

Seven Brachytheciaceae (Musci) Species New to Libya

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BRACHYTHECIACEAE Schimp. includes up to 1117 species worldwide. Eleven of its species were reported from Libya between the years 1914-1931. In the present work, 10 species are recorded, seven of them, namely: *Brachythecium rutabulum* (Hedw.) Schimp., *Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Huttunen, *Pseudoscleropodium purum* (Hedw.) M. Fleisch., *Rhynchostegium megapolitanum* (Blandow ex F. Weber & D. Mohr) Schimp., *Sciuro-hypnum plumosum* (Hedw.) Ignatov & Huttunen, *Scleropodium touretii* (Brid.) L.F. Koch and *Scorpiurium deflexifolium* (Solms) M. Fleisch. & Loeske. are new records bringing the number of Brachytheciaceae species known from Libya to eighteen. Key and distribution of the 18 species in the Mediterranean countries and in the world are given. Descriptions and illustrations of the seven new records are also provided.

Keywords : Brachytheciaceae, Mosses, WadiKouf, Libya.

Introduction

Family Brachytheciaceae Schimp. includes 62 genera and 1117 accepted species names worldwide (The Plant List, 2013). It is predominantly temperate, but its species are also represented in all vegetation zones of the Earth (Huttunen et al., 2007). They are more diverse in xeric and Mediterranean climates. Up till now seven genera and eleven species of this family are known from Libya (Ros et al., 2013). All these eleven species were reported between the years 1914-1931 (Bottini, 1914; Zodda, 1926 and Pampanini, 1931), *i.e.*, are quite old records (Ros et al., 2013). Moreover six out of the eleven species are single records.

With the purpose of preparing a more up to date moss flora of Libya, the first author of this paper (S.G. Youssef) made a large number (550) of moss collections, between the years 2004-2008, from five areas in Al-Jabal Al-Akhdar (the green mountain) namely: Shahet, Beida, Mas'sa, Hani'ya and Wadi (Valley) Kouf (Fig. 1). Two hundred out of the 550 specimens were collected from the last area, 100 of them were of mosses growing on tree trunks (epiphytes) while the other 100 represent

mosses growing on the soil under trees in the Wadi (Fig. 2).

Investigation of 94 out of the 100 epiphytic specimens resulted in the record of only four species namely; *Fabronia pusilla* var. *ciliata* - Fabroniaceae (Shabbara & Ghanem, 2006), *Orthotrichum diaphanum* Schrad. ex Brid., *Orthotrichum schimperi* (Youssef et al., 2009a) and *Zygodon catarinoides* (Youssef et al., 2009b) - Orthotricaceae. These mosses were then new records to Libya except *Orthotrichum diaphanum* Schrad. exBrid. which was recorded earlier by Pampanini (1931). All these four mosses were included in the list of the Mediterranean mosses published by Ros et al. (2013), which maintained a total of 91 taxa. The six remaining epiphytic specimens were imponderable.

The present paper is the fourth in a series of works (Shabbara & Ghanem, 2006 and Youssef et al., 2009 a,b) on mosses of Wadi Kouf area in Libya and deals with part of the 100 specimens that were found growing on soil under the trees. The specimens of the four other areas (Shahet, Beida, Mas'sa, and Hani'ya) count 350 and have not been investigated yet.

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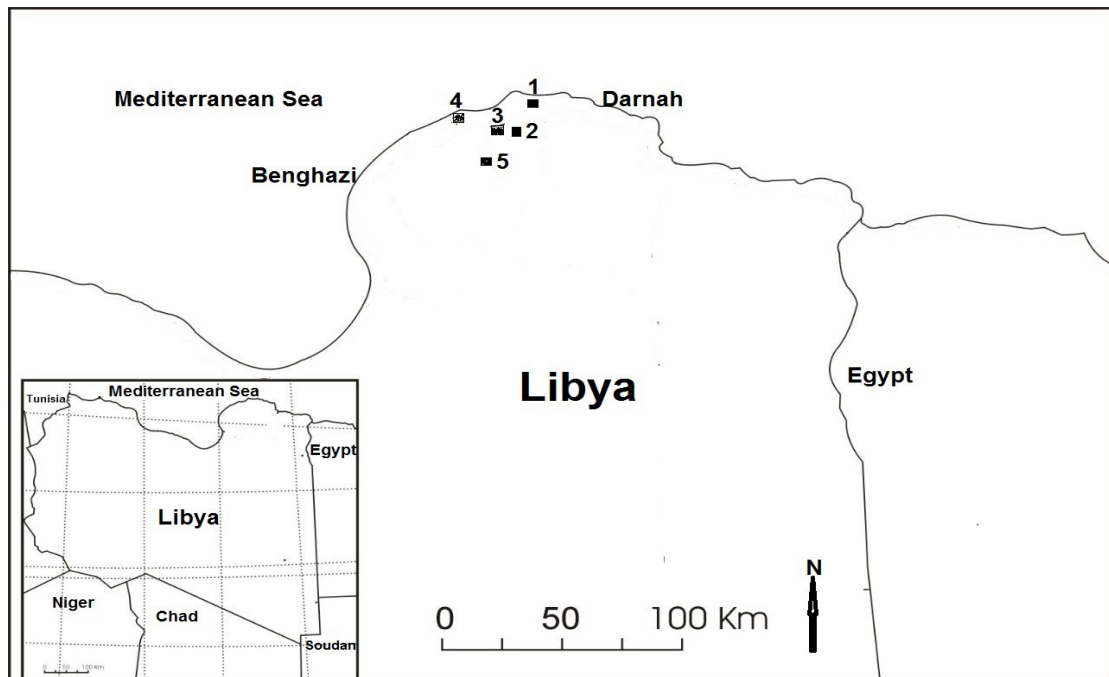


Fig. 1. Map showing location of the sites of collection; 1= Shahet, 2= Beida, 3= Mas'sa, 4= Hani'ya and 5=Wadi Kouf area.



Fig. 2. Image from Wadi Kouf area. The collected mosses were found growing, on wet soil under trees; 3 -8 meters below the lower bridge.

Materials and Study Area

One-hundred moss specimens were collected throughout the winter (January-March, 2007) and May 2008 from Wadi (=Valley) Al-Kouf area (Fig. 1). The collected mosses were found growing, on shaded coarse soil between rocks where water flows under trees below Wadi Kouf old bridge (Fig.2) at latitude 32° 41' 49" N and longitude 21° 33' 55" E. The collected samples are kept at CAIA. Wadi Al-Kouf area lies SW of Beida (or Bayda), between latitudes ca 32° 36' 49"- 32° 45' 20"N and longitudes ca 21° 27' 32"- 21° 37' 54"E, ca 450-550 m above sea level (Suleiman et al., 2016). The Wadi Al-Kouf area consists of rocks and stones with high and low water levels and is rich in arborescent seed plants as: *Cerantonia siliqua* L., *Juniperus phoenicea* L., *Olea europaea* L., *Quercus coccifera* L., *Pistacia lentiscus* L. and *Phillyrea latifolia* L. Wadi Al-Kouf area is part of Al- Jabal Al-Akhdar region. The Al- Jabal Al- Akhdar is a limestone plateau 700 to 870 m above sea level with an undulating surface which tips gently to the south, stretches between the longitudes 20° 35' E to 23° 15' E and latitudes 30° 58' N to 32° 56' N in the North-East of Libya between Benghazi and Darnah (Fig. 1) (Suleiman et al., 2016). This Jabal (mountain) is covered by arching Plateau built of upper Cretaceous and Tertiary sediments of limestone, subordinate dolomites and marls. These sediments were deposited at the southern margin of the Tethys sea (Röhllich, 1978).

This Wadi belongs to Mediterranean climate, being characterized by moderate temperatures and more reliable rainfall from autumn to early spring. It is a humid Wadi getting rains from September to May and rarely in summer. The average annual rainfall ranges between 450-650 mm, 24-30% falling in January. The temperature is 8-13°C in winter and 22-27°C in summer, while winds are Northern in winter but Southern and East Southern in other seasons. These climate conditions are suitable for a good plant cover.

Results and Discussion

After careful study of the 100 specimens it was found that 36 of them belong to Brachytheciaceae. Only Brachytheciaceae will be dealt with here while the 64 remaining

specimens belong to other families and will be considered in forthcoming publications. The collected samples are kept at CAIA.

The study of the 36 Brachytheciaceae specimens showed that they belong to ten species namely: *Brachythecium rutabulum* (Hedw.) Schimp (323 YLK-325 YLK), *Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Huttunen (326 YLK), *Homalothecium sericeum* (Hedw.) Bruch, Schimp. & W. Gümbel (327 YLK and 329 YLK), *Pseudoscleropodium purum* (Hedw.) M.Fleisch. (330 YLK), *Rhynchostegium megapolitanum* (Blandow ex F. Weber & D. Mohr) Schimp. (331 YLK-340 YLK), *Rhynchostegium riparioides* (Hedw.) Cardot. (341 YLK and 345 YLK), *Sciuro-hypnumplumosum* (Hedw.) Ignatov & Huttunen (346 YLK), *Scleropodium touretii* (Brid.) L.F. Koch (347 YLK-356 YLK), *Scorpiurium circinatum* (Bruch) M. Fleisch. & Loeske. (357 YLK and 358 YLK) and *Scorpiurium deflexifolium* (Solms) M. Fleisch. & Loeske (359 YLK). The number following each plant name is the specimen number which is followed by the acronym «YLK» where Y= Youssef- one of the authors of this paper, L= Libya and K= Wadi Al-Kouf- study area. Three of these species namely *H. sericeum*, *R. riparioides* and *S. circinatum* were recorded before from Libya (see Ros et al., 2013) while the other seven species are new records to it, raising the number of Brachytheciaceae known from Libya to 18 species. Details about these ten species (all collected on 20 January 2007) are given below.

The 18 species are highly distributed in different countries of the Mediterranean region (Table 1). They, all, are recorded in Algeria, Corsica, France, Greece and Spain. As shown in Table 1, *Rhynchostegium riparioides* and *Scleropodium touretii* are the most common in the Mediterranean region being recorded in 32 out of 34 countries each, while *Eurhynchiastrum pulchellum* is the least common "recorded in 18 countries".

The 18 mosses are also distributed in other parts of the world, USA (Anderson et al., 1990), Australia (Hedenäs, 2002), Britain (Smith, 2004), Hawaii (Staples et al., 2004), China (Ignatov et al., 2005) and Africa (O'Shea, 2006).

TABLE.1. Geographic distribution of the 18 species of Brachytheciaceae hitherto, recorded from Libya in the different Mediterranean countries. AD= Andorra, AL= Albania, AZ= Azores, BA= Bosnia-Herzegovina, BG= Bulgaria, BL= Balears, CN= Canary Islands, CO= Corsica, CT= Crete, CY= Cyprus, DZ= Algeria, EG= Egypt, ES= Spain, FR= France, GR= Greece, HR= Croatia, IT= Italy, JO= Jordan, LB= Lebanon, LY= Libya, MA= Morocco, MD= Madeira, ME= Montenegro, MK= Macedonia, MT= Malta, PT= Portugal, RS= Serbia, SA= Sardinia, SC= Sicily, SI= Slovenia, SY= Syria, TN= Tunisia, TR= Turkey. * = new record. ++= recorded in the present work and earlier, tot= total.

Species	AD	AL	AZ	BA	BG	BL	CN	CO	CT	CY	DZ	EG	ES	FR	GR	HR	IL	IT	JO	LB	LY	MA	MD	ME	MK	MT	PT	RS	SA	SC	SI	SY	TN	TR	tot	
<i>Brachyhectium rutabulum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	28
<i>Brachyhectium salebrosum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	25
<i>Eurhynchiastrum pulchellum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	18	
<i>Homalothecium aureum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	27	
<i>Homalothecium philippianum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	25	
<i>Homalothecium sericeum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+	+	+	+	+	+	+	31	
<i>Microeurhynchium pumilum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	27	
<i>Pseudoscleropodium purum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	26	
<i>Rhynchostegiella curviseta</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	27	
<i>Rhynchostegiella litorea</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23	
<i>Rhynchostegium confertum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	28	
<i>Rhynchostegium megalopolitanum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*	+	+	+	+	+	+	+	+	+	+	+	+	+	30	
<i>Rhynchostegium riparioides</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+	+	+	+	+	+	+	32	
<i>Sciuro-hypnum plumosum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	24	
<i>Sciuro-hypnum populeum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23	
<i>Scleropodium touretii</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*	+	+	+	+	+	+	+	+	+	+	+	+	+	32	
<i>Scorpiurium circinatum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+	+	+	+	+	+	+	31	
<i>Scorpiurium deflexifolium</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	*	+	+	+	+	+	+	+	+	+	+	+	+	+	23	
Total	5	16	14	16	14	15	14	18	13	13	18	3	18	18	18	17	14	17	5	13	18	16	14	17	14	7	17	16	16	17	15	7	10	17		

The following is a key to all Brachytheciaceae species recorded from Libya (taxa which were not found in the present work are marked by (♦)).

Key to species

1-Plants very small and filiform *Microeurhynchium pumilum*♦

1- Plants medium to large size.....2

2- Middle leaf cells shorter or as long as apical cells, leaf margins strongly Serrulate to serrate above.....3

2- Middle leaf cells longer than apical cells, leaf margins ± serrulate above...4

3- Middle leaf cells as long as apical cells, costa often bearing two to three dorsal projections at its upper half, branch leaves with recurved margins at base ...

....*Scorpiurium deflexifolium*

3- Middle leaf cells shorter than apical cells, branch leaves with plane margins throughout..... *Scorpiurium circinatum*

4- Leaves strongly plicate...5

4- Leaves smooth to slightly plicate; cells at base shorter and wider than above.....6

5- Costa extending high up into the acumen ... *Homalothecium philippeanum*♦

5- Costa not extending high up into the acumen 7

7- Leaf margins serrulate near base, sometimes also near apex

Homalothecium sericeum

7- Leaf margins serrulate in upper part only.....8

8- Costa extended half way up the leaf or longer*Brachythecium salebrosus*♦

8- Costa ending below apex...*Homalothecium aureum*♦

6- Leaves± secund when moist.....*Sciurohypnum plumosum*.

6- Leaves straight..... 9

9-Stem leaves broadly ovate to ovate lanceolate, ± decurrent...10

9- Above combination absent.....11

10- Alar cells slightly different from basal cells.....*Brachythecium rutabulum*

10- Alar cells distinct12

12- Leaves with appressed and broad bases; apices slender, tapering and twisted.....*Rhynchostegium megapolitanum*

12- Leaf bases not appressed, apices not tapering, slightly twisted*Rhynchostegium confertum*♦

11- Plants very slender; leaves linear- or oblong- lanceolate ...13

11- Above combination absent 14

13-Leaves linear-lanceolate, costa extending into acumen*Rhynchostegiella litorea*♦

13- Leaves oblong-lanceolate, costa not extending into acumen*Rhynchostegiella curviseta*♦

14- Leaves strongly concave, stem and branch leaves ± similar; medial cells linear-flexuose.....15

14- Above combination absent16

15- Stems subpinnately branched, complanate; branch leaves with reflexed apiculus *Pseudoscleropodium purum*

15-Stems irregularly branched, not complanate, apiculus not reflexed, branches tumid and julaceous*Scleropodium touretii*

16- Stem and branch leaves ± similar, leaves rounded to ovate shortly pointed, leaf margins serrate or denticulate throughout.....*Rhynchostegium riparioides*

16- Above combination absent.....17

17 costa up $\frac{3}{4}$ the length of leaf..... *Eurhynchiastrum pulchellum*

17 costa extending high up to near apex... *Sciurohypnum populeum*♦

Descriptions and associations

Only the seven new records will be described and illustrated below while associations will be given for all recorded taxa.

Brachythecium rutabulum (Hedw.) Schimp

Plants yellow green, up to 1.8 cm long. Stems 1.4 cm long, irregularly to subpinnately branched, branches ascending. Leaves erectopate, decurrent, concave, slightly plicate, ovate lanceolate to ovate, stem leaves longer and wider than branch leaves, 1.7-1.9 mm long, 0.6-0.9 mm wide; apex acute to acuminate sometimes twisted; margins plane, serrulate; costa $\frac{3}{4}$ the length of the leaf. Upper laminal cells elongate, ± thin walled, 20-40 µm long, 2-4 µm wide; medial cells ± thick walled, long linear-flexuose, 6-8 µm wide and about 10 times longer, 60-90 µm; basal laminal cells shorter, wider, rhomboidal to rectangular; alar cells slightly differentiated, rectangular, 12-30 µm long, 10-12 µm wide.

Figure 3, a-k. 3 gatherings, not associated with other mosses.

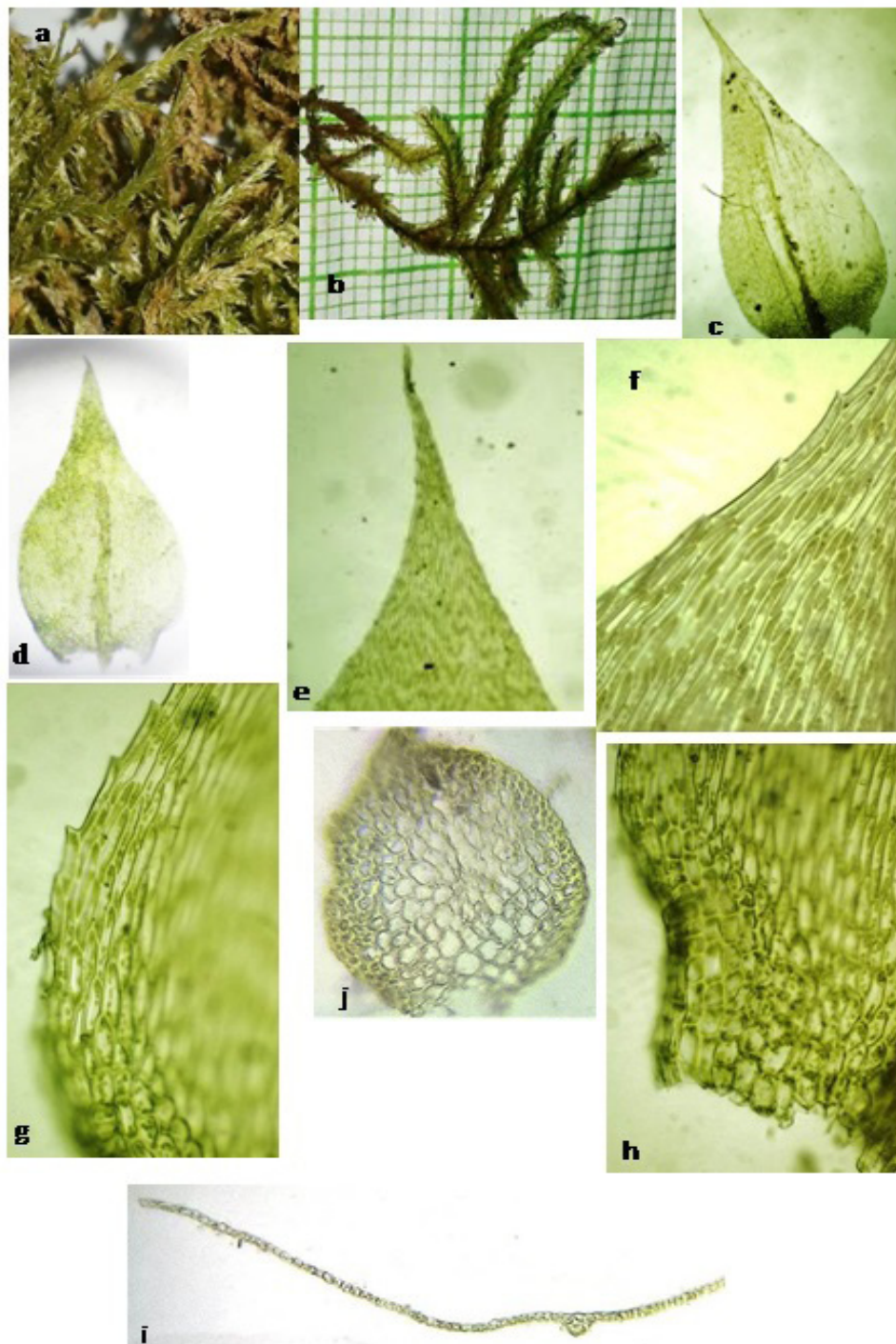


Fig. 3. a-k. *Brachythecium rutabulum*: a- dry gametophyte. b- wet gametophyte. c- stem leaf. d- branch leaf. e- leaf apices. f- median marginal cells. g, h- leaf base showing alar cells region. i- part of cross section of leaf. j- cross section of stem.

Scale bar: a= 3.67mm, b=3.82 mm, c= 367 μ m, d= 409 μ m, e= 49 μ m, f= 42 μ m, g= 18 μ m, h=39 μ m, i= 11 μ m, j= 5 μ m

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen

Plants green to light green, up to 3.2 cm long. Stems 2.8 cm, pinnately branched, branches erect, straight. Leaves patent, erect-spreading, usually little changed when dry, stem and branch leaves different; stem leaves triangular-ovate, 1.2-1.5 mm long, 0.3-0.5 mm wide, acute; branch leaves ovate, 1.1-1.3 mm long, 0.2-0.4 mm wide, blunt acute to obtuse, margins plane, serrulate above; costa reaching about $\frac{3}{4}$ the length of the leaf. Upper laminal cells, rhomboidal to linear, 10-30 μm long, 2-4 μm wide; medial cells long and narrow long, linear rhomboidal, 5-6 μm wide and about 10 times longer, 50-65 μm long; basal laminal cells shorter and wider; alar cells quadrate to short-rectangular, or rectangular in a distinct, \pm auriculate group, 10-30 μm long, 2-6 μm wide.

Figure 4, a-l. 1 gathering, not associated with other mosses.

Homalothecium sericeum (Hedw.) Bruch, Schimp. & W. Gumbel, 3 gatherings, associated with *Rhynchostegium megapolitanum*. Recorded before from Libya by Zodda (1926).

Pseudoscleropodium purum (Hedw.) M. Fleisch.

Plants yellowish green, up to 2.2 cm long. Stems 2 cm, ascending, subpinnately branched, complanate. Leaves imbricate, strongly concave, stem and branch leaves \pm similar, broad ovate, ovate to elliptical, 1.6-1.8 mm long, 0.5-0.7 mm wide, abruptly narrowing into reflexed apiculus; margins plane, serrulate above and entire below; costa reaching about $\frac{2}{3}$ the length of the leaf, single, rarely forked. Upper laminal cells, linear to linear-flexuose, 30-45 μm long, 2-6 μm wide; medial cells, linear-flexuose, 5-6 μm wide and about 10-12 times longer, 54-70 μm long; basal laminal cells irregularly rhomboidal, wider, alar cells clearly differentiated, irregularly quadrate to rectangular, 15-20 μm long, 10-12 μm wide.

Figure 5, a-m. 1 gathering, not associated with other mosses.

Rhynchostegium megapolitanum (Blandow ex F. Weber & D. Mohr) Schimp.

Plants yellow green to pale green, 3.5 cm long. Stems 3 cm. Leaves imbricate when dry, erecto-patent to patent when moist, ovate to ovate lanceolate

with appressed base, \pm decurrent. The stem leaves are rather longer and wider than the branch leaves, 1.6-2.1 mm long, 0.7-0.9 mm wide; apex tapering into long acuminate, distinctly twisted; margins plane, denticulate; costa extending to ca. $\frac{2}{3}$ the length of leaf. Upper laminal cells elongate to long linear-flexuose, \pm thin walled, 20-40 μm long, 2-4 μm wide; medial cells thick walled, uniformly long linear-flexuose or vermicular, 4-6 μm wide and about 10 times longer, 40-60 μm ; basal laminal cells shorter, wider, alar cells clearly differentiated, quadrate, short-rectangular, or rectangular, 10-30 μm long, 6-10 μm wide.

Figure 6, a-i. 10 gatherings, associated with *Homalothecium sericeum* and *Scorpiurium circinatum*

Rhynchostegium riparioides-5 gatherings, associated with *Scleropodium tourretii*. Recorded before from Libya by Zodda (1926).

Sciuro-hypnum plumosum (Hedw.) Ignatov & Huttunen

Plants brownish green to light green, up to 3.5 cm long. Stems 3 cm, \pm pinnate, branches erect-ascending, \pm curved when dry. Leaves erect spreading to loosely imbricate, \pm secund, slightly concave or not, stem and branch leaves \pm similar, branch leaves straight or curved, stem leaves sometimes larger, broadly ovate lanceolate to ovate, 1-1.4 mm long, 0.5-0.7 mm wide, somewhat decurrent, gradually or suddenly narrowing into acuminate apex; margins plane, recurved at base, denticulate to finely denticulate to near base; costa stout at base, tapered above and vanishing at or above the mid leaf, single or branched. Upper laminal cells, fusiforme to linear-flexuose, 20-40 μm long, (2) 4-6 μm wide; medial cells, linear-flexuose, (4) 6-8 μm wide and about 6-11 times longer, 35-65 μm long; basal laminal cells shorter, wider, quadrate to rectangular, incrassate, 10-30 μm long, 6-10 μm wide.

Figure 7, a-j. 1 gathering, not associated with other mosses.

Scorpiurium circinatum (Bruch) M. Fleisch. & Loeske, 2 gatherings, associated with *Scleropodium tourretii*. Recorded before from Libya by Bottini (1914).

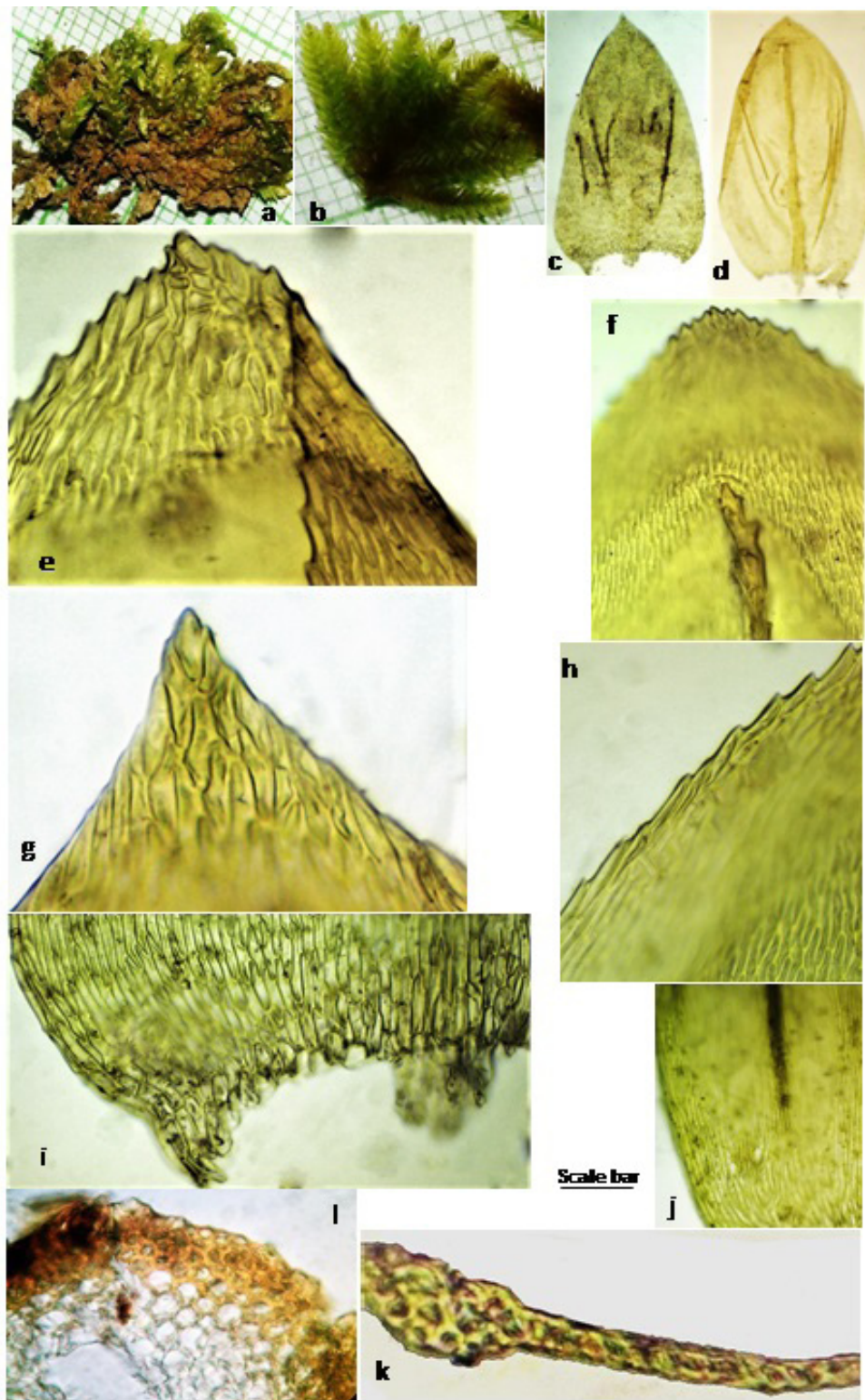


Fig. 4. a-l. *Eurhynchiastrum pulchellum*;; a- dry gametophyte. b-wet gametophyte. c- stem leaf. d- branch leaf. e.f.g- leaf apices. h- median marginal cells. i, j - leaf base showing alar cells region. k- part of cross section of leaf. l- part of cross section of stem.

Scale bar: a= 1.1 mm, b=1.1 mm, c= 361 μ m, d= 315 μ m, e= 12 μ m, f= 15 μ m, g= 8 μ m, h= 21 μ m, i=30 μ m, j= 50 μ m, k=4 μ m, l=6.5 μ m

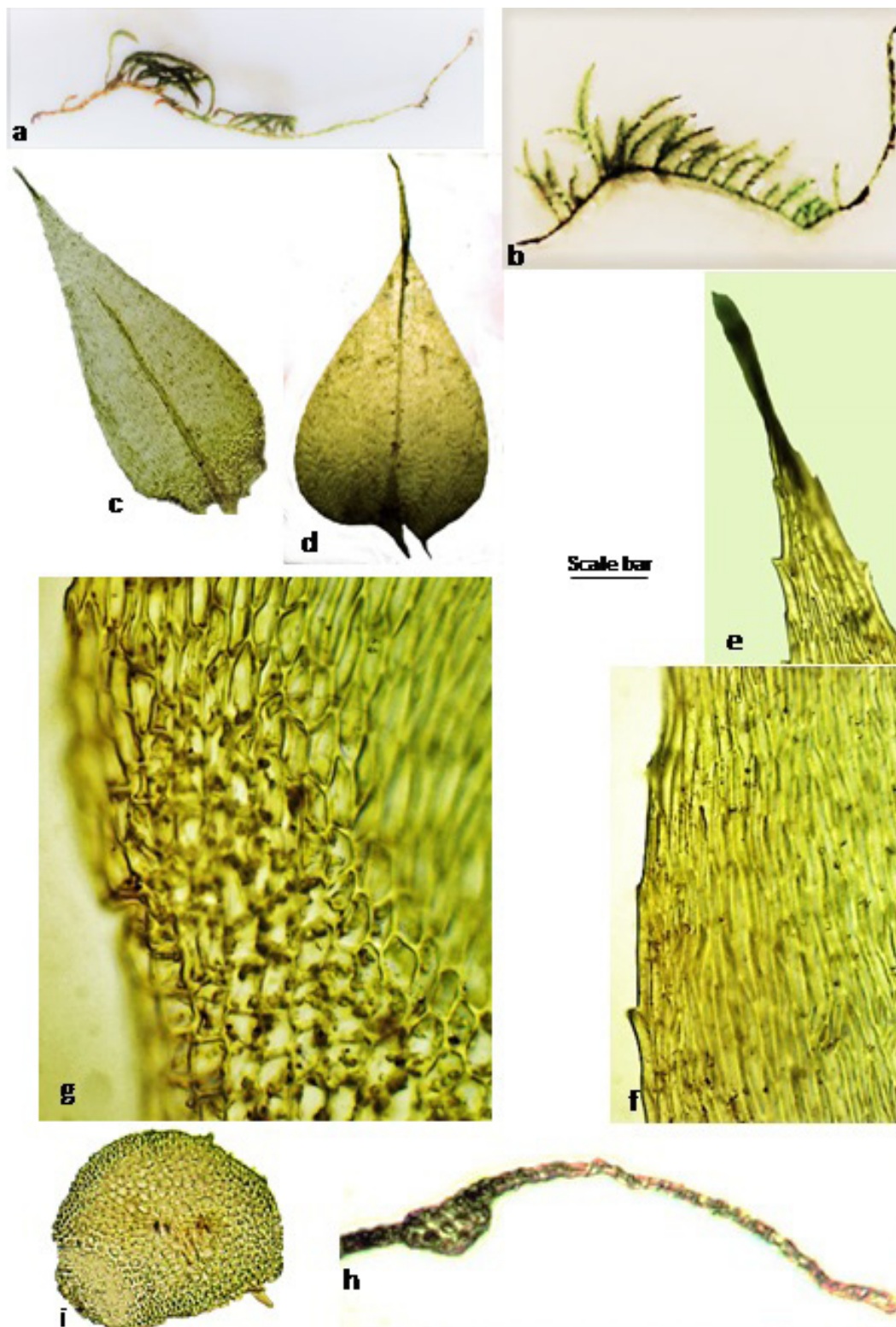


Fig. 5. a-i. *Rhynchoszegium megapolitanum*, a-i: a- dry gametophyte. b- wet gametophyte. c- branch leaf. d- stem leaf. e- leaf apex. f. median marginal cells. g- leaf base showing alar cells region. h- cross section of leaf. i- cross section of stem.

Scale bar: a= 7 mm, b= 5 mm, c= 333 μ m, d= 382 μ m, e= 409 μ m, f= 18 μ m, g= 7 μ m ,h= 10 μ m, i= 6 μ m

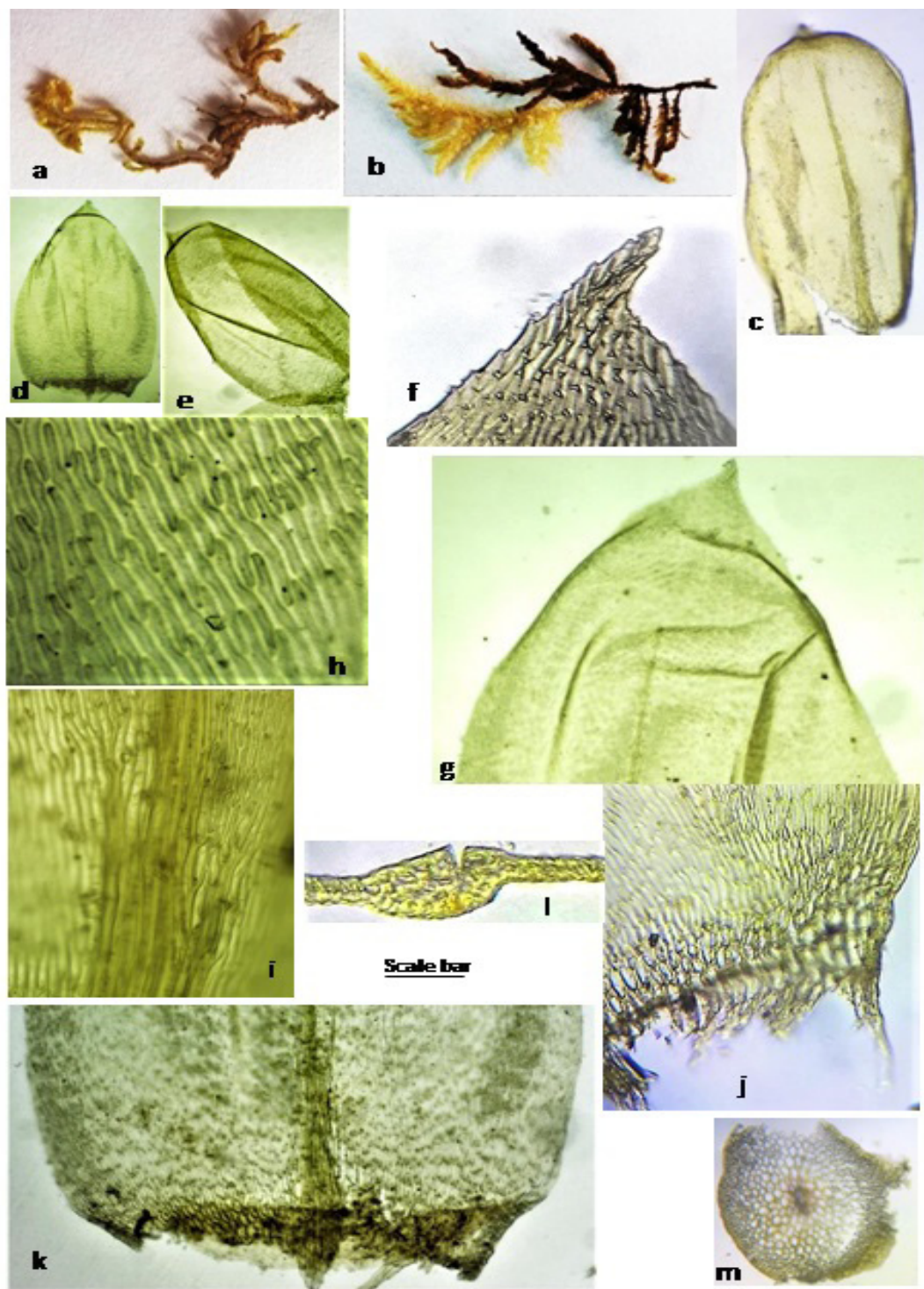


Fig. 6. a-m. *Pseudoscleropodium purum*. a- dry gametophyte. b- wet gametophyte. c,d,e- different shapes of leaves. f,g- leaf apices. h- median laminal cells. i- part of middle laminal cells showing forked costa. j,k - leaf base showing alar cells region. l- cross section of leaf. m- cross section of stem.
 Scale bar: a= 5 mm, b= 4.5 mm, c= 377 μ m, d= 566 μ m, e= 548 μ m, f= 425 μ m, g= 425 μ m, h= 30 μ m, i= 37 μ m, j= 37 μ m, k= 18 μ m, l= 6.5 μ m, m=55 μ m

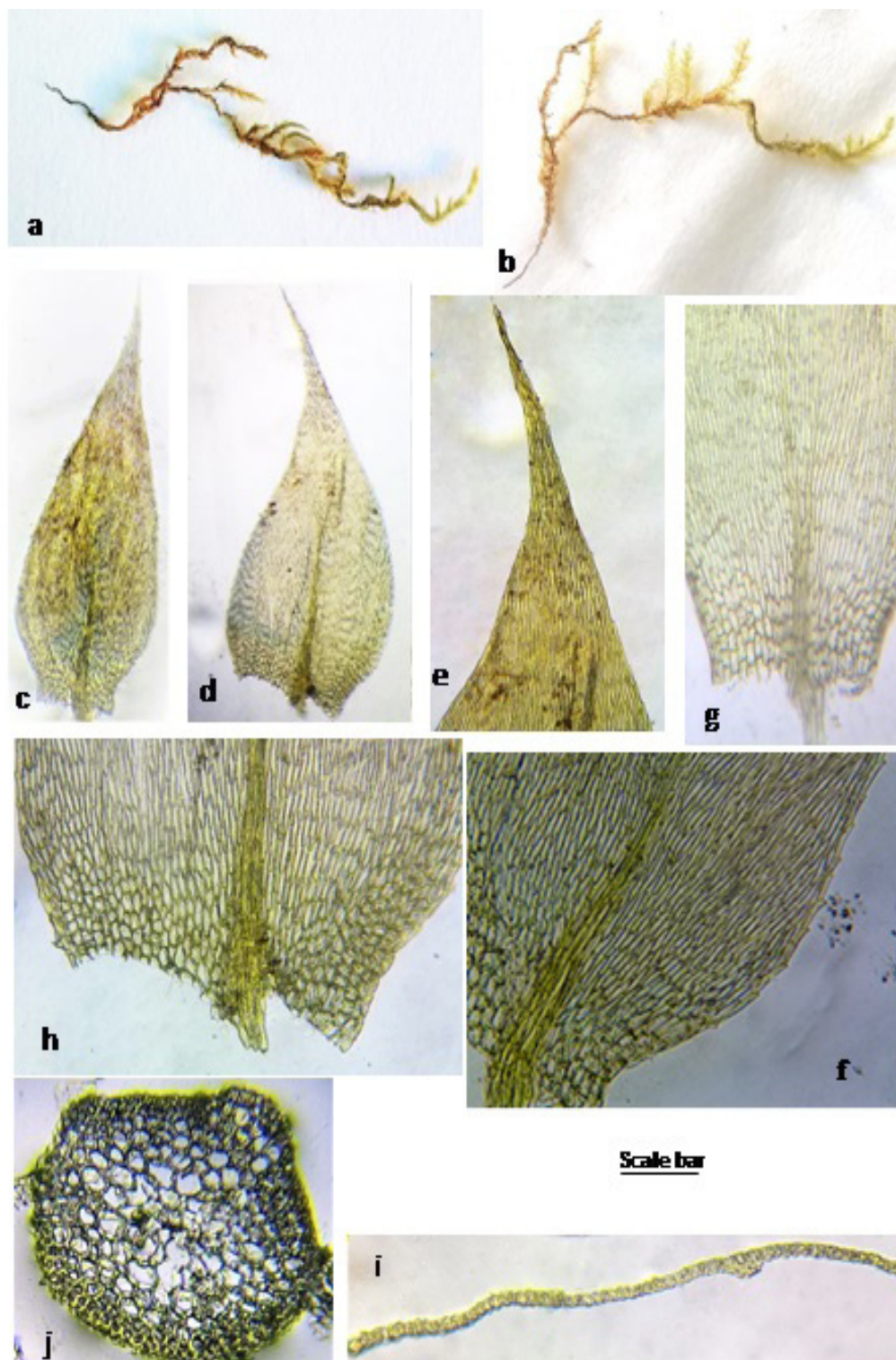


Fig. 7. a-j. *Sciuro-hypnum plumosum*. a- dry gametophyte. b- wet gametophyte. c- branch leaf. d- stem leaf. e- leaf apex. f- median marginal cells. g- basal part of leaf showing forked costa. h - leaf base showing alar cells region. i- part of cross section of leaf. j- cross section of stem.

Scale bar: a = 6.14 mm, b = 5.92 mm, c = 244 μ m, d = 240 μ m, e = 460 μ m, f = 80 μ m, g = 56 μ m, h = 50 μ m, i = 10 μ m, j = 15 μ m

Scleropodium tourretii (Brid.) L.F. Koch

Plants yellow to yellow green, up to 8 cm long. Stems 7.5 cm, irregularly branched. Leaves mostly crowded, loosely imbricate, spreading, straight to slightly secund, usually little changed when dry, oblong to oblong-lanceolate, strongly concave, almost boat-shaped in apex, the top of the leaf usually distinctly recurved, 1.3-1.5 mm long, 0.5-0.8 mm wide; apex blunt acute or obtuse, rarely acuminate, becoming reflexed as squarrose apiculus; margins plane, entire to weakly serrate above, \pm crenate at leaf apex; costa strong, double and long with one arm reaching mid leaf, single to mid leaf or beyond. Upper laminal cells

short, oblong-hexagonal to rectangular, 20-40 μm long, 2-4 μm wide; medial cells thick walled, uniformly long linear-flexuose or vermicular, mostly with rounded apexes, 5-6 μm wide and about 10 times longer, 60-80 μm , shorter towards the leaf apex; basal laminal cells shorter, wider, alar cells clearly differentiated, quadrate, short-rectangular, or rectangular, 12-30 μm long, 10-12 μm wide.

Figure 8, a-o. 10 gathering, associated with *Rhynchostegium riparioides* and *Scorpiurium circinatum*.

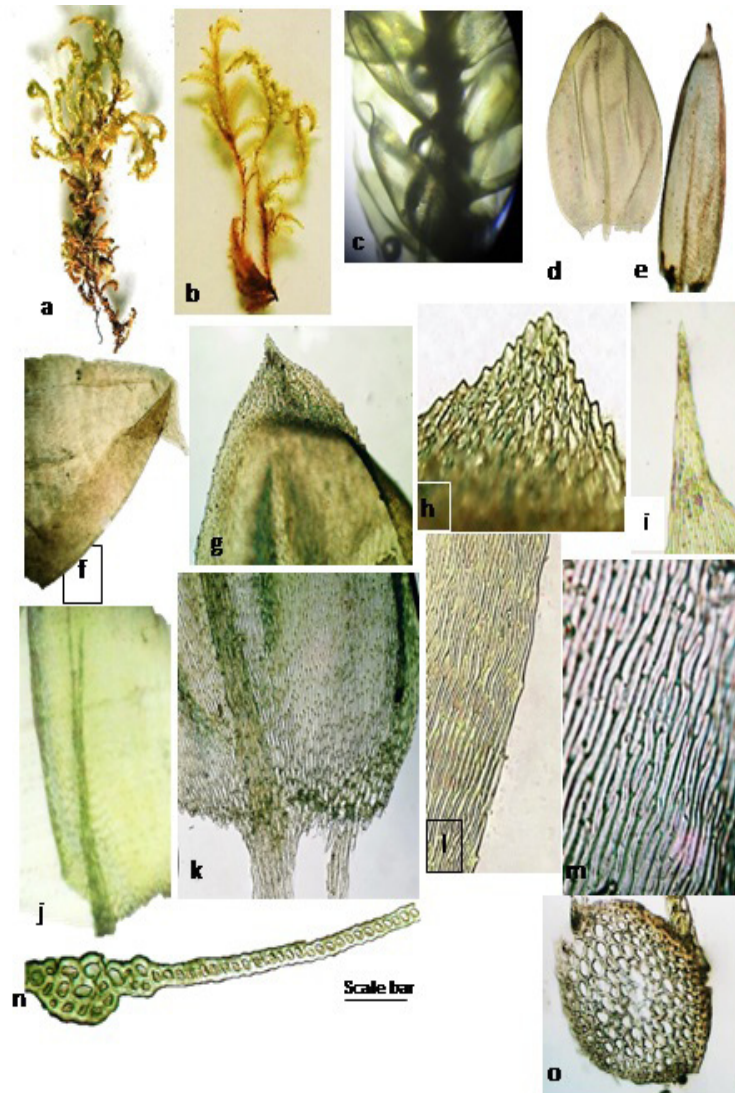


Fig. 8. a-o. *Scleropodium tourretii*: a- dry gametophyte. b- wet gametophyte. c- enlarged part of gametophyte showing deeply concave, almost boat-shaped leaves, becoming reflexed as squarrose apiculus. d- oblong leaf. e- oblong- lanceolate leaf. f- concave recurved apex. g, h- blunt acute leaf apices. i- acuminate leaf apex. j- leaf base showing bifurcate costa. k- leaf base showing alar cells. l- lower marginal laminal cells. m- median laminal cells. n- part of cross section of leaf showing costa. o- cross section of stem.

Scale bar = 16 mm (a), 18 mm (b), 0.7mm (c), 0.4 mm (d), 0.4 mm (e), 8 μm (f), 8 μm (g), 96 μm (h), 3 μm (i), 26 μm (j), 16 μm (k), 20 μm (l), 30 μm (m), 7 μm (n) and 9 μm (o).

Scorpiurium deflexifolium (Solms) M. Fleisch. & Loeske

Plants olive-green to dark yellow green, 3 cm long, branches strongly curved when dry. Stems 2.8 cm. Leaves imbricate when dry, patent to spreading when moist, branch leaves ovate lanceolate, stem leaves are rather shorter and wider than the branch leaves, ovate, 0.8-0.9 mm long, 0.3-0.4 mm wide; apex acute to \pm obtuse; margins \pm recurved at base, strongly serrulate or serrate above, weakly below; costa percurrent bearing some dorsal projections at its upper half. Upper laminal cells rhomboidal, (4) 8-12 μ m long, 2-4 (6) μ m wide; medial cells rhomboidal to long rhomboidal, (2)4-6 μ m wide and about two-three times longer than wide, (8)10-20 (34) μ m long; basal laminal cells shorter, wider, alar cells clearly differentiated, quadrate, 4-8 μ m long, (2) 4-8 μ m wide.

It may be said in conclusion that the present work raised the number of mosses known from Libya to 98 taxa belonging to 41 genera, in 16 families and 10 orders all under class Bryopsida. The 16 families are arranged in a descending order according to the number of taxa each includes as follows: Pottiaceae 41, Brachytheciaceae 18, Bryaceae 9, Fissidentaceae and Funariaceae each 5 taxa, Orthotrichaceae 4, Grimmiaceae 3, Dicranaceae, Ditrichaceae, Encalyptaceae, and Mniaceae each 2 taxa, Amblystegiaceae, Fabroniaceae, Hypnaceae, Leptodontaceae, and Ptychomitriaceae each one taxon. It is expected that the investigation of the remaining samples, hopefully in the near future, will add greatly to our knowledge of the Libyan moss flora.

Figure 9, a-l. 1 gathering, not associated with other mosses.



Fig. 9. a-l. *Scorpiurium deflexifolium*.: a- dry gametophyte. b- wet gametophyte. c- stem leaf. d,e- branch leaves. f,g,h- leaf apices. i- middle laminal cells showing costa with dorsal projection. j- leaf base showing basal laminal cells and alar cells region. k- part of cross section of leaf. l- cross section of stem.

Scale bare: a= 7mm, b= 1.7mm, c= 347 μ m, d= 235 μ m, e= 275 μ m, f= 9 μ m, g= 8 μ m, h= 30 μ m, i= 20 μ m, j= 18 μ m, k=4 μ m, l=18 μ m

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سبعة أنواع من الفصيلة Brachytheciaceae (حزازيات قائمة) جديدة على ليبيا

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تحتوي الفصيلة eaecaicehtyhcarB على ما يقرب من 7111 نوعا منتشرة في ربوع العالم. منها 11 نوعا رصدت في ليبيا بين عامي 1391-4191. وفي البحث الحالي تم تسجيل عشرة أنواع منها سبعة جديدة على ليبيا وهي:

Brachythecium rutabulum (Hedw.) Schimp., *Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Huttunen, *Pseudoscleropodium purum* (Hedw.) M. Fleisch., *Rhynchostegium megapolitanum* (Blandow ex F. Weber & D. Mohr) Schimp., *Sciurohypnum plumosum* (Hedw.) Ignatov & Huttunen, *Scleropodium touretii* (Brid.) L.F. Koch and *Scorpiurium deflexifolium* (Solms) M. Fleisch. & Loeske.

وبذلك أصبح عدد أنواع هذه الفصيلة المعروفة من ليبيا ثمانية عشرة نوعا. تم عمل مفتاح تعريفي للأنواع الثمانية عشرة وكذلك تم ذكر توزيعها في منطقة البحر المتوسط والعالم. كما تم وصف وتصوير الأنواع السبعة الجديدة.