STUDIES ON THE FLORA AND VEGETATION OF THE GOLESTAN NATIONAL PARK*, NE IRAN

II. A NEW *POA* AND SOME NEW AND NOTEWORTHY GRASS RECORDS FOR IRAN

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Poa golestanensis H. Scholz & Akhani spec. nov. is described from the Golestan National Park, NE Iran. The following species are added to the grass flora of Iran from that area: *Alopecurus aequalis* Sobol., *Cleistogenes serotina* (L.) Keng, *Heteropogon contortus* (L.) P. Beauv. ex Roem. et Schult., *Hordelymus europaeus* (L.) Harz. The occurrence in Iran of *Poa compressa* L., *P. densa* Troitsky, and *Bothriochloa bladhii* (Retz.) S.T. Blake which were not mentioned in Rechinger's *Flora Iranica* but were reported in later papers is confirmed. The maps of distribution in the Park are provided for the treated species.

Keywords. Golestan National Park, *Gramineae*, grasses, Iranian flora, new records, new species.

INTRODUCTION

This is the second contribution of a series dealing with the flora and vegetation of Golestan National Park (cf. Akhani, 1996). Here a new *Poa* and four interesting new grass records for Iran are enumerated with three further species of which the occurrence in Iran is confirmed. Recently Tzvelev (1997) has published a new *Festuca* (*F. akhanii*) from the Park based on the material sent him for identification: c.2km W of Almeh towards Sharleq, 37°20′N, 56°6′E, 22 v 1995, *Akhani* 10806 (holo. LE; iso. MSB, hb. Akh.). The number of species known in the Park is now increased to 1302. A third contribution including new records and new species from other families follows in the same fascicle (Akhani, 1999). The associated species with some of the treated species in the present paper are given in Tables 1–4 of the next paper (Akhani, 1999). The vouchers of almost all cited plants are kept in M (Botanische Staatssammlunge München) and in the private herbarium of H. Akhani, Tehran (hb. Akh.). Some duplicates are also in the following herbaria: B, E, LI, MMTT (Natural History Museum of Iran) and W. A detailed map of the Park and the names of different places referred to in this paper is given in the first (Akhani, 1996)

* 'Golestan' means in Persian etymology 'the country of flowers'. This is the older name of the area which replaced the formerly 'Mohammad Reza Shah National Park' after the Iranian Revolution.

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and the third contributions (Akhani, 1999), respectively. Maps of distribution within the Park are generated by using the computer program FLOREIN (1996), version 4, which has been adapted for this project by Mr C. Düring (Regensburg). They are based on herbarium specimens and phytosociological relevés made according to the Braun-Blanquet method (Dierschke, 1994).

ENUMERATION OF SPECIES

Alopecurus aequalis Sobol., Fl. Petrop. 16 (1799). **Fig. 1.**

Material examined. NW part of the Park: Sulukli Lake, 37°29′30″N, 55°46′20″E, 1380m, 15 viii 1995, *H. Akhani* 11969 (B, LI, M, hb. Akh.).

Alopecurus aequalis is an aquatic plant, previously known only from two localities in NE Afghanistan and N Pakistan within the *Flora Iranica* area (Bor, 1970: 277). In Iran it was collected in the NE of the Park at the margin of Sulukli Lake. Species associated with *Alopecurus aequalis* in four phytosociological relevés are shown in Table 3 (Akhani, 1999).

Bothriochloa bladhii (Retz.) S.T. Blake in Proc. Roy. Soc. Queensland. 80: 62 (1969). **Fig. 1.**

Syn.: *Andropogon bladhii* Retz., Obs. Bot. 2: 27 (1781); *Bothriochloa caucasica* (Trin.) C. E. Hubb. in Kew Bull. 1939: 191 (1939).

Material examined. Center of the Park: 8km E of Tangerah towards Tangegol, 37°23′N, 55°53′E, in lowland forest, 1 viii 1994, *H. Akhani* 9644-b (M, hb. Akh.); c.6km E of Tangerah, near Golestan Parking, 37°23′N, 55°51′E, limestone outcrops N of the road, open *Carpinus orientalis-Quercus castaneifolia* scrub, 8 ix 1995, *H. Akhani* 12103 (B, M, hb. Akh.); southwestern part of the Park: c.3km E of Kondeskuh, in valley of Qez-Qaleh, 900–950m, on W-facing steep limestone outcrops, *Carpinus orientalis-Juniperus communis* community, 37°19′N, 55°47′E, 5 viii 1994, *H. Akhani* 9953 (hb. Akh.); NW of the Park (outside the Park): steep cliffs NW of the Zav village, 550–650m, 37°31′30′N, 55°45′E, 17 xi 1996, *H. Akhani* 12331 (M, W, hb. Akh.).

Bothriochloa bladhii was known in *Flora Iranica* (Bor 1970: 538, sub *B. caucasica*) only from one locality in NE Afghanistan. It has been added to the Iranian flora under the same name by Termeh (1975: 77), from one locality in Mazandaran: Shahsavâr, Khorram-âbâd, 4 vii 1967, *Termeh* 10372-E (IRAN, n. v.). The species is widely distributed in Caucasia, Turkey (?), Iran, Afghanistan, W Pakistan, India, China, tropical Africa and Australia. *B. bladhii* is a late-flowering C4-grass which grows in rocky openings of forested areas of the Park. It is associated with the more common *B. ischaemum* (L.) Keng and some other interesting species (see Table 4 in Akhani, 1999).

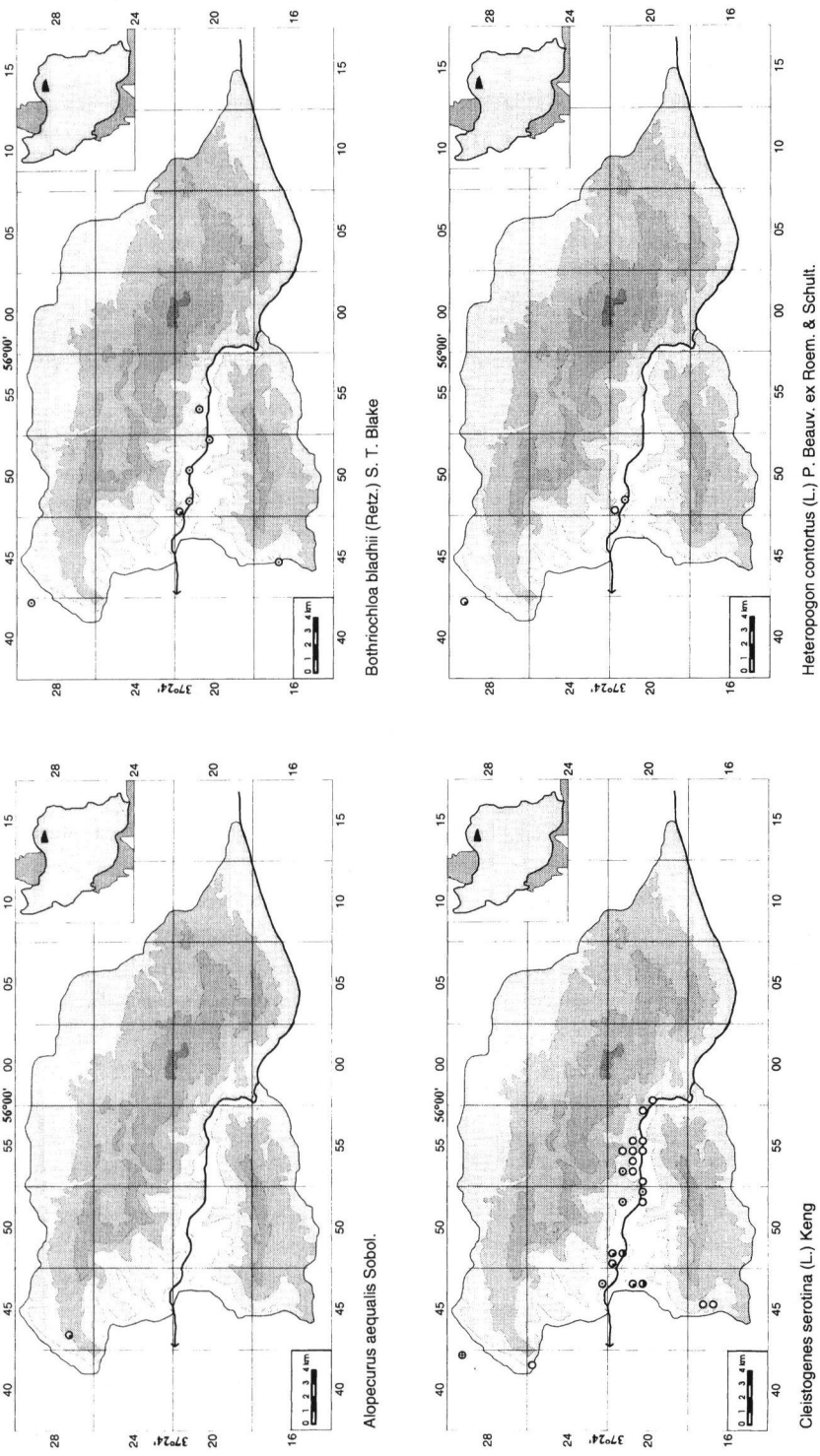

FIG. 1. Distribution of *Alopecurus*, *Bothriochloa*, *Cleistogenes* and *Heteropogon* in Golestan National Park. ⊕ = +, ○ = 1, ◔ = 2, ◕ = 3, ◑ = 4, ● = 5 cover abundance according to Braun-Blanquet's scales (cf. Dierschke, 1994), ⊙ = record only based on herbarium specimen.

Cleistogenes serotina (L.) Keng in Sinensia 5: 149 (1934). **Fig. 1.**
Syn.: *Festuca serotina* L., Systema, ed. 10, 2: 876 (1759).

Material examined. C part of the Park: Adam-Chaqran rocks (Sakhre-hay-e Adam-Chaqran), rocky S-facing slopes c.2km W of Tangegol, 37°22′30″N, 55°54′30″E, 700–1000m, 14 xi 1996, *Akhani* 12266 (M, W, hb. Akh.); c.4km W of Tangegol, 37°23′N, 55°54′E, 800m, 3 viii 1994, *Akhani* 9826 (sterile, M, hb. Akh.); 3km E of Tangegol, N side of the road, W of Abshar, 37°23′N, 55°58′E, 780–1000m, on limestone in scrub of *Carpinus orientalis* and *Quercus castaneifolia*, 26 vi 1995, *Akhani* 11477 (hb. Akh.); c.2km E of Tangerah, N side of the road, 650–700m, 37°24′N, 55°49′E, steep limestone slopes, 14 × 1995, *Akhani* 12233 (M, W, hb. Akh.); 5km E of Tangerah, 15km W Tangegol, 37°23′20″N, 55°50′E, on S-facing limestone slope, 600–800m, 21 xi 1996, *Akhani* 12379 (LI, M, W, hb. Akh.); c.6km E of Tangerah, near Golestan Parking, limestone rocks north of the road, open *Carpinus orientalis–Quercus castaneifolia* scrub, 8.9.1995, *Akhani* 12106 (M, hb. Akh.); c.4km SE of Tangerah, Lateh Khodaqoli, 37°22′N, 55°49′30″E, 900–950m, 3 vii 1995, *Akhani* 11582 (only leaves, M, hb. Akh.); 5km E of Tangegol, 37°22′30″N, 55°59′30″E, 750–900m, 30 vii 1995, *Akhani* 11842 (M, hb. Akh.); 2–3km N Tangegol, above Savar-Baqi, 37°24′N, 55°56′E, 1350–1650m, 28 viii 1995, *Akhani* 12101 (M, hb. Akh.); just off NW border of the Park, steep cliffs NW of the village of Zav, 550–650m, 37°31′30′N, 55°45′E, 17 xi 1996, *Akhani* 12329 (E, hb. Akh.).

A new grass genus for Iran, known previously from S C & E Europe, Crimea, Turkey, Caucasia, Turkmenistan and N China. The Iranian plants match well with subsp. *serotina*, which is characterized by densely scaly rhizomes, 4–7mm wide leaves and a very short, inconspicuous awn less than 1mm long; subsp. *bulgarica* (Bornm.) Tutin occurs in S Russia, E Romania and E Bulgaria and is characterized by less scaly rhizomes, narrower leaves not more than 3mm wide and longer awns of 2–3mm.

Cleistogenes serotina is a late flowering plant and ecologically restricted to low altitude on limestone rocks. This and some other late flowering species, namely *Bothriochloa ischaemum*, *B. bladhii*, *Heteropogon contortus*, and *Seseli tortuosum* subsp. *kiabii* (see Akhani, 1999), are the main components of ground vegetation in exposed open scrubs at altitudes from 500–1000m. All four grass species are characterized by C4-photosynthetic pathways and need very warm and at least temporarily moist conditions which are available in rocky openings and on steep slopes in the eastern part of the South Caspian forest belt. The open scrub consists mainly of *Carpinus orientalis*, *Quercus castaneifolia* (mostly in shrub form), *Celtis caucasica*, *Paliurus spina-christi*, and *Crataegus pentagyna* subsp. *pentagyna*, *C. kurdestanica*, which vary in density and accompanying species according to elevation, substrate, exposure and gradient [see Table 4 in Akhani (1999)]. In Iran such habitats have been almost unknown to botanists. Unfortunately, in most parts of the South Caspian lowlands such special ecological niches since a long time have been damaged by overgrazing and cultivation (wheat), which took place even on steep slopes.

The generic name of *Cleistogenes* Keng versus *Kengia* Parker is a matter of controversy. Parker (1960: 289) argued that according to what was then Article 68 of the *International Code of Botanical Nomenclature*, all new generic names published in or after 1912, coinciding with technical terms currently used in morphology, are illegitimate. Bor (1970: 441–442) criticized this argument and used the name

Cleistogenes in *Flora Iranica*. *Cleistogenes* has subsequently been used in several other standard floras, e.g. *Flora of Turkey* (Tan in Davis, 1985: 579), and *Flora Europaea* (Tutin, 1980: 256).

Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult., Syst. Veg. 2: 836 (1817). **Fig. 1.**
Syn: *Andropogon contortus* L., Sp. Pl. 1045 (1753).

Material examined. C part of the Park: c.6km E of Tangerah, near Golestan Parking, 37°23′N, 55°51′E, limestone outcrops north of the road, open *Carpinus orientalis–Quercus castaneifolia* scrub, 8 ix 1995, *Akhani* 12105 (LI, M, W, hb. Akh.); 5km E of Tangerah, 15km W Tangegol, 37°23′30″N, 55°50′E, on S-facing limestone slope, 600–800m, 21 xi 1996, *Akhani* 12372 (LI, M, W, hb. Akh.); off the NW border of the Park, steep cliffs NW of the village of Zav, 550–650m, 37°31′30′N, 55°45′E, 17 xi 1996, *Akhani* 12328 (E, LI, M, W, hb. Akh.).

A new grass genus for Iran; hitherto known from Iraq, Afghanistan and Pakistan within the *Flora Iranica* area (Bor, 1970), and widely distributed in tropical and warm temperate regions of the world. For habitat and associated species see notes under *Cleistogenes serotina* and Table 4 in Akhani (1999).

Hordelymus europaeus (L.) Harz, Samenkunde 2: 1148, f. 135 (1885). **Fig. 2.**
Syn.: *Elymus europaeus* L., Mant. 35 (1767).

Material examined. SW part of the Park: N side of Shakha Mountain, 37°20′N, 55°50′E, 1750–1900m, montane forest, 4 vii 1995, *H. Akhani* 11594 (M, hb. Akh.); E extension of Shakha Mountain, Lateh Tas and Qarni-areq, 37°19′30″N, 55°52′ E, 1800–1820m, 6 viii 1995, *H. Akhani* 11876 (B, M, hb. Akh.).

The monotypic grass genus *Hordelymus* has not previously been reported from the *Flora Iranica* area. *H. europaeus* is a Euro-Siberian species distributed in Europe, NW Africa, Anatolia and Caucasia. As this species has been collected in the easternmost part of the Hyrcanian forests, it is probable that the species occurs all along the forested zone.

The above-mentioned localities are situated in closed forest of the northern slopes of Shakha Mountain, at altitudes of 1750–2000m. The foggy conditions at these altitudes provide high moisture levels throughout the year. The dominant trees and shrubs are: *Carpinus betulus* L., *Quercus castaneifolia* C.A. Mey., *Sorbus torminalis* (L.) Crantz, *Acer campestre* L., *Acer hyrcanicum* Fisch. & C.A. Mey., *Ulmus glabra* Huds., *Fraxinus excelsior* L., *Mespilus germanica* L., *Crataegus microphylla* K. Koch and *Ilex spinigera* (Loes.) Loes. The ground vegetation is very rich. On N-facing slopes it is formed by the three fern species, *Dryopteris caucasica* (R. Br.) Fraser-Jenkins, *Athyrium filix-femina* (L.) Roth and *Pteridium aquilinum* (L.) Kuhn. On S-facing slopes they are replaced by *Poa nemoralis* L., *Festuca drymeja* Mertens & C. Koch, *Bromus benekenii* (Lange) Trimen and *Vicia crocea* (Desf.) B. Fedtsch. The discovery of *Hordelymus europaeus* within the easternmost boundary of the Caspian forest belt shows clearly that our knowledge of the flora of the Caspian

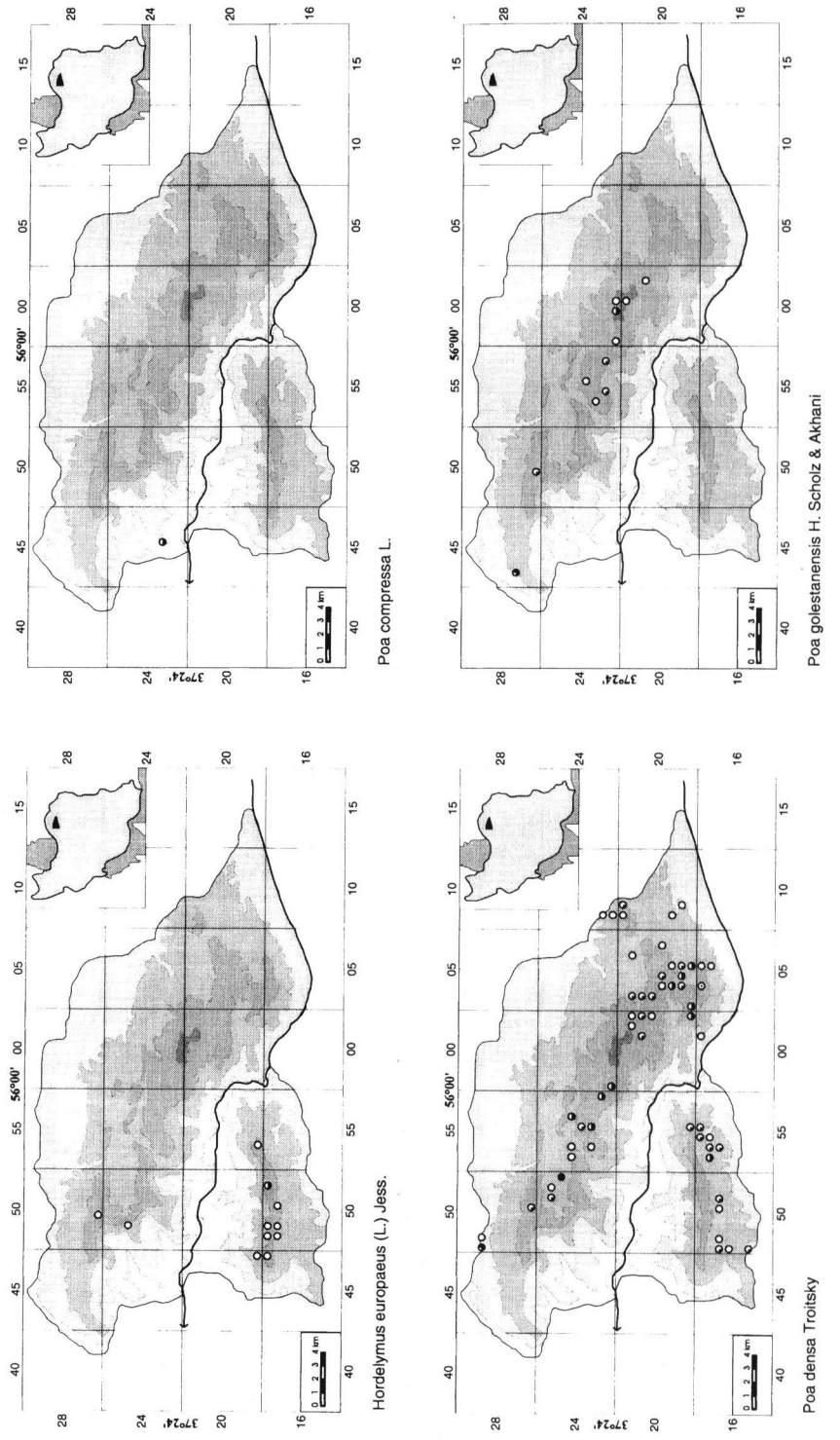

FIG. 2. Distribution of *Hordelymus* and *Poa* in Golestan National Park (see Fig. 1 for legend).

forests, particularly at higher altitudes, is poor. Very probably, many more omni Euro-Siberian and Euxino-Hyrcanian elements are to be expected in the undercollected areas.

Poa compressa L., Sp. Pl. 69 (1753). **Fig. 2.**

Material examined. W part of the Park: c.3km NEN Tangerah, Afrali, 37°25′N, 55°48′E, 1000–1100m, forest clearings dominated by *Pteridium aquilinum*, 30 vi 1995, *H. Akhani* 11547 (hb. Akh.).

Poa compressa is widely distributed in Europe, Asia and N. America. Bor (1970: 35) has already expected its occurrence within the boundaries of the *Flora Iranica* area. Assadi (1988: 48) has reported this species in Arasbaran Protected Area, in N Azerbaijan: Between Saigram-Dagh and Kaleibar, 2000m, *Assadi & Sardabi* 24389 (TARI, n. v.). The species has been collected in an open area in a forested zone of the western part of the Park. It is associated with *Thalictrum minus* L., *Pteridium aquilinum* (L.) Kuhn, *Vicia grandiflora* Scop., *V. lutea* L., *V. variabilis* Freyn & Sint., *Alcea gorganica* (Rech. f., Aellen & Esfand.) Zohary, and *Carex divulsa* Stokes. etc.

Poa densa Troitsky in Trudy Glavn. Bot. Sada 27: 619 (1928). **Fig. 2.**

Material examined. South-Centre of the Park: c.2km SW of Almeh towards Cheshmeh-Khan, in mixed formation of thorn-cushions and grasses, 37°20′N, 56°7′E, 1750–1850m, 6 vii 1994, *H. Akhani* 9453 (B, M, hb. Akh.); 2–3km E of Sharleq towards Almeh, 37°20′N, 56°4′E, 1400–1500m, mixed formation of grassland and shrub, 22 v 1995, *H. Akhani* 10774 (B, LI, M, hb. Akh.); NW part of the Park, c.14km SW of Lohondor, Koilar, 37°30′N, 55°50′E, in mixed formation of shrubs and grasses, 1350–1550m, 2 vi 1995, *H. Akhani* 11078 (B, LI, M, hb. Akh.); C of the Park: 2–4km NW of Almeh, N of Almeh flats and S slopes of Qara-Gineh Mountain, 1800–1950m, 29 v 1995, 37°22′N, 56°6′E, *H. Akhani* 11010 (M, hb. Akh.).

This species was not cited from Iran in *Flora Iranica* (Bor, 1970). But Tzvelev (1976: 451) reported N Iran as belonging to the distribution range of the species. This is one of the most frequent grasses in subalpine vegetation types in the transition zone between forests and steppe.

Poa golestanensis H. Scholz & Akhani, **sp. nov. Figs 2 & 3.**

Gramen perenne, (55–)80–100cm altum, dense caespitosum rhizomatibus repentibus praeditum vel destitutum. Culmi et foliorum culmorum vaginae in partes superiores distincte valde scabrosi, inferne gradatim laeves; vaginae inferiores parum compressae itaque subflabellatae, glabrae laevesque. Foliorum laminae lineari-acutae, basalium usque ad 50cm longae, eae culmorum breviores, et 2–4(–5)mm latae, planae vel conduplicatae, subtus et marginibus scabrae, supra sulcatae atque scaberulae; ligulae truncato-obtusae, plusminusve dentatae, 1–2mm longae. Paniculae angustae, contractae, (7–)10–16cm longae, axibus ac pedicellis scabrosis. Spiculae 6–7.5mm longae, 3–4(–5)-florae; gluma inferior 2.8–3.5mm longa, lanceolata, 1-nervis, superior 3.5–4.7mm longa, 3-nervis, elliptico-acuta; lemma inferius

FIG. 3. *Poa golestanensis* H. Scholz & Akhani, *Akhani* 11329 (iso., M).

oblongo-acutum, 5-nerve, dorso scabridiusculum et scabricarinatum, 4–5mm longum et c.2mm latum, lana nulla vel obsoleta; paleae 3–4mm longae secus carinas scabrae, apice ca. 0.5mm bidentatae. Antherae 2–2.6mm longae. Caryopsides ignotae.
Type. NE of Iran, E. Mazandaran: c.11km ENE of Tangegol, summit of Divar Kaji Mountain, 2200–2370m, 37°24′20″N, 56°3′E, 18 vi 1995, *H. Akhani* 11329 (holo. MMTT; iso.: B, M, hb. Akh.).

Perennial grass, (55–)80–100cm tall; densely tufted, with or without creeping rhizomes. *Culms and culm leaf-sheaths* sharply scabrous in upper parts, less so or nearly smooth towards the base; lower sheaths slightly compressed, subflabellate, glabrous and smooth. *Leaf-blades* linear, acute, up to 50cm long, on culm leaves shorter, and 2–4(–5)mm wide, flat or conduplicate, very scabrid beneath and marginally, rough and ribbed above; ligules truncate to rounded, finely toothed, 1–2mm long. *Panicles* narrow, contracted, (7–)10–16cm long, with distinctly rough axes and pedicels. *Spikelets* 6–7.5mm long, 3–4(–5)-flowered; lower glume 2.8–3.5mm long, lanceolate, 1-nerved; upper 3.5–4.7mm long, ovate-elliptic, 3-nerved; lowest lemma narrowly oblong, acute, 5-nerved, on the back rough and with a scabrid keel, 4–5mm long and c.2mm wide, basally glabrous or with very few short crisp hairs. *Paleas* 3–4mm long, with scabrid keels, at the apex c.0.5mm notched. *Anthers* 2–2.6mm long. *Caryopses* unknown.

The new species is related to *Poa longifolia* Trin. (sect. *Macropoa* F. Hermann ex Tzvelev). It differs from all other members of this section by the distinctly strong scabrosity, especially of leaves, upper parts of the plant, and spikelets. Moreover, the somewhat broader lemmas and sometimes the very scanty fleece at base of the lowest floret are also very characteristic. Probably endemic to the mountains of NE Iran, *P. golestanensis* is geographically well separated from the distribution area of *P. longifolia* in the Caucasus region, extending to Asia Minor, N Iraq and W Iran, and its satellite taxa subsp. *fagetorum* (P. Smirn.) Tzvelev and subsp. *meyeri* (Trin. ex Roshevitz) Tzvelev, endemic to Crimea and Talysh, respectively (Tzvelev, 1976).

Additional material examined. NW parts of the Park: Chartongi and Besh-Jakhdan area, 37°29′N, 55°52′E, montane forest, 1950m, 16 vi 1995, *H. Akhani* 11259 (B, LI, M, hb. Akh.); Sulukli Lake, 37°29′30″N, 55°46′20″E, 1380m, 15 viii 1995, *H. Akhani* 11989-b (M, hb. Akh.); C of the Park: c.6km NW of Almeh, top of Qarah Gineh Mountain (N & E corners), 37°23′N, 56°4′E, 2100–2150m, in grassy openings at margin of *Quercus macranthera* forest, 11 vii 1995, *H. Akhani*, 11757 (M, LI, hb. Akh.); S side of Divar Kaji Mountain, 37°24′N, 56°2′E, 2200–2300m, in mixed formations of *Quercus macranthera* forest and subalpine vegetation, 12 vii 1995, *H. Akhani* 11781 (M, hb. Akh.); 7km NEN of Tangegol, Gerieh Sar, 37°26′N, 55°57′E, 2080m, associated with *Juniperus sabina*, limestone rock on top of mountain, 23 viii 1995, *H. Akhani* 12068 (M, LI, hb. Akh.).

Ecology and chorology. Poa golestanensis grows in subalpine meadows, in grassland openings and on shrub-covered summits in montane forests of the Golestan National Park. No. 11259 has been collected from a subalpine karst-meadow surrounded by montane forests. It was collected together with *Thlaspi stenocarpum* (Boiss.) Hedge,

Melica transsilvanica Schur, *Carex divulsa* Stokes, *C. melanostachya* M. Bieb., *Galium verum* L., *Arabis sagittata* (Bertol.) DC., *Calamagrostis epigejos* (L.) Roth, *Convolvulus arvensis* L., *Stipa holosericea* Trin. etc. No. 11989-b was collected around a hitherto unknown mountain lake, where *Alopecurus aequalis* (see above) and several other interesting plants were found (cf. Akhani, 1999). Here, the following species have been recorded with *Poa golestanensis* in phytosociological relevés: *Calamagrostis epigejos* (L.) Roth, *Urtica dioica* L., *Thalictrum minus* L., *Hypericum perforatum* L., *Teucrium hyrcanicum* L., *Rubus caesius* L., *Polygonum aviculare* L., *Polygonum convolvulus* L., *Lathyrus pratensis* L. and *Carex melanostachya* M. Bieb. No. 12068 was collected at top of a mountain associated with *Juniperus sabina-J. communis* L.-community.

It is very probable that *P. golestanensis* is distributed in other subalpine meadows of the Alborz range outside the Park, particularly at higher elevations in Mazandaran province and perhaps eastwards to Gilan. Chorologically, this species could well belongs to the Hyrcanian or Euxino-Hyrcanian elements. *Poa masenderana* Freyn & Sint. and *Poa densa* Troitsky (see above) are two other species which share a rather similar distribution pattern. The latter is a mountain species distributed in montane steppes and the former is a typical forest element growing in shady lowland or montane forests.

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