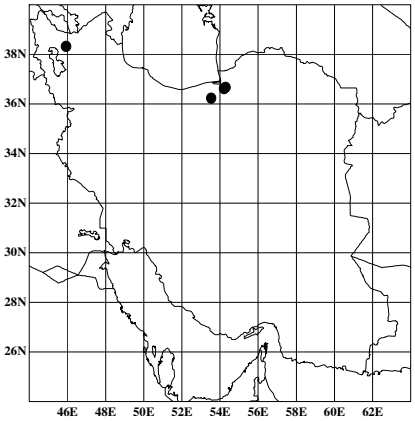
Map 5. *Ophioglossum vulgatum*



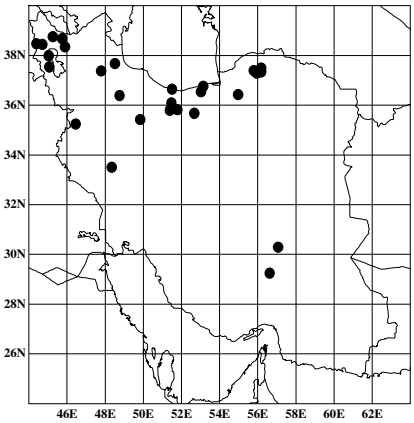
Map 6. *Psilotum nudum*



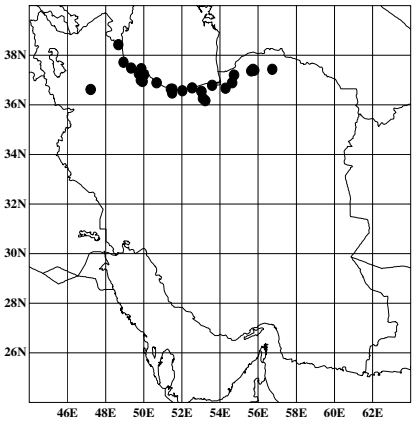
Map 7. *Equisetum arvense*



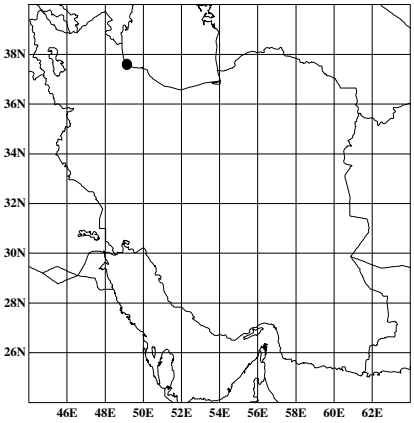
Map 8. *Equisetum palustre*



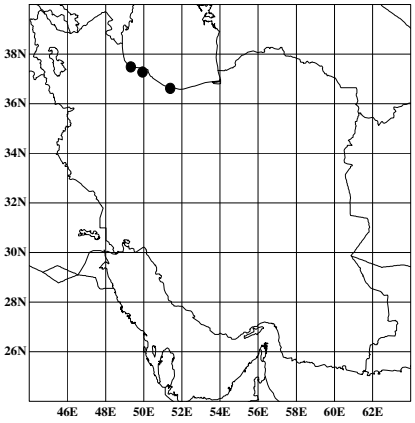
Map 9. *Equisetum ramosissimum*



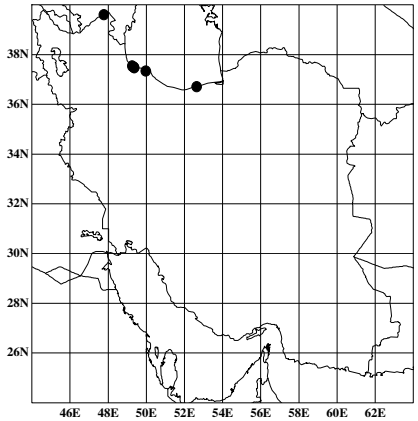
Map 10. *Equisetum telmateia*



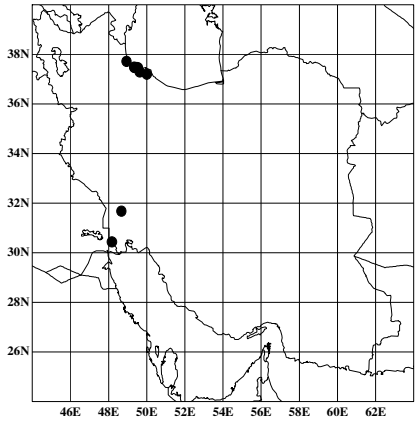
Map 11. *Osmunda regalis*



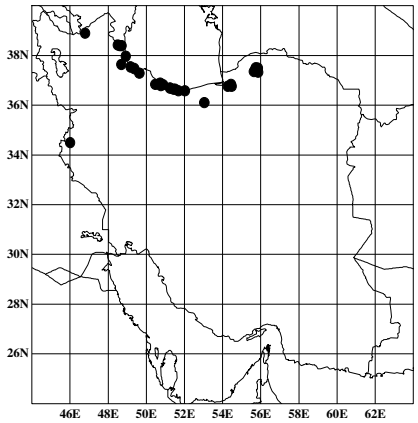
Map 12. *Marsilea quadrifolia*



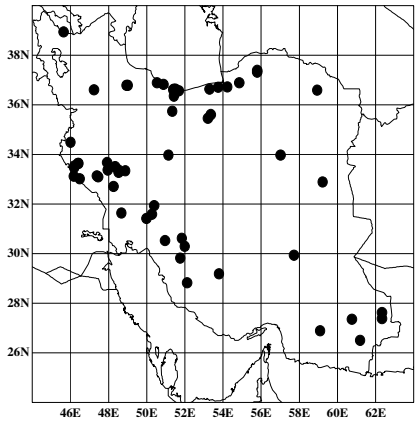
Map 13. *Azolla filiculoides*



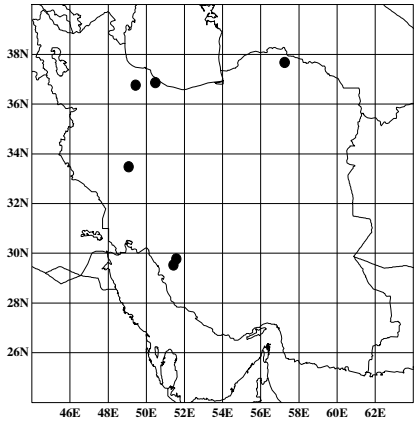
Map 14. *Salvinia natans*



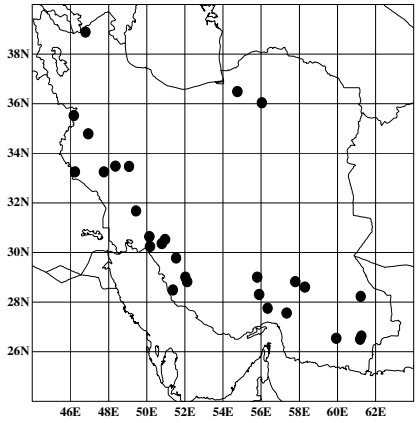
Map 15. *Pteridium aquilinum*



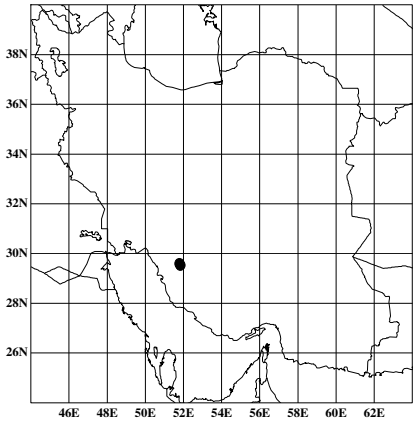
Map 16. *Adiantum capillus-veneris*



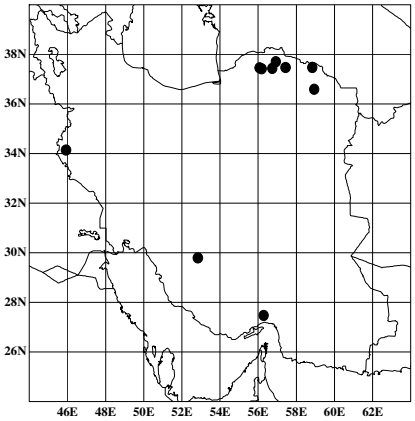
Map 17. *Anogramma leptophylla*



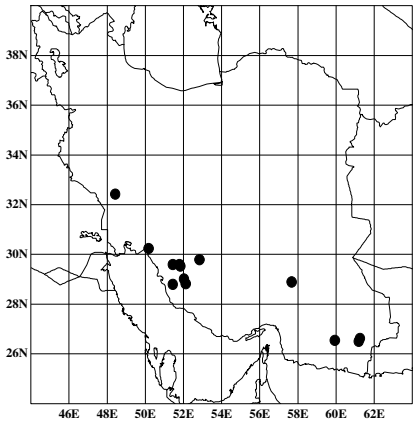
Map 18. *Cheilanthes acrostica*



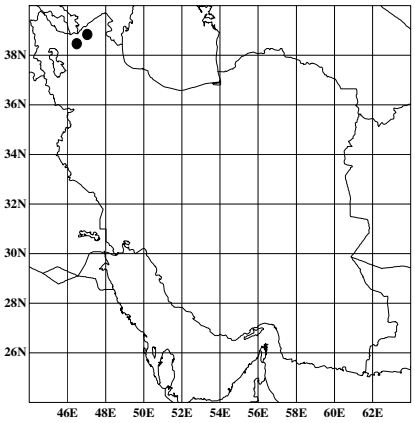
Map 19. *Cheilanthes coriacea*



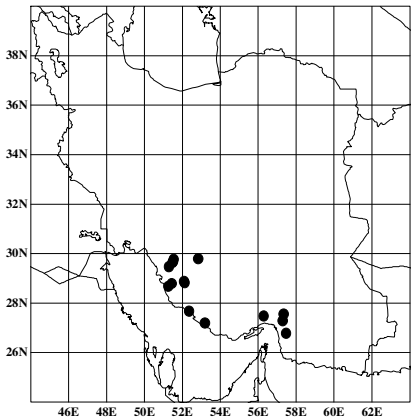
Map 20. *Cheilanthes persica*



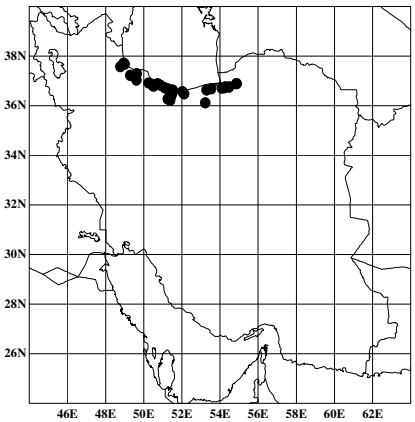
Map 21. *Cosentinia vellea*



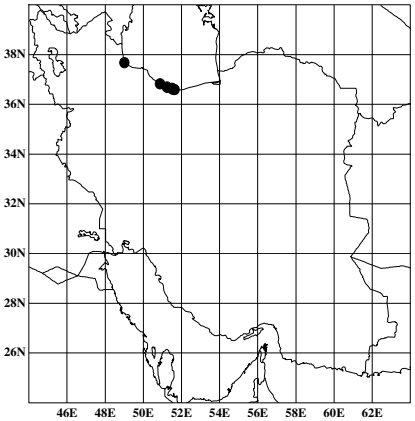
Map 22. *Paragymnopteris marantae*



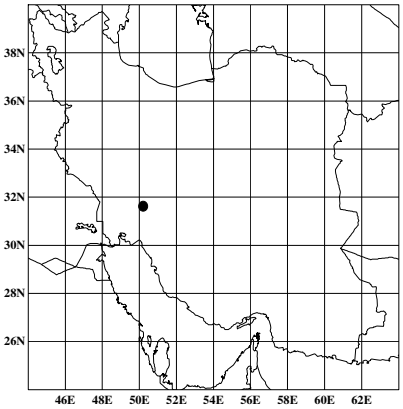
Map 23. *Onychium divaricatum*



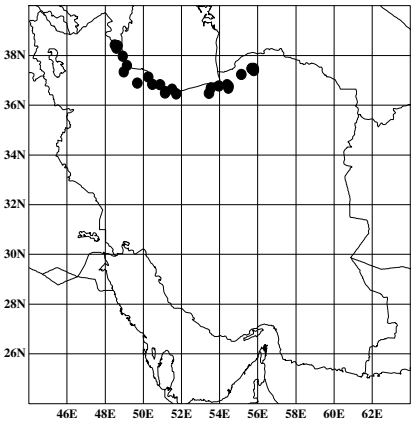
Map 24. *Pteris cretica*



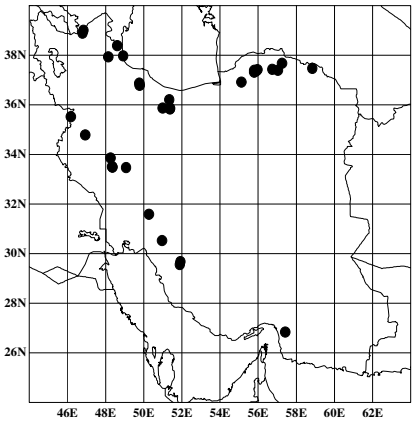
Map 25. *Pteris dentata*



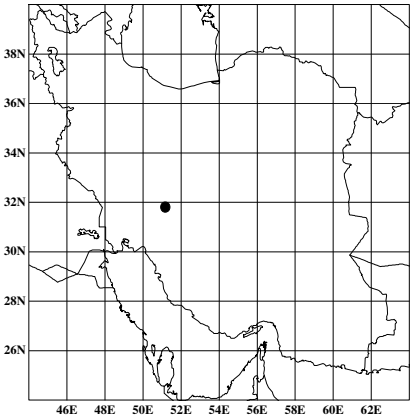
Map 26. *Pteris vittata* (doubtful location)



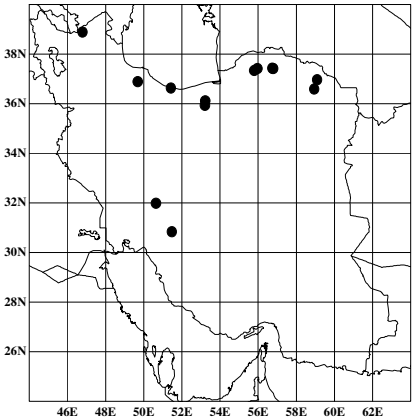
Map 27. *Asplenium adiantum-nigrum*



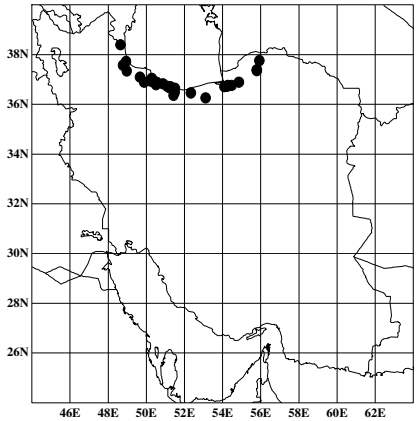
Map 28. *Asplenium ceterach*



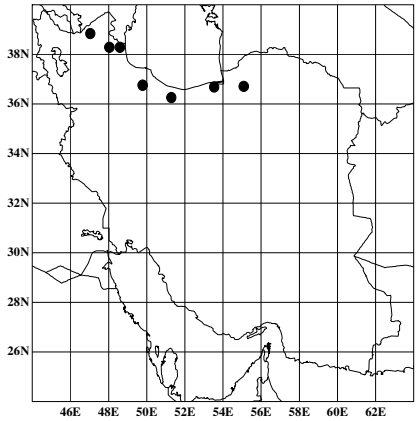
Map 29. *Asplenium lepidum*



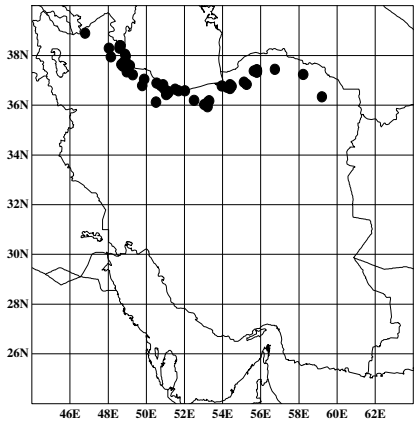
Map 30. *Asplenium ruta-muraria*



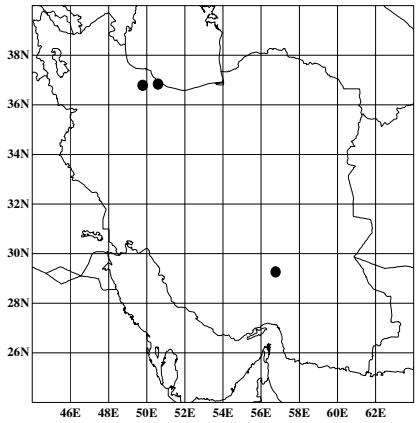
Map 31. *Asplenium scolopendrium*



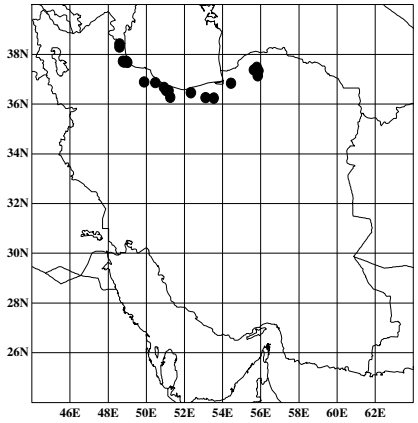
Map 32. *Asplenium septentrionale*



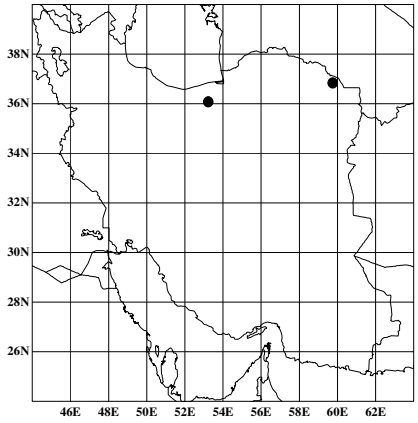
Map 33. *Asplenium trichomanes*



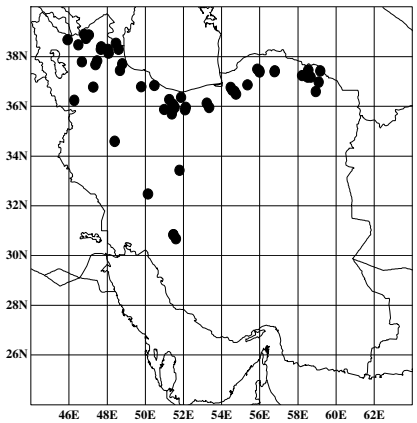
Map 34. *Asplenium viride*



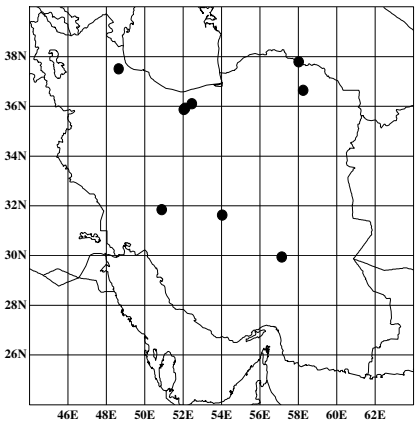
Map 35. *Athyrium filix-femina*



Map 36. *Cystopteris alpina*



Map 37. *Cystopteris fragilis* ssp. *fragilis*



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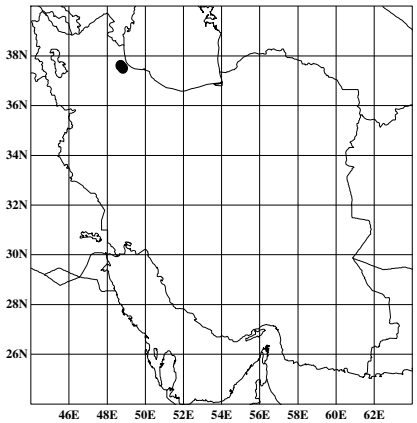

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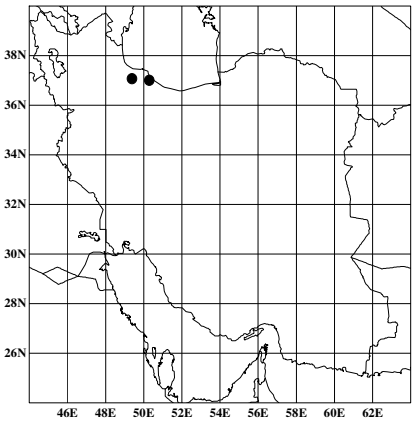

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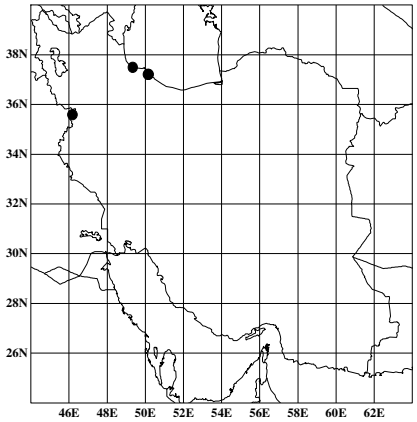

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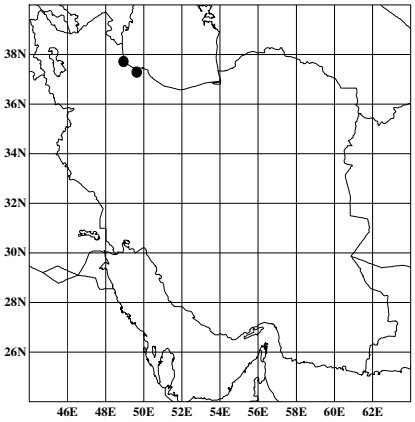

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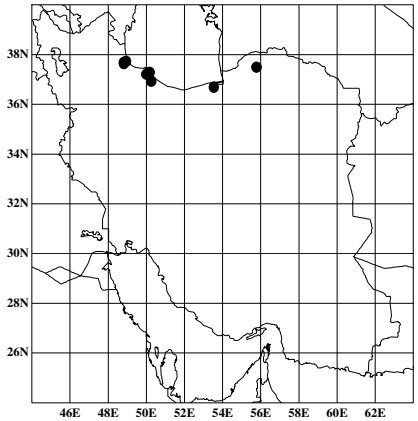

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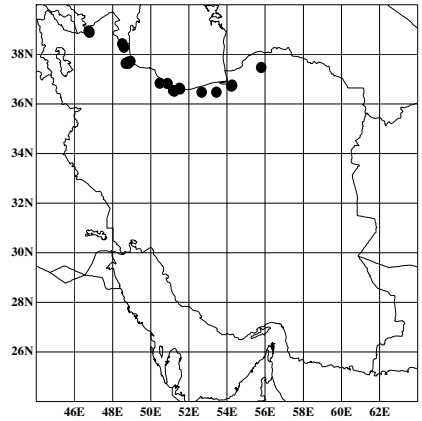

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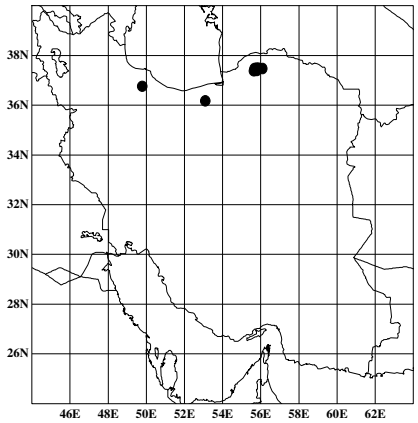

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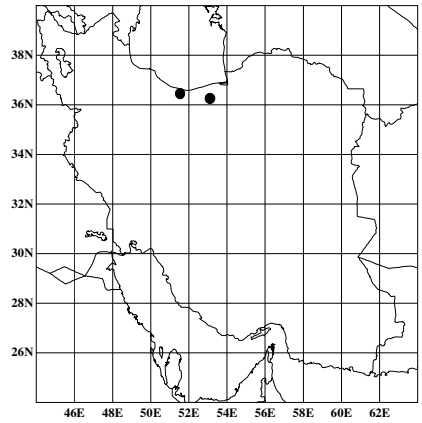

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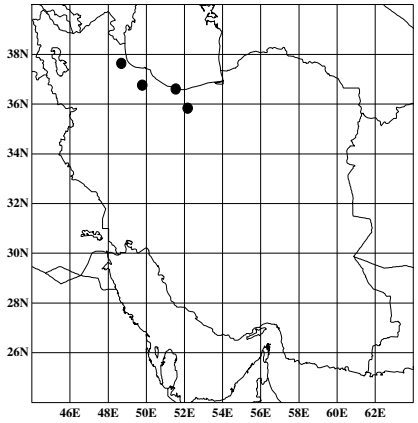

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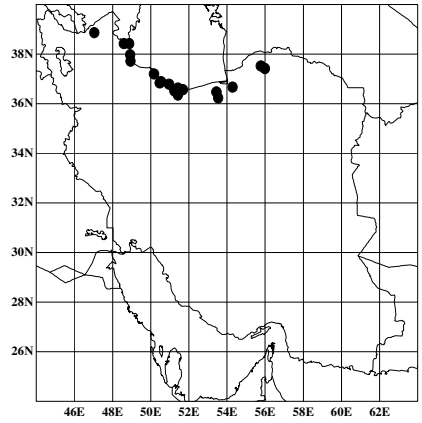

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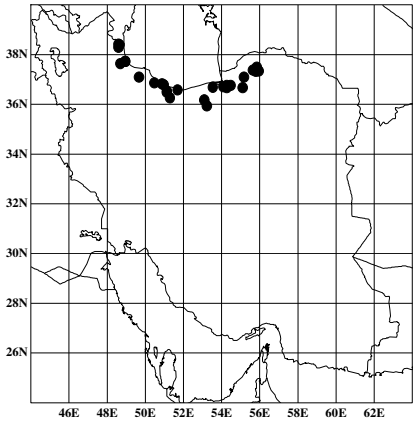

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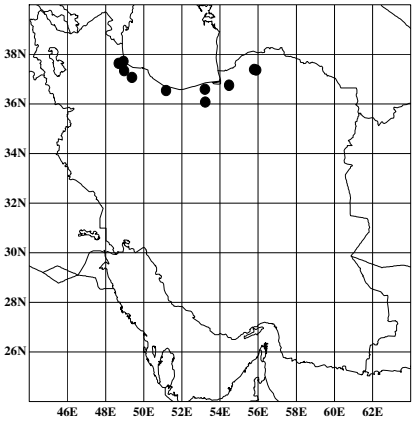

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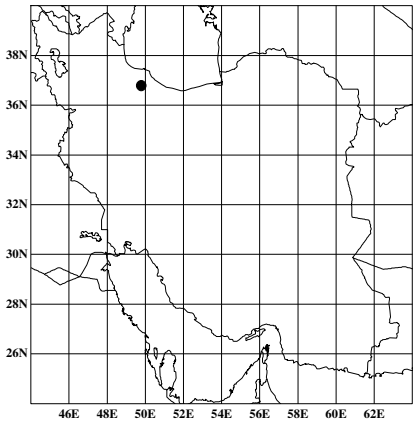

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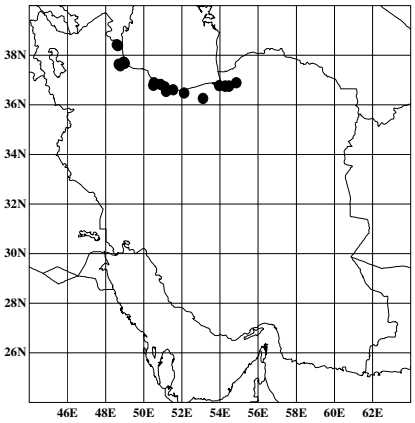
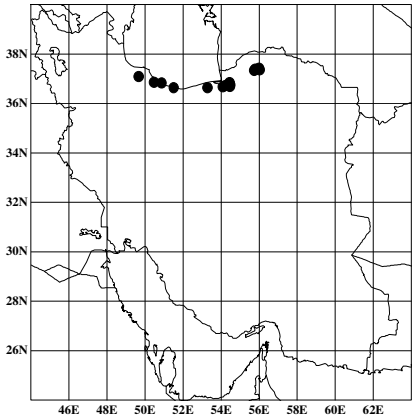
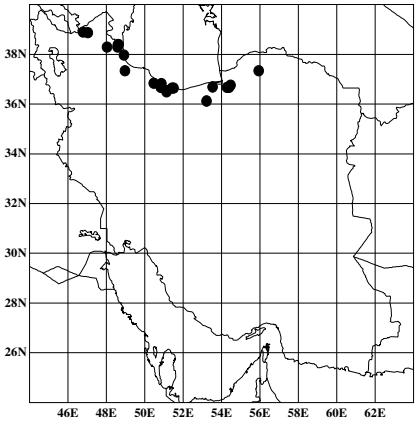


Map 52. *Polystichum woronowii*



Map 53. *Polypodium interjectum*



Map 54. *Polypodium vulgare*

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