

D. Ben-Natan, O. Fragman-Sapir & B. Shemesh

Contributions to the Flora Palaestina Region

Abstract

Ben-Natan, D., Fragman-Sapir, O. & Shemesh, B.: Contributions to the Flora Palaestina Region. — Fl. Medit. 34: 73-94. 2024. — ISSN: 1120-4052 printed, 2240-4538 online.

The Flora Palaestina is considered to be a well-studied flora in the Middle East and worldwide. Nevertheless, surveys conducted in recent years have revealed new findings in several new areas that were not studied before. In this paper we collect some of these important findings reporting 28 new floristic records for the region.

Key words: floristics, Israel, Mediterranean area.

Article history: Received 12 October 2023; received in revised form 12 March 2024; accepted 23 March 2024; published 13 April 2024.

Introduction

The Flora Palaestina region (Israel, the Palestinian Territories, western Jordan and the Golan Heights) has been studied thoroughly since the late 19th century until the early 21st century (Boissier 1872; Post 1896; Aaronson 1931, 1941; Dinsmore Eig & al. 1954; Zohary 1966, 1972; Feinbrun-Dothan 1978, 1986; Zohary & al. 1980-84; Danin 2000, 2004). About 2400 species were recorded within the borders of the state of Israel and the Palestinian territories, and about 2,700 when including western Jordan (Fragman & al. 1999). The last comprehensive work summarizing the known data on the entire local flora was published in 1991 in the Analytical flora (Feinbrun-Dothan & Danin 1991). The last published checklist (Fragman & al. 1999) includes comprehensive data on all species, new findings and tagging for doubtful species. Since 2000 only sporadic updates were published: Additional updates to the flora were published by Gretuter and Raus (Euro+Med Checklist Notulae) mostly by Danin (e.g. Danin 2009; Danin & al. 2011), and some in other papers and books – by local and non-local botanists (e.g. Domina & Raimondo 2009; Fragman-Sapir & Fritsch 2011; Peri 2015). Other findings were not published at all. Species newly documented in the region were recorded in the past 20 years and especially in the last five years, when almost every year new floristic discoveries were made during field surveys and botanical expeditions. Some of these findings were reported by surveyors and field botanists or by amateurs, some new findings are based on new identifications of known plants or new treatments of previously documented species. None of these new floristic

tic records were formally published in peer-reviewed literature. Some were published in Hebrew with partial data, without specimens being collected or vouchers being deposited in any herbaria.

The purpose of this paper is to publish the new findings of all the species that are previously undocumented for the region. We have collected data on all the newly recorded species from the region from the last ± 20 years, and assembled the data, along with extensive collections of plant materials which were dried, deposited in the HUJ and the TELA herbaria (Holmgren & al. 1990), and are included here as vouchers from each newly reported species. We hope that this paper will be the first of many, which will help form a revival of the floristic research of the region.

The new findings are listed here in alphabetical order of taxonomic families, and in alphabetical order within each family. For every species we bring the relevant taxonomic and discovery histories, as well as habitat information, additional remarks, and a list of vouchers deposited and examined in the local herbaria.

The new floristic records

Alismataceae Vent.

Sagittaria subulata (L.) Buchenau

Sagittaria subulata was first recorded in Israel by Ruediger Prasse in Ein Yered in the Shfela in 1994, and identified as *Alisma gramineum* Lej. due to the similarity of its phyllode to *A. gramineum*'s submerged leaf form. Prasse's unpublished record was confirmed during the Israel Rare Plant Survey conducted by "Rotem" (the Israel Plant Information Centre) and published by Fragman-Sapir in Euro+Med-Checklist Notulae 18 (Greuter & Raus 1999). These plants were later collected as a rare native species and grown from root shoots in several local botanical gardens and sanctuaries. In 2012 the species was located by Oz Golan in an additional location: Ein Ro'im (and also, allegedly, in two other additional unconfirmed nearby sites) in the eastern Upper Galilee, and reported in the Flora of Israel and adjacent regions website forum. In 2015 the Ein Yered population, which was previously thought to be extinct in the early 2000's, was seen in bloom by Amit Mendelson. Later that year, both the Ein Ro'im and the Ein Yered populations were recorded by Dar Ben-Natan, who later reidentified the plants, with the generous help of Ruediger Prasse, as *Sagittaria subulata*, and confirmed that this is the same species observed in Ein Yered in the 1990's. According to Zohary (1989), *Alisma gramineum* occurs in the Golan Heights and Sinai, but the basis for this claim is unknown, since no known records of this species currently exist from Israel. It is possible that some of the Golan Heights populations of *Alisma* attributed currently to *A. lanceolatum* With, belong in fact to *A. gramineum*, but this has as yet to be verified.

Sagittaria subulata is an American species, popularly grown in aquariums. It has, most likely, arrived at these locations due to fish owners dumping their aquariums into the water.

Reference material: ISRAEL, Shfela, Ein-Yered near Gezer, in an old well near Tel Gezer, shallow water on top of clay, shadowed by a *Ficus carica* L. tree and a thicket of *Phragmites australis* (Cav.) Trin. ex Steud., 6.11.2015, *Dar Ben-Natan* (HUJ133391!, HUJ134784!).

Asteraceae Bercht. & J. Presl

Achillea falcata L.

Achillea falcata is quite common in the higher parts of Mt Hermon and Edom Mts in Jordan, but has never been previously recorded from other parts of Israel. In 2018, during a Deshe OLI rare plants survey for the INPA (Israel Nature and Parks Authority) to locate populations of the locally rare *Achillea aleppica*

DC., old herbarium material from upper Nahal Arugot was identified by Merav Lebel as *Achillea falcata* (Lebel, 2018), and during the survey, a large population of this species was located in the same area as the material collected in 1985, on cliffs and hard limestone in the Nahal Canub Reserve. This is currently the only known locality of this species in Israel, outside Mt Hermon.

Reference material: ISRAEL, Judean Mts, wadi entering Nahal Arugot below Hirbet Knub, 1698.1118, alt: 500 m, rock ledges and cliffs, 7.1985, *Aaron Liston* (134820!), ISRAEL, Nahal Knub Reserve, below Ibey Hanahal settlement, 31.5997641 N 35.2139131 E, cliffs and rocks in northern exposures, 4.6.2020, *Dar Ben-Natan* (HUJ134818!).

Andryala dentata Sm.

A. dentata was discovered in Israel by Yair Ur in 2018, and identified by Shimon Cohen-Sivan. The species has been found so far in two locations in the NE Golan Heights in 2018 and 2020 (Ben-Natan, 2023) and hundreds of plants were observed there again in 2023. Further monitoring will reveal whether it is a casual occurrence, or if the populations are stable and self-sustained.

Reference material: ISRAEL, Golan Heights, Kuneitra reservoir, near the old Syrian army headquarters, 945m alt., 16.7.2019, *Yair Ur* (HUJ133388!).

Brocchia cinerea (Delile) Vis.

The species was first discovered in Israel in 2020 by Dudi Rivner in Wadi Paran in the S Negev Desert. The plants were identified by Ori Fragman-Sapir, and have been observed in the same locality every year since. In 2022 the species was further located by Rivner in upper Wadi Paran, west of the original locality. The plants were found growing along silt-sandy banks of a large wadi and it is assumed that their origin is in the sands of eastern and central Sinai Peninsula, Egypt, drained by Wadi Paran, where *B. cinerea* is common. Further monitoring of these populations in the coming years is required in order to ascertain whether they are self-sustained or casual, occurring along Wadi Paran after strong floods only.

Reference material: ISRAEL, S. Negev, Wadi Paran, near road 10, 15.4.2021, *Daphna Carmeli* and *Dudi Rivner* (HUJ134770!).

Siebera nana (DC.) Bornm.

While common in upper Mt Hermon, and also known from Edom in southern Jordan, *Siebera nana* has never been recorded in Israel and the West Bank, outside Mt Hermon, until a small population numbering a total of about 50 plants was discovered by Dar Ben-Natan during a Deshe OLI survey for the INPA in the southern Judean Desert. The plants grow there in limestone crevices in the northern exposure of Mt Hardon, together with another newly documented species for Israel, reported here as well – *Minuartia intermedia* (Ben-Natan & Ron 2021). This is currently the only population known in Israel outside Mt Hermon, although this inconspicuous species may be further found in the future in the higher Judean Mts, known to inhabit several other Irano-Turanian relicts found more easily on Mt Hermon and Edom (Feinbrun-Dothan 1978; Feinbrun-Dothan & Danin 1998).

Reference material: ISRAEL, Judean Desert, Mt Hardon, northern exposure on a steep rocky slope pacing north towards Nahal Adasha, 31.3439140 N 35.1910670 E, 31.3427120, 35.1938170, 31.3417030, 35.1934740, More than one hundred individuals across the slope, together with *Minuartia intermedia* (Boiss.) Hand.-Mazz., *Bromus danthoniae* Trin., *Boissiera squarrosa* (Banks & Sol.) Nevski, *Lolium subulatum* (Banks & Sol.) Eig, *Descurainia sophia* (L.) Webb ex Prantl, *Coridothymus capitatus* (L.) Rechb.f. and others, 28.4.2020, *Dar Ben-Natan* (HUJ133346!).

Boraginaceae Juss.*Myosotis discolor* Pers. (Fig. 1a)

This slender annual was first recorded by Shmuel Mazar in 2016, growing in a wet *Eucalyptus camaldulensis* Dehnh. grove at the upper part of Mesil A'sania – a small stream in the northern Golan Heights, known to local plant enthusiasts and botanists as a hotspot for many locally rare, wet habitat species. It was collected later the same year in the same site by Mimi Ron, Yair Ur and Bar Shemesh, and was observed there annually up to 2022, when it was recorded further down the stream during a field survey for Deshe OLI and Shamir institute for the research of the Golan Heights, and collected and identified by Dar Ben-Natan (Lev-Ramati & al. 2022; Ben-Natan 2023). Previously, this population was misidentified by Mazar (Mazar 2016) as *M. stricta* Link ex Roem. & Schult., and later as *M. congesta* Shuttlew.

This species is very rare in Israel and is currently known only from two other sites in the N Golan Heights, found by Shmuel Mazar as well.

Reference material: ISRAEL, Golan Heights, Mumsia ruins, N. of Alonei HaBashan, N. of the spring in *Eucalyptus* grove, 20.4.2016, *Shmuel Mazar* (HUJ134765!), ISRAEL, Golan Heights, upper Mesil A'sania (=Mumsia), herbaceous vegetation in a damp meadow on the banks of a small, shallow stream (Mesil), 33.0764730 N 35.8178940 E, 33.0784070 N 35.8219720 E, 18.4.2022, *Dar Ben-Natan* (HUJ134764!, TELA4100!)

Myosotis laxa subsp. *cespitosa* (Schultz) Hgl. ex Nordh. (Fig. 1b)

This species was apparently collected by Armitage from Haifa in 1891 and deposited in the Syrian Protestant Collage of Beirut, later identified in the HUI herbarium by Aaron Liston in 1984 and noted as “probably adventive”, which is most likely why this record was previously overlooked. In 2019, photographs of this species taken somewhere near Hadera were posted on Facebook by Oz Golan, but no evidence of this species was found in the Hadera regional council survey that took place that same year (Mendelson & al. 2020). In 2022, during a Deshe OLI field survey for the KKL-JNF in the Hadera Forest Vernal Pond, blooming patches of *M. laxa* were discovered in knee-high water by Dar Ben-Natan and Dvora Lev-Ramati (Lev-Ramati & al. 2022), where they grow among a dense herbaceous vegetation of *Butomus umbellatus* L., *Scirpus maritimus* L. and *Alisma lanceolatum* With. *Myosotis laxa* is very different to other *Myosotis* species native to the region, and is easily distinguished from them by its relatively large corolla and habit, calyx shape and glabrescent leaves, calyces and stems.

Reference material: ISRAEL, Haifa, 2.4.1891, Armitage (HUJ134967!), ISRAEL, Sharon Plain, Hadrera forest, vernal pond, in water about 30 cm deep, 32.4302220 N 34.8938870 E, 32.4325830 N 34.8951420 E, In association with *Butomus umbellatus* L., *Scirpus maritimus* L. and *Alisma lanceolatum* With., 10.4.2022, *Dar Ben-Natan* (HUJ134767!, TELA4101!), ISRAEL, Sharon Plain, Hadera forest, vernal pond, in mostly dry places at time of collecting, 32.4325870 N 34.8951570 E, end of bloom, 24.5.2022, *Dar Ben-Natan* (TELA4102!).

Neatostema apulum (L.) I.M. Johnst.

This small annual was first discovered during a Rotem field excursion to upper Nahal Grar, on a small slope on sandy clay-loess, where it was misidentified as *Arnebia decumbens* (Vent.) Coss. & Kralik. Later on it was identified as *Buglossoides* sp. By Dar Ben-Natan, and estimated as a possible new color variant of *B. tenuiflora* (L.f.) I.M.Johnst., or an undescribed new species. In the spring of 2020 and the spring of 2022, two new populations were discovered by Dar Ben-Natan during field

surveys for Deshe OLI in the lower Nahal Bsor basin (Shalev & al. 2021; Ben-Natan & al. 2022), both on sandy regosols near outcrops of Pleistocene calcareous sandstone (Kurkar), and later that year finally identified as *Neatostema apulum* (Shemesh & al. 2023). All three populations appear to be small and very local, and although *N. apulum* is known around the Mediterranean from various habitats, and growing on different sediments, the Israeli populations seem exclusive to relatively quite arid sandy-clay habitats in the Coastal Negev – a rare habitat, rich in endemics and in locally endangered species. These habitats are threatened by cattle grazing, motor vehicles, agriculture, afforestation and urban expansions. Endemic and endangered species, such as *Anthemis philistea* Boiss. and *Galium philistaicum* Boiss. are relatively abundant in all three sites where *N. apulum* is currently known from in Israel. Interestingly, this pattern is very similar to another Mediterranean, locally extremely rare species with a similar global habitat range, which is also new to the region and is reported from Israel for the first time in this paper: *Valerianella pumila* (Willd.) DC., which in fact grows together with, or nearby, *N. apulum* in two out of three currently known sites.

In all three sites, most specimens examined in the field were cleistogamous, in agreement with Johnston's remark on this matter mentioned in the Flora of Cyprus (Meikle 1985). Some plants produce both chasmogamous and cleistogamous flowers. The cleistogamy in these populations can possibly be attributed to the aridity of the habitat and low-sporadic annual rainfall, as most examined cleistogamous specimens were much smaller than the few chasmogamous ones. In 2023, a year of little rainfall in southern Israel, in each of the Nahal Grar and Nahal Bsor populations less than 10 out of several hundred specimens observed in the field during a Deshe OLI rare plants survey for the INPA were chasmogamous.

Reference material: ISRAEL, Negev Coastal Plain, northern bank of upper Nahal Grar, badlands SE of Tel Haror, sandy clay regosol, 31.378202 N 34.611955 E, 114 m. Many dozens in a local patch, growing along a few meters. Very similar to *Buglossoides tenuiflora* (L.f.) I.M. Johnst. but differs in the yellow corolla and in its internal indumentum which isn't arranged in rows, in the five hairy patches in the corolla throat, lower anther insertment, the annulus of 10 quadrate lobes below the anthers, acute cauline leaves and basal leaves arranged in a pseudo-rosette, and both stiff bristles growing out of small warts and softer hairs. Differs from *Arnebia* Forssk. In the shape of the pistil, placement of anthers and shape of the ripe calyx. 27.2.2019, Dar Ben-Natan (HUJ134893!, TELA4396!), ISRAEL, Negev Coastal Plain, Be'eri nature reserve, southern basin, 31.4267 N, 34.4696 E, 100 m. Kurkar and sandy clay regosol with high concentration of sulfur. Batha of *Coridothymus capitatus* (L.) Rchb.f., *Fumana thymifolia* (L.) Webb, and *Thymelaea hirsuta* (L.) Endl. with elements of sand and Kurkar vegetation. Local patch with small and short plants, most of them showing cleistogamy. 23.3.2022, Dar Ben-Natan (HUJ134894!), ISRAEL, North Negev, Nahal Gerar, Park Sharsheret, 31.3786044 N 34.6122005 E, Sandy-silt soil, with Kurkar parts of Pleshet formation. Hundreds of plants, mostly Cleistogamic, 9.5.2023, Dar Ben-Natan (HUJ135047!), ISRAEL, North Negev, Nahal Besor badlands, 31.347124 N, 34.472787 E, 31.348563 N 34.472965 E, 31.349996 N 34.474218 E, Kurkar and Loess-sandy soil. East of Mitzpor Shay. Three clusters found at the top of north-south ridges. Patches of 1-3X2-10 m. together with *Valerianella pumila* and *Galium philistaicum*. Several hundreds of plants, mostly Cleistogamic, 13.5.2023, Dar Ben-Natan (HUJ135048!).

Caprifoliaceae Juss.

Valerianella discoidea (L.) DC.

Valerianella discoidea is one of the most common *Valerianella* species in Israel and the west bank, occurring from the southern Shfela to Mt Hermon in the north, and until recently was mistaken

for *Valerianella coronata* (L.) DC., which is much rarer locally, and occurs mostly in the northern parts of Israel. The first to notice this mistake and to identify *V. discoidea* from Israel was Oz Golan, who published several posts on the matter on social media in 2019, followed by Shmuel Mazar later that year. Further examination of herbarium material from the HUI collection found very few collections of the real *V. coronata*, all from the Upper Galilee and lower Mt Hermon.

Reference material: ISRAEL, Jerusalem, Matsleva, batha, *N. Naftulsky* (HUI134844!), ISRAEL, Upper Galilee, Mt Meiron, wadi, 4.5.1926, *N. Naftulsky* (HUI134842!), ISRAEL, Upper Galilee, Kirbet Tsemah, W wall of wadi, 16.3.1940, M. Zohary and *N. Feinbrun-Dothan* (HUI134838!), ISRAEL, Mt. Carmel, Carmel Forest, 26.3.1952, *N. Feinbrun-Dothan* (HUI134848!), ISRAEL, Lower Galilee, Mt Tevor, N slope, maquis, 31.3.1954, *D. Yaffé* and *C. Sherikar* (HUI134949!), ISRAEL, Coastal Carmel, Atlit, Kurkar hill, assoc. of *Ceratonia-Pistachia lenticus*, 5.4.1956, *G. Orshan* (HUI134839!), ISRAEL, Mt. Hermon, 1200 m, 28.5.1969, *Yael Eshel* (HUI134835!), ISRAEL, S. Hermon, Qala'at Nemrod, Baniyas – Majdal-Shams road, among the fortress ruins, hard Jurassic limestone, degraded maquis of *Quercus calliprinos*, alt: 750 m, 22.4.1975, *Avi Shmida* and *E. Noi-Meir* (HUI134837!), ISRAEL, Upper Galilee, Mt Shazor, *Quercus calliprinos* – *Pistachia palaestina* sparse maquis, on hard limestone rocks and terra rosa, 26.4.1982, *R. Berliner* (HUI134841!), ISRAEL, Golan Heights, hill N of Susita, on Susita Chalk, 14.3.1983, *A. Liston* (HUI134847!), ISRAEL, Mt. Hermon, Namneman ridge, between Yif'at and Man Valley, rocky slope, 28.5.1984, *A. Liston* (HUI134836!).

Vallerianella coronata (L.) DC. Reference material: ISRAEL, Upper Galilee, Jebel El Arus (Mt. Hilel), 4.6.1926, A. Eig and M. Zohary (HUI134833!), ISRAEL, Upper Galilee, Mt Jermak (Mt Meiron), 20.5.1959, *Lea Pruzbul* (HUI134831!), ISRAEL, Mt Kata (lower Mt Hermon), sandstone, 1.6.1983, *Avi Shmida* (HUI134830!), ISRAEL, Upper Galilee, Dovev, 15.5.2017, *Smuel Mazar* (HUI134832!).

Valerianella obtusiloba Boiss.

A slender eastern Mediterranean annual, differing from all other local *Valerianella* species by its strikingly large and fringed fruiting calyces.

Valerianella obtusiloba was discovered in the Upper Galilee and reported as a species new to the region by Oz Golan (Golan 2018), but no specimens were deposited in any local herbaria. The plant was re-collected in its main locality in 2023, specimens were deposited in HUI herbarium and seeds were grown in the Israel Gene Bank as well as in the Jerusalem Botanical Gardens.

Reference material: ISRAEL, Upper Galilee. South of Neve Ziv, 35.1890454N 33.0140018 E, dark-brown soil pockets in Eocene chalk, SW facing slope, garigue of *Calicotome villosa*, *Rhamnus lycioides* and *Quercus calliprinos*, 9.4.2023, *Mimi Ron* and *Dar Ben-Natan* (HUI 135051!), ISRAEL, Upper Galilee. South of Neve Ziv, 35.1802271 N 33.0219383 E, near a dirt road in the woods, 9.4.2023, *Mimi Ron* and *Dar Ben-Natan* (HUI 135053!), ISRAEL, Upper Galilee, south of Neve Ziv, 35.1797584 N 33.0216187 E, small shallow pockets of Terra-Rosa soil, in Eocene colcareous outcrops, dense garigue of *Calicotome villosa*, *Pistacia lenticus* and *Quercus calliprinos*, with planted *Pinus halepensis* forest above, and open patches of *Cistus salviifolius* and *Sarcopoterium spinosum*, 9.4.2023, *Mimi Ron* and *Dar Ben-Natan* (HUI 135054!).

Valerianella pumila (Willd.) DC. (Fig. 1c)

A minute herb, occurring around the Mediterranean and W Irano-Turanian. *Valerianella pumila* was cited from Moav, Jordan, in the Flora Palaestina (Feinbrun-Dotan 1978) and from the Syrian parts of Mt Hermon in the Analytical Flora of Eretz-Israel (Feinbrun-Dotan & Danin 1991). The first record of this species from within the borders of Israel is from 2015, when Dror Melamed found a

small population near Nahal Garar, on a Loess flat in the badlands above the wadi's bank, and published a short note in Hebrew in the Kalanit online magazine (Melamed & Fragman-Sapir 2015). Two further populations were discovered in lower Nahal Garar and in the Nahal Bsor badlands by Dar Ben-Natan in 2020, during a field survey for Deshe OLI (Shalev & al 2021). All three populations are small and extremely local, occurring on loess or calcareous sandstone (Kurkar).

Curiously, in two of these three sites, *V. pumila* occurs in association with *Neatostema apulum* (which is also recorded from Israel for the first time in this paper), as well as several endemic and endangered species, restricted to sandy habitats along the Coastal Plains of Israel. The extremely local and fractured nature of these populations, far away from the closest known populations in northern Jordan and southern Syria, and together with the highly specific habitat in a small and geographically defined area of distribution in spite of the much wider global range of distribution and habitats – all shared by *V. pumila* as well as *N. apulum*, suggests that these populations are relics left by some trend of climate changes that may have affected these species' distribution, probably in the Holocene epoch, considering the sediment's age.

Reference material: JORDAN, Moav, west of Zizeh, alt: 720 m, 4.1925, *Fred S. Meyers et J. E. Dinsmore* (HUI134970!), ISRAEL, N. Negev – Park Nahal Garar near Rahat, alt: 62 m, 20.2.2015, *Dror Melamed* (HUI125989!), ISRAEL, bank of Nahal Garar, west of Ruhama, small loess slopes covered with herbaceous vegetation, near a path, a small clearing in a *Eucalyptus* grove, 27.2.2019, *Dar Ben-Natan* (HUI134785!), ISRAEL, lower Nahal Garar, southern bank, 31.4000631,34.4454599, coarse Kurkar sandstone outcrops with a patch of *Sarcopoterium spinosum* (L.) Spach Batha, 18.2.2020, *Dar Ben-Natan* (HUI134889!).

***Caryophyllaceae* Juss.**

Cerastium brachypetalum Desp. ex Pers.

Found and identified in 2019 on Mt. Kata (lower Mt. Hermon) by Oz Golan, who published the finding on Facebook without sharing an exact location for verification. The species was found again and verified by Dar Ben-Natan during the 2020 Deshe OLI rare plant survey for the INPA (Shemesh & al, 2020). In 2022, a second locality was found by Ben-Natan in Mas'ade Forest during a survey in the northern Golan Heights for Deshe OLI and Shamir institute for the research of the Golan Heights, in very short herbaceous vegetation in a small *Quercus calliprinos* Webb forest clearing, on Ein-Zivan Basalt scree (Ben-Natan 2023). Interestingly, several other locally very rare small annuals, occurring in Israel in relatively large populations on Jurassic sandstone on Mt Kata, occur also in small stony basalt patches in clearings of Mas'ade forest: *Teesdalia coronopifolia* (J.P.Bergeret) Thell., *Linaria pelisseriana* (L.) Mill., *Aira elegantissima* Schur, and *Moenchia erecta* (L.) P.Gaertn. et al. Some of these are recorded from other areas in Israel as well, but some, like *Cerastium brachypetalum* and *Teesdalia coronopifolia*, haven't been found outside these two habitats.

Reference material: ISRAEL, Mt Kata, 33.2439650 N 35.7497670 E, Sandstone, *Sarcopoterium spinosum* Batha in the slope below Nimrod, together with *Cerastium glomeratum* Thuill. And *Cerastium comatum* Desv., 3.5.2020, *Dar Ben-Natan* (HUI133355!, TELA2056!), ISRAEL, N. Golan Heights, Mas'ade Forest, Basalt, stony open places in *Quercus calliprinos* Webb forest, 33.2222790 N 35.7536320 E, 9.5.2022, *Dar Ben-Natan* (HUI134806!).

Minuartia intermedia (Boiss.) Hand.-Mazz. (Fig. 1d)

Small, densely glomerate annuals growing in semi-arid habitats. Large populations were already known (and unidentified as of that time) to the local botany community in Mt Hermon, sometimes



Fig. 1. a) *Myosotis discolor*, photo by D. Ben-Natan; b) *Myosotis laxa* subsp. *cespitosa*, photo by O. Fragman-Sapir; c) *Valerianella pumila*, photo by O. Fragman-Sapir; d) *Minuartia intermedia*, photo by O. Fragman-Sapir.

regarded as a glomerate form of *Minuartia decipiens* (Fenzl) Bornm., when the species was first identified in the region by Oz Golan, who discovered a population in Mt Kata (lower Mt Hermon) in 2019 (Shemesh & al. 2021). In 2019-2021, several further populations were found by Dar Ben-Natan in the Judean Mts and the Judean Desert (Ben-Natan & Ron 2021). The species was already recorded in Jordan by Danin in 2004 (Taifour & El-Oqlah 2019), where it is sparsely abundant on rocky sandstone hills in Edom. The species is quite abundant in Mt Hermon between altitudes of 1200 and 1600, and much rarer in the Judean Mts.

Reference material: ISRAEL, Judean Mountains, Mt Amassa, on the slopes of the wadi East of the road going up the mountain to Beit Yatir, rocks, West facing slope, Nahal Tov, 30.3.2012, *Dar Ben-Natan* (HUJ134972!), ISRAEL, Mt Hermon, Bir Ansuba, roadside, 16.5.2018, *Dar Ben-Natan* (HUJ134974!), ISRAEL, Judean Mts, top of Mt Amasa, 31.3309671 N 35.0970000 E, a rocky Batha, 2.4.2019, *Dar Ben-Natan* (HUJ133345!, HUI34973!), ISRAEL, Mt Kata, 33.2445450 N 35.7501410 E, Sandstone slopes, in exposed places and scree, 5.3.2020, *Dar Ben-Natan* (HUJ133341!, TELA2070!), ISRAEL, Judean Desert, Mt Hardon, northern exposure on a steep rocky slope pacing north towards Nahal Adasha, 31.3427520 N 35.1941870 E, together with *Siebera nana* (DC.) Bornm., *Bromus danthoniae* Trin., *Boissiera squarrosa* (Banks & Sol.) Nevski, *Lolium subulatum* (Banks & Sol.) Eig, *Descurainia sophia* (L.) Webb ex Prantl, *Coridothymus capitatus* (L.) Rchb.f. and others, 28.4.2020, *Dar Ben-Natan* (HUJ133357!, TELA2059!),

Silene marschallii subsp. *marschallii* C.A.Mey. (Fig. 2a)

Silene marschallii was first discovered in the region in Upper Nahal Arugot by Ofra Friedmann and Ohad Binyamini in 2020 and identified the following year by Dar Ben-Natan. It is known in Israel from one location only, where it grows in a Batha of *Sarcopoterium spinosum* (L.) Spach at an altitude of 800 m. The local population is very small and highly endangered. It is the southern-most population for this species, hundreds of kilometers from the nearest known population in Turkey.

Reference material: ISRAEL, Judean Desert, Nahal Canub Reserve, near Ibei Hanahal settlement, 31.6002370 N 35.2154199 E, 31.6000791 N 35.2152559 E, 31.6006931 N 35.2153588 E, upper part of a northern exposed slope, in a Batha of *Sarcopoterium spinosum* (L.) Spach and *Coridothymus capitatus* (L.) Rchb.f., about five specimens together with *Consolida scleroclada* (Boiss.) Schroedinger and *Astragalus cretaceus* Boiss. & Kotschy, 4.6.2020, *Dar Ben-Natan* (HUJ133353!), ISRAEL, Judean Desert, upper Nahal Arugot, 4.6.2020, *Ohad Binyamini, Ofra Fridmann, Ori Fragman-Sapir*, and *Dar Ben-Natan* (HUJ134811!).

Cistaceae Juss.

Fumana scoparia Pomel

This species was discovered in Israel on Mt Carmel (Carmiya) by Oz Golan, who did not deposit any plants in a local herbaria nor shared the location for verification, but reported the discovery in the Kalanit Israel Botanical Magazine (Golan & Shmida 2021). Since then, the species was further recorded and collected by other botanists in several localities in the Upper and Lower Galilee, Judean Mts and NE Shefela (Lev-Ramati & al. 2022.)

It is surprising how this shrublet went unnoticed for so long in the central areas of Israel. It is readily distinct from all other local *Fumana* species by its large, bright yellow flowers, woody branches and dense, summer deciduous leaves, semiterete and spirally arranged around the sterile shoots. These findings draw a new southernmost border for this species' distribution in the Middle East.

Reference material: ISRAEL, Judean Mts, Neve Illan Forest, 31.8085331,35.0474402,

Horizontal lime rock, together with *Satureja thymbra* L. and *Micromeria fruticosa* (L.) Druce, 3.6.2020, *Dar Ben-Natan* (HUJ133340!), ISRAEL, Judean Mts, south of Maoz Zion Alef, 31.7858720 N35.1489560 E, Horizontal lime rock at the margins of a planted pine forest, 5.11.2019, *Dar Ben-Natan* (HUJ133348!,TELA2054!), ISRAEL, Judean Mts, south of Maoz Zion Alef, 31.7tbh 858720 N 35.1489560 E, Horizontal lime rock at the margins of a planted pine forest, 18.5.2020, *Dar Ben-Natan* (HUJ133351!), ISRAEL, Shfela, near industrial area of Shilat, 31.9178611,35.0256667, 4.9.2019, *Nogen Tsabari* (HUJ133390!), ISRAEL, Lower Galilee, Tur'an Ridge, env. of Mitzpe Netofa, 32.8010 N 35.3862 E, alt: 365 m. Limestone outcrops in open batha and garrigue, 24.2.2021, *Dar Ben-Natan* (HUJ134939!), ISRAEL, Upper Galilee, Sulam ridge, 33.083722,35.162487, alt: 180 m. Calcareous rock in sunny clearing, 16.3.2021, *Dar Ben-Natan* (HUJ134979!), ISRAEL, Ahihud Forest, hard limestone outcrop, 32.9224930,35.1650920, 24.4.2022, *Dar Ben-Natan* (HUJ134805!).

Cleomaceae Airy Shaw

Cleome chrysantha Decne. (Fig. 2b)

The species was known from the region in the eastern Sinai Peninsula (Egypt). It is an annual or short-living perennial of the extreme desert. *Cleome chrysantha* was discovered in Israel for the first time by Dudi Rivner in the year 2016-7, which had good precipitation in S Israel, on a steep gravelly wash, where *Anticharis glandulosa*, another locally extremely rare species was found. The habitat is similar to some of its habitats in Sinai. The population was monitored since and was found to be self-sustained, germinating and blooming only in rainy years. The find was reported in the Kalanit Israel Botanical Magazine (Rivner & Shmida 2017).

Reference material: ISRAEL, Eilat Mts, Mt Zfahot, 25.5.2018, *Dudi Rivner and Ori Fragman-Sapir* (HUJ134812!).

Crassulaceae J. St.-Hil.

Sedum assyriacum Boiss. (Fig. 2c)

A rare annual that was discovered by Yair Ur near Revaya Water-Reserve in the Golan Heights in 2017, and initially misidentified as *Sedum palaestinum* Boiss. because of its bright yellow petals that are 3-4 times as long as the tepals. In 2019 it was reidentified as *S. assyriacum* Boiss. by Dar Ben-Natan. It is distinct from other local species by yellow petals, glabrous filaments and follicles and spatulate, notched nectariferous scales, as well as by the straight, semi-erect fruiting follicles.

S. assyriacum is a poorly known species, described originally in the mid-19th century from NE Iraq. Later it was collected in the Anti-Lebanon, around Rashaya and Zebadani, and in southern Syria in the Hauran and Djebel Druze (Mouterde 1966). Already in the *Nouvelle flore du Liban et de la Syrie*, Mouterde mentions *S. assyriacum* as extinct in the Rashaya – Zebadani area, possibly due to changes to drainage systems, or agriculture taking over its habitats. *S. assyriacum* hasn't been collected in Iraq since its description, and it is now possibly extinct in the country (Ghazanfar & Edmondson 2013). If these estimations are correct, southern Syria and the Golan Heights could be the main areas of occurrence for this species today. Although further surveys may locate it again in the Anti-Lebanon and Iraq. Ghazanfar & Edmondson (2013) consider *S. assyriacum* as a doubtful species similar to *S. pallidum* M.Bieb, due to the reddish petal midrib, which is visible in some of the plants in the Golan Heights population as well. However, the bright yellow petals, along with the follicles' and the nectariferous' shapes, clearly separate *S. assyriacum* from *S. pallidum*. Van Ham & 't Hart's 1998), and Messerschmid & al (2020) place *S. assyriacum* and the related *S. nanum* Boiss.

close to the genus *Petrosedum* Grulich, which emphasizes the distance between these unique species and the diverse *S. pallidum* complex, suggesting both species might warrant a new combination.

Sedum assyriacum occurs in the Central Golan Heights in vernal ponds on wet basaltic soil, together with other plants typical to this habitat such as *Damasonium polyspermum* Coss., *Elatine macropoda* Guss., *Myosurus minimus* L. and annual *Lythrum* species. Although *S. assyriacum* is already recorded from Syria, this is the first record of this species in the Flora Palaestina region.

Reference material: ISRAEL, Golan Heights, east of Revaya Reservoir, north of Ramat Magshimim, south of Yonatan and west of Nahal Elal's bend, 32.8840990 N, 35.7981280 E, vernal pond, wet mud, 20.4.2018, *Dar Ben-Natan* (HUJ133392!, HUI134828!), ISRAEL, Golan Heights, vernal pool on basaltic soil, east of Revaya Reservoir and west of Nahal El-al, 32.884099 N 35.798128 E, atl: 460 m. 6.5.2021, *Dar Ben-Natan* (HUJ134905!).

Juncaceae Juss.

Juncus pygmaeus Rich. ex Thuill. (Fig. 2d)

This minute annual was discovered By Mimi Ron and Dar Ben-Natan in 2020 during an SPNI survey in Hadera, in a vernal pond on sandy clay sediment, in association of *Juncus acutus* L., and together with other pygmy annuals, typical of this habitat and locally endangered – such as *Schoenoplectiella supina* (L.) Lye, *Isolepis cernua* (Vahl) Roem. & Schult. and *Oldenlandia capensis* L.f. (Mendelson & al. 2020). Since then, it was sighted in the same location in 2021 and again in 2022. The population consists of several hundred plants. On several occasions, as well as in other rare plants surveys conducted in the immediate vicinity of the known site in 2021 and 2022, no further extensions of that population were located. Most of the vernal ponds area linked to the pond where the plants were originally found were destroyed due to construction work in the last decade. A surprising second population was discovered in 2022 by Noam Segev in a vernal pond in the N Samaria, on clay sediments and in association of mostly small annuals. This population, observed again in 2023, consists of several hundred plants as well, and is under threat of being lost due to urbanization.

Reference material: ISRAEL, Hadera, Samar vernal pond, on the wet bottom of the pond, in open spaces between *Juncus acutus* L. clumps, 32.4342231,34.8939021, together with *Schoenoplectiella supina* (L.) Lye, *Isolepis cernua* (Vahl) Roem. & Schult., *Juncus articulatus* L. and others, several hundred specimens, 27.4.2019, *Dar Ben-Natan* (HUJ134762!), ISRAEL, Shomron, Bar'on industrial area, N of Kdumim. Alt: 390 m. Vernal pond in calcareous area, cley, 21.4.2022, *Noam Segev* (HUJ134975!), ISRAEL, Sharon Plain, Samar vernal pond, margins of vernal pond in association with *Juncus acutus* L. and *Scirpus maritimus* L., 11.5.2022, *Dar Ben-Natan* (HUJ134798!, TELA4107!).

Linaceae DC. ex Perleb

Linum trigynum L. (Fig. 3a)

A slender, branched annual, that has been considered extremely rare and endangered locally, and is known only from Mt Kata in the lower Mt Hermon, where it grows on Jurassic sandstone and only rarely observed (the species was not found in rare plants surveys conducted on Mt Kata between 2020 and 2022, but was observed there again in 2023) (Shemesh & al. 2020). A single doubtful sighting was recorded from Illanot Forest in the Sharon Plain in 1989 (Shmida, Pollak and Fragman-Sapir 2012). In the spring of 2019, a large population consisting of hundreds to thousands of specimens was observed by Dar Ben-Natan in Tel-Yitzhak North Nature Reserve in the Sharon Plain, and was



Fig. 2. a) *Silene marschallii* subsp. *marschallii*, photo by O. Fragman-Sapir; b) *Cleome chrysantha*, photo by O. Fragman-Sapir; c) *Sedum assyriacum*, photo by D. Ben-Natan; d) *Juncus pygmaeus*, photo by D. Ben-Natan.

considered at first to be *Linum corymbulosum* Rchb. After being visited again a year later, it was identified by Dar Ben-Natan as *Linum trigynum*. A further, smaller population was discovered that same year by Dar Ben-Natan and Ori Fragman-Sapir during an IPNI survey for the Regional Council of Hadera (Mendelson & al. 2020), and another one in Liman Nature Reserve in the Coastal Galilee by Merav Lebel. A fourth population was photographed in dry fruit in 2022 by Yael Orgad in the Sergeant's Grove in Netanya, and identified by Dar Ben-Natan. In 2023 its previously reported occurrence in Illanot Forest was confirmed by Bar Shemesh.

In all coastal populations, *Linum trigynum* grows on red sandy loam, locally called hamra, in association with many other rare and highly endangered species, exclusive to this habitat in Israel and critically threatened by the mass urbanization of the Coastal Plains of Israel in recent decades. All five sites are locally known as important hotspots for endangered hamra species.

Most likely, this species wasn't noticed in the Coastal Plain up until now due to its resemblance to *Linum corymbulosum*, which is very common on clay and clay-loam soils on calcareous rocks in the inland areas of central and northern Israel, and is absent, as far as we know, from sandy habitats in the Coastal strip of Israel. Further populations of *Linum trigynum* might be discovered in other coastal hotspots in the future.

Reference material: ISRAEL, Sharon Plain, Tel Yitzhak North Reserve, 32.2510840 N 34.8629190 E; 32.2504250 N 34.8618660 E, Hamra soil, moist niches between tall grasses and in the shade of bushes in margins of *Calicotome villosa* (Poir.) Link garrigue, together with *Paronychia echinulata* Chater, *Centaurium maritimum* (L.) Fritsch, *Silene papilosa* Boiss., and *Lavandula stoechas* L., thousands, 26.4.2020, Dar Ben-Natan, (HUJ133368!, HUJ134781!), ISRAEL, Sharon Plain, Hadera, Zeita Hill ("The Tulip Hill") south of Neve Elazar neighborhood and north of road 9, 32.4163890 N, 34.9415510 E, Hamra soil, moist niches between tall grasses and in the shade of bushes in margins of *Calicotome villosa* (Poir.) Link and *Sarcopoterium spinosum* (L.) Spach garrigue, together with *Juncus capitatus* Weigel, *Paronychia echinulata* Chater, *Medicago murex* Willd., *Ornithopus pinnatus* (Mill.) Druce, *Tolpis umbellata* Bertol., *Lupinus luteus* L., and *Riccia gaugetiana* Durieu & Mont., Hundreds, 26.4.2020, Dar Ben-Natan (HUJ133343!, HUJ134782!), ISRAEL, Sharon plain, Illanot woods, 32.292721, 34.902318, A garigue of *Cistus salvifolius* L. & *Calicotome villosa* (Poir.) Link on clay-loam soil, 9.4.2023, Dar Ben-Natan and Bar Shemesh (HUJ135031!), ISRAEL, Mt Hermon, Mt Katta, 33.2435234, 35.7491986, Sandy loam near sandstone outcrops, damp soil, 18.5.2023, Dar Ben-Natan (HUJ135052!).

Orchidaceae Juss.

Himantoglossum comperianum (Steven) P. Delforge

A disjunctive, rare E Mediterranean orchid. *Himantoglossum comperianum* was first discovered in Israel by Sakra Jen in the spring of 2020, and identified by Ori Fragman-Sapir. So far, a single plant was recorded in bloom in the Northern Golan Heights in 2020, and again in 2022, on the roof of a deserted bunker inhabited by an herbaceous plant community for a few decades. The finding was published in Hebrew in the Kalanit Israel Botanical Magazine, but no specimens were collected (Shifmann 2020).

Himantoglossum comperianum is already recorded from Syria (Peri 2015), which makes its occurrence in the Golan Heights somewhat unsurprising. We hope that further surveys might reveal larger, sustained populations in the area – although no such population was found during the survey conducted in the Northern Golan Heights in 2022 by Deshe OLI and Shamir institute for the research of the Golan Heights (Ben-Natan 2023). It is difficult to ascertain whether this single individual on

Tel Ram represents a larger population, as yet undiscovered by local botanists or otherwise mostly extinct, or a recent casual occurrence, dispersed from across the Syrian border. The natural habitats on the eastern parts of the N Golan Heights are heavily threatened, and most of the area outside of old minefields was already lost to rapid expansion of agricultural terraces and military activity.

Interestingly, a single specimen of *Himantoglossum robertiaum* (Loisel.) P.Delforge, identified by Ori Fragman-Sapir, was discovered in the Judean Mts by Gaby Peleg, Ofra Laron and Ofra Negev in March 2023. No specimen was collected and currently opinions differ as to its indigenoussness. Further surveying and monitoring are required in order to see whether this individual represents a nearby sustained and yet undiscovered population, or a casual occurrence (natural or otherwise).

Reference material: ISRAEL, Golan Heights, Mt Ram, on top of a deserted bunker on the mountain's western top, 33.2458000 N 35.7876280 E, Herbaceous vegetation typical to volcanic cones in the northern Golan Heights, only one individual, 21.5.2020, *Dar Ben-Natan* (HUJ133339!), ISRAEL, N. Golan Heights, on a deserted bunker's roof at the top of Tel Ram's western peak, in association with *Vicia tenuifolia*, *Eryngium glomeratum*, an *Peltaria angustifolia*, 33.2457770 N, 35.7876780 E, a single individual, 19.5.2022, *Dar Ben-Natan* (HUJ134793!).

Papaveraceae Juss.

Fumaria officinalis subsp. *cilicica* (Hauskm.) Liden

Collected in 1926 from the Upper Galilee by Eig and Zohary, and again from Mt Hermon in 1986 by Liston and Shmida, but excluded from the Flora Palaestina (Zohary & Feinbrun-Dothan 1966-1986) and the Analytical Flora of Eretz-Israel (Feinbrun-Dotan & Danin 1991), *Fumaria officinalis* was observed, collected and identified again in the region only in 2011, by Shimon Cohen-Sivan and Shauli Bekerman, who found it again on Mt Hermon. Since then, further, large populations were found by several botanist and surveyors in the Northern Golan Heights, Upper Galilee and Mt Hermon, on basalt, scoria or limestone. As suggested by Shmida in the Hebrew publication on this matter in the Kalanit online magazine (Shmida 2015), it is possible that *Fumaria officinalis* is expanding its range in northern Israel, and that it is now much more common than it used to be. It is now fairly abundant in the NE Golan Heights (Ben-Natan 2023), but still uncommon in the region as a whole.

Reference material: ISRAEL, Upper Galilee, garden's sides, 2.6.1926, *A. Eig* and *M. Zohary* (HUJ124994!), ISRAEL, Mt Hermon, 5.5 km NNW of Majdal-Shams, roadside, alt: 1600 m, 4.6.1986, *A. Liston* and *A. Shmida* (HUJ124993!), ISRAEL, Mt Hermon, 24.5.2011, *Shauli Bekerman* (HUJ130097!), ISRAEL, Golan Heights, Mt Bental, open forest of *Quercus boissieri*, alt: 110 m, 9.5.2012, *A. Shmida* and *Sh. Klein* (HUJ126323!), ISRAEL, Mt Hermon, lower cable-car station, 9.4.2013, *Shimon Cohen-Sivan* (HUJ130094!).

Plantaginaceae Juss.

Limosella aquatica L.

Delicate hydrophyte, growing in shallow ponds. First discovered in Israel by Bar Shemesh in 2019 in the northern margins of the Shomron Mts (Shemesh & al. 2022), and by Siko Bechor in 2020 in the Upper Galilee, and identified by Ori Fragman-Sapir in 2020. In both localities, the plants occur on calcareous rocky hills, in small and shallow rock ponds (about 15 cm deep) in caliche outcrops, layered with thin clay mud at the bottom, and in small shallow vernal ponds on grey rendzina soil.

Contrary to the title of the Hebrew publication in this matter in the Kalanit Israel Botanical Magazine (Bechor & Fragman-Sapir 2020), we believe that most likely *Limosella aquatica* arrived

at these habitats naturally, by long-distance seed dispersal, probably carried by birds.

Reference material: ISRAEL, Upper Galilee, Ahihud Forest, small vernal pools in hard calcareous rocky outcrops, 12.4.2022, *Siko Bechor* (HUJ134817!).

Poaceae Barnhart

Molineriella minuta (L.) Rouy (Fig. 3b)

Discovered and identified for the first time in the region by Bar Shemesh from Mt Kata (lower Mt Hermon) in 2021 (Shemesh & al. 2021), this delicate grass was apparently previously known from Mt Kata (although only a single specimen was found in the HUI herbarium, collected by Yair Ur in 2009) and has been misidentified repeatedly as *Zingeria biebersteiniana* (Claus) P.A.Smirn. Several additional specimens collected in the same area by Dar Ben-Natan, Mimi Ron and Ori Fragman-Sapir the previous year (Shemesh & al. 2020) were later identified as *Molineriella minuta* as well. This delicate species is currently known in Israel only from that single location, where it occurs on Jurassic sandstone outcrops together with *Aira elegantissima* Schur, whereas *Z. biebersteiniana* occurs in the region almost exclusively in dolines on the higher parts of Mt Hermon. Only a single collection of this species from Israel outside Mt Hermon exists in the HUI herbarium: collected by Yair Ur in a vernal pond near Tsuriman in the northern Golan Heights.

Reference material: ISRAEL, Mt Kata (Lower Mt Hermon), 2704/7945, alt: 1050 m, 29.6.2009, Yair Ur (HUJ134819!), ISRAEL, Mt Hermon, Mt Kata, sandstone outcrops, 33.2479 N, 35.7552 E, alt: 1080m. Together with *Aira elegantissima* Schur and *Moenchia erecta* (L.) P.Gaertn. & al., 3.5.2020, Dar Ben-Natan (HUJ134899!).

Phleum pratense L.

A perennial grass, erect to ascending, reaching a height of up to 80 cm, with thickened bulbous basal internodes. *Phleum pratense* was collected from Mt Hermon by A. Shmida in the 1970s, and identified as *P. bertolonii* DC. (synonym). On this basis, it was included in Shmida's Field Guide for the Mt Hermon Plants (Shmida 1981). The species was not included in the Analytical Flora of Eretz-Israel (Feinbrun-Dotan & Danin 1991). This addition to the flora of Mt Hermon wasn't reported in scientific literature up to the present.

In 2018, three *Phleum* sp. specimens were discovered by Re'ut Luria, Dar Ben-Natan and Merav Lebel during a Deshe OLI rare plants survey for the INPA, in upper Mesil A'sania in the northern Golan Heights. The plants found growing in a vernal stream (called Mesil locally) bank on alluvial basaltic clay soil, together with *Alopecurus arundinaceus* Poir. and *Carex divisa* Huds., and later identified as *P. pratense* by Dar Ben-Natan, Ori Fragman-Sapir and Yuval Sapir. The plants were observed again in the same location in 2019. In 2022, during a botanical survey in the northern Golan Heights for Deshe OLI and Shamir institute for the research of the Golan Heights, a larger population, consisting of several dozen individuals, was located further downstream from the original location (Ben-Natan 2023).

The difference between the plants growing in Mesil A'sania and those of the Mt Hermon populations, growing on glacial silt clay in dolines at an altitude of 2000+ m, is solely in habit and spikes and spikelets dimensions: while plants from A'sania reach 40 cm or more and have generally larger spikes and spikelets, the Mt Hermon populations consist of short plants (up to 15 cm) generally bearing smaller spikes and smaller spikelets. This leads us to follow Stewart & al. (2011) in regarding the two as conspecific. The same pattern can be observed in the *Alopecurus arundinaceus* populations of the Golan Heights wet habitats and Mt Hermon dolines at 2000+ m, which in both habitats occur together with the much rarer *P. pratense*.

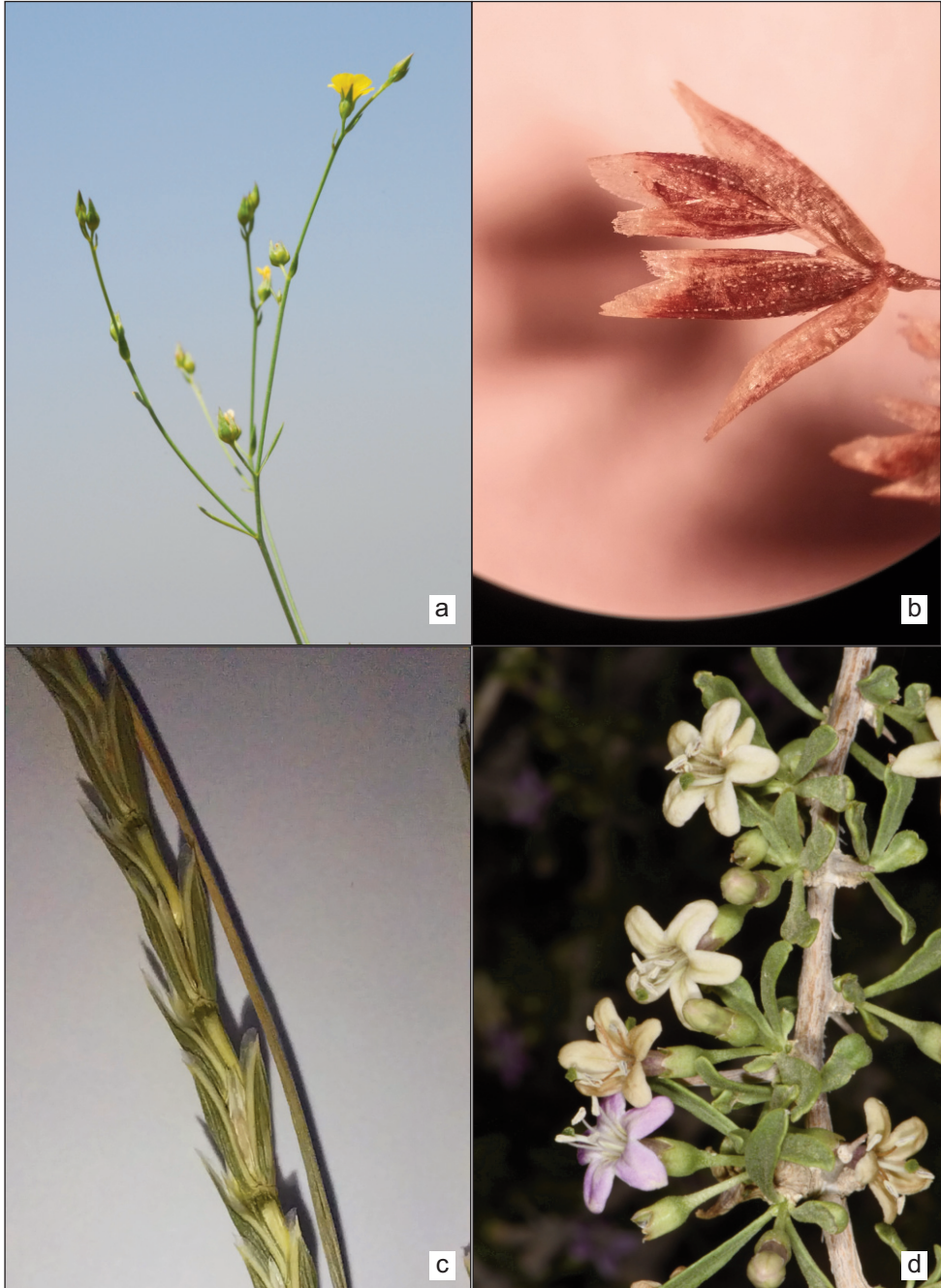


Fig. 3. a) *Linum trigynum*, photo by O. Fragman-Sapir; b) *Molineriella minuta*, photo by D. Ben-Natan; c) *Pholiurus pannonicus*, photo by D. Ben-Natan; d) *Lycium petraeum*, by photo O. Fragman-Sapir.

Reference material: ISRAEL, S Mt Hermon,: 3.5 km N of Majdal Shams, alt: 1850 m., 7.1975, *A. Shmida* (HUJ134965!), ISRAEL, S. Hermon: 4.5 km NE of Majdal Shams, Bolan Valley, alt: 2000 m, hard Jurassic limestone, 26.7.1975, *A. Shmida* (HUJ134960!, HUIJ134962!, HUIJ134963!, HUIJ134964!), ISRAEL, S. Hermon, 5 km NW of Majdal Shams, alt: 1450 m. Brown soil in dolina, 22.5.1969, *A. Danin* (HUJ134961!, HUIJ134966!), ISRAEL, S. Hermon, Gebel Majdal Shams, alt: 1700-2100 m. Limestone, Jura, 12.9.1967, *D. Pery* (HUJ134959!), ISRAEL, Golan Heights, upper Mesil A'sania (west of Ein Mumsia and road 98), 33.0763551 N 35.8178219 E, Stream's bank, tall herbaceous vegetation, together with large clumps of *Alopecurus arundinaceus* Poir., very few specimens, 4.6.2018, *Dar Ben-Natan* (HUJ134768!), ISRAEL, Golan Heights, upper Mesil A'sania (west of Ein Mumsia and road 98), 33.0763551,35.8178219, Stream's bank, tall herbaceous vegetation, together with large clumps of *Alopecurus arundinaceus* Poir., very few specimens, observed for the second consecutive year, probably perennial, horned glumes, lacking cilia at margins, 23.6.2019, *Dar Ben-Natan* (HUJ133383!), ISRAEL, Golan Heights, upper Mesil A'sania, 33.0748410 N 35.8153500 E, 33.0754470 N, 35.8163760 E, moist meadow in the banks of a small stream (Mesil), 19.5.2022, *Dar Ben-Natan* (HUJ134772!, TELA4103!).

Pholiurus pannonicus (Host) Trin. (Fig. 3c)

Spreading-ascending annual grass, very similar to *Parapholis incurva* (L.) C.E.Hubb., and differing in the much larger habit, 2-flowered spikelets and venation on the glumes and lemmas.

Pholiurus pannonicus was first discovered in Israel by Dar Ben-Natan during a botanical survey in the northern Golan Heights for Deshe OLI and Shamir institute for the research of the Golan Heights, in May 2022. The plants were found growing in a dense patch on the shallower margins of a vernal pond (dry at the time of the finding) on basalt clay soil, about 1 km west of the Syrian border (Ben-Natan 2023). *Pholiurus pannonicus* is recorded in the NE Mediterranean from western Turkey and Greece. To our knowledge, it has not been reported southeastwards of that area, which makes this the first record of this species not only from the Golan Heights, but the entire Middle East. It is most probably present in southern Syria as well, in the Quneitra Valley, which the Tsuriman vernal ponds are a part of.

Reference material: ISRAEL, Golan Heights, near ruins of Tsuriman, dry bottom of vernal pond, basalt clay soil covered with herbaceous vegetation, 33.096521 N 35.836719 E, 20.5.2022, *Dar Ben-Natan* (HUJ134936!, HUIJ134937!, HUIJ134938!).

Rubiaceae Juss.

Galium tenuissimum M. Bieb.

Low herbs growing in Israel in margins of plantations on pyroclastic ash soils in the northern Golan Heights, and readily distinguishable from the very similar *Galium chaetopodium* Rech.f. by the absence of long awns at the edge of the petals. *G. tenuissimum* was identified in a single location at the margins of a plantation near Buk'ata, where it is highly threatened by agricultural activity. Another locally extremely rare species with similar circumstances and habitat (*Crambe alutacea* Hand.-Mazz.) became extinct in 2022 after the plot where it used to grow was repurposed and cultivated (Ben-Natan 2023).

Galium tenuissimum was discovered as a species new to the Flora Palaestina region by Dar Ben-Natan during a Deshe OLI survey for the KKL-JNF in 2023, and identified by Bar Shemesh and Dar Ben-Natan. Similar plants were discovered the same year in two other locations, but their identification is not certain.

Reference material: ISRAEL, N Golan Heights, east of Tel Sha'ifri, near Buk'ata 33.1991635,35.7934923, alt: 1080m, next to a plantation of fruit trees. Deep caly-loam soil, 15.5.2023, *Dar Ben-Natan* (HUJ 135049!).

Solanaceae Juss.

Lycium petraeum Feinbrun (Fig. 3d)

A rare, poorly known species, described by Feinbrun-Dothan (1978) from Jordan, where it grows at the margins of irrigated plots on the Edom Mts, and is probably a relic of ancient agriculture, the natural origins of which are as yet unknown.

This species is largely similar to *L. depressum* Stocks in its short corolla tube and many flowered flower-clusters, and can be distinguished by the pubescent lower part of the filaments, brighter red berries, viscous young branches and leaves, and habitat. *L. petraeum* was recorded in Israel for the first time in Arad in 2008, by Dar Ben-Natan, and was misidentified at first as *Lycium shawii* Roem. & Schult., then as *L. depressum* Stocks, and later as an unidentified *Lycium sp.* The plants were re-identified by Dar Ben-Natan as *L. petraeum* only in 2022, after comparing the live plants from Israel to herbarium material from Jordan, kept in the HNJ herbarium, and to photographs taken By Ori Fragman-Sapir in Edom Mts the same year.

By then, *L. petraeum* was recorded by Dar Ben-Natan in four localities in the Central Negev and Judean Desert. In three of these four locations, *L. petraeum* grows near old historically irrigated plots (Nabataean terraces, wells and agriculture in Nahal Haro'a, Nahal A'ro'er and Be'erotayim). In all of those places, *L. petraeum* was probably brought and planted by nomad tribes that used to cultivate the loess terraces in the Central Negev, such as late Nabataeans or Bedouin, similar to the Jordanian populations.

Reference material: HOLOTYPE, JORDAN, Edom, Wadi Musa, Hedge rows, alt: 1200 m, 29.3.1936 (HUJ29819!), PARATYPE, JORDAN, Wadi Musa, alt: 1200 m, hedge rows, *A. Eig, M. Zohary & N. Feinbrun-Dothan*, 29.3.1936 (HUJ29820!), TURKEY, B5 Yozgat: Yozgat to Kirikkale, 5 km from Yozgat, alt: 1060 m, *A. Baytop*, 7.6.1974 (HUJ134969!), TURKEY, B3, Eskisehir: 3 km S. of Cifteler, alt: 870 m, *A. Baytop*, 28.8.1974 (HUJ134968!), ISRAEL, Nahal Ezuz, Be'erotayim, probably a remnant of planted by local Bedouins for plot bordering, 30.7923510 N, 34.4686278 E, 11.3.2020, *Dar Ben-Natan* (HUJ134883!), ISRAEL, Negev, Nahal Ha'roah, near a picnic area, in the vicinity of Nababtic terraces, on Loess, 30.8758052 N, 34.7849143 E, alt: 450 m. 13.8.2022, *Dar Ben-Natan* (HUJ134895!, HUJ134896!, HUJ134897! HUJ134898!).

Discussion

In the last two decades, and increasingly so in recent years, the renewed interest in the diversity and taxonomy in Israel have led to the discoveries of more than 60 previously unrecorded or mis-identified species in the local flora. 28 of which are included here and 32 more will be reported in upcoming papers. These species were found all across the region, from the Eilat Mountains in the south to Mt Hermon in the north, and from the Golan Heights in the northeast to the western Negev Desert in the southwest.

An analysis of the new findings presented in this paper shows that they are mostly herbaceous plants (25 species out of 28 in total), of which 21 are annual, and only three species are woody. This corresponds with the rich herbaceous and particularly annual flora of the region (Fragman & al.

1999), which is unique in a global perspective (Poppenwimer & al. 2023). It is assumed that more than half of the local flora is annual and in many cases one can find dozens or even hundreds of annual species in small areas (Shmida 1985), hence the complexity and importance of conservation of such microhabitats.

Most of the new discoveries presented here are regarding new floristic records for the Flora Palaestina region, previously not reported from the region and sometimes familiar to local botanists and travelers from visits to bordering countries such as Jordan, Egypt and Syria (e.g. *Lycium petraeum*, *Cleome chrysantha* and *Sedum assyriacum*), or from the higher Mt Hermon (*Siebera nana*, *Linum trigynum*). Some of the examples presented in this paper were previously regarded as doubtful records that went unpublished or that were not accepted by local authorities, and only a few of them are misidentifications of already recorded species (*Valerianella discoidea*, *Sagittaria subulata*, *Achillea falcata*, *Molineriella minuta* and *Minuartia intermedia*). Some of the new species recorded here, mostly from wet habitats, are likely to have recently been bird- or wind-dispersed into the region and establish new populations, but many are putative relicts that survived in small and scattered populations.

While some of the new discoveries' absence from local literature are the result of the relative absence of survey and botanic activities in some remote areas of the region, many new discoveries were made in relatively densely surveyed areas. These were achieved mainly by increased observation and identification capabilities, both in the field and in the herbaria, and a rise in interest in plant taxonomy and diversity.

The findings in this paper contribute to the updated list of the local flora (in preparation). They showcase the vast diversity that can be found in such small regions in the eastern Mediterranean, and demonstrate the importance of thorough biodiversity surveys. Habitat conservation is of great importance for the conservation of this plant diversity, with special emphasis on the conservation and interface of small and vulnerable ecosystems in densely populated areas such as central Israel, and in densely cultivated areas such as the northern Golan Heights and western Negev.

Since 1999 (Fragman & al. 1999) no updated checklist of the local vascular plants has been published. The estimated number of species recorded from the Flora Palaestina region, including the new additions from recent years, is approaching 2700 species. Since many of the newly discovered species are extremely rare and occur in few localities, immediate actions to conserve them both *in situ* and *ex situ* are required. Many locally rare and endangered species are conserved in the Jerusalem Botanical Gardens, as well as other botanical gardens, sanctuaries and the Israel Gene Bank.

This paper is part of efforts to update the Flora Palaestina checklist. It is hoped that more studies and publications on the local flora, and that of the eastern Mediterranean as a whole will follow.

Acknowledgments

We would like to thank the many talented people who looked for, noticed and shared their new discoveries, and to the ones who made efforts to identify them and deposit their collections in the HUJ and TELA herbaria: Dror Melmed, Dudi Rivner, Mimi Ron, Ofra Fridman, Ohad Binyamini, Oz Golan, Reut Luria, Rudiger Prasse, Sakra Jen, Shimon Cohen-Sivan, Shmuel Mazar, Siko Bechor, Yair Ur and Yuval Sapir.

Special thanks to our friends and colleagues in Deshe OLI: Amir Perelberg, Dvora Lev-Ramati, Hila Gil, Merav Lebel, Noam Segev, Omri Shalev and Uri Ramon.

We would like to dedicate this paper to Mimi Ron, who has taught us a great deal about the local flora, fieldwork and the psych of a botanist.

Thanks also to Avi Shmida and the late Avinoam Danin who taught us the fundamentals of botany and ecology.

References

- Aaronsohn, A. 1931: I Florula Transjordanica. – Genève.
 —. 1941: II Florula Cisjordanica. – Genève.
- Bechor, S. & Fragman-Sapir, O. 2020: *Limosella aquatica* L. – A new alien species for the flora of Israel. – Pl. Mag. **7**. [in Hebrew].
- Ben-Natan, D. in Raizner, Y, Ben-Natan, D., Mendelson, A., Romem, E., Perelberg, A. & Malkinson, D. 2023: The Volcanic Cone Strip of the Golan Heights: Survey, analysis and assessment of nature, landscape and heritage. – Tel-Aviv. [in Hebrew].
- , Gil, H. & Perelberg, A. 2022: Be'eri Crater Nature Reserve: Vegetation survey. – Tel-Aviv [in Hebrew].
- & Ron, M. 2021: Botany. – Pp. 775-800 in: Gil, H., Ben-Natan, D., Ron, M., Mendelson, A., Enmar, L., Shaham, B., Haviv, E., Ydov, S., Perelberg, A., Kagan, G. & Ramon, U., Ecological Corridor of Yatir. – Tel-Aviv. [in Hebrew].
- Boissier, E. 1872: Flora Orientalis, **2**. – Genève.
- Boulos, L. 2002: Flora of Egypt. – Cairo.
- Chamberlain, D. F. 1972: *Sedum*. – Pp. 210-243 in Davis, P. H. (ed.) Flora of Turkey and the East Aegean Islands, **4**. – Edinburgh.
- Danin, A. 2000: The Nomenclature News of Flora Palaestina. – Fl. Medit. **10**: 109-172.
 — 2004: Distribution Atlas of Plants in the Flora Palaestina area. – Jerusalem.
 — 2009: *Tetragonia tetragonoides* (Pall.) Kuntze. in: Greuter, W & Raus, T. (eds) 2009: Med-Checklist Notulae, 28. – Willdenowia **39(2)**: 335.
 — & Suchorukow, A. P. 2009: *Chenopodium rubrum* L. in: Greuter, W & Raus, T. (eds) 2009: Med-Checklist Notulae, 28. – Willdenowia **39(2)**: 337.
 — & — 2009: *Chenopodium chenopodioides* (L.) Aellen. in: Greuter, W & Raus, T. (eds) 2009: Med-Checklist Notulae, 28. – Willdenowia **39(2)**: 337.
 — & Martins, L. 2009: *Crupina intermedia* (Mutel) Walp. in: Greuter, W & Raus, T. (eds) 2009: Med-Checklist Notulae, 28. – Willdenowia **39(2)**: 337.
 — & Plitmann, U. 2009: *Lathyrus saxatilis* (Vent.) Vis. in: Greuter, W & Raus, T. (eds) 2009: Med-Checklist Notulae, 28. – Willdenowia **39(2)**: 338-9.
 — & Raus, T. in Greuter, W & Raus, T. (eds) 2011: Med-Checklist Notulae, 30. – Willdenowia **41(2)**: 311-328, 312-314, 320-322.
 —, Avni, Y., Avni, N. & Taube, N. in Greuter, W & Raus, T. (eds) 2011: Med-Checklist Notulae, 30. – Willdenowia **41(2)**: 311-328, 312-314, 320-322.
- Davis, P. H. & al. (eds) 1965-1988: Flora of Turkey and the East Aegean Islands, **1-10**. – Edinburg.
- Domina, G. & Raimondo, F. M. 2009: A new species of *Orobancha* (*Orobanchaceae*) from Israel. – Fl. Medit. **19**: 185-188.
- Eig, A. Zohary, M. & Feinbrun-Dothan, N. 1954: Analytical Flora of Palestine. – Palestine J. Bot. Jerusalem **1**: 1-504. [in Hebrew].
- Feinbrun-Dothan, N. 1978: Flora Palaestina, **3**. – Jerusalem.
 — 1986: Flora Palaestina, **4**. – Jerusalem.
 — & Danin, A. 1998: Analytical Flora of Eretz-Israel. – Jerusalem. [in Hebrew].

- Ferreira Z. M. 2015: Biosystematics of the Genus *Andryala* L. (*Asteraceae*). – Doctorate in Biological sciences, Universidade da Madeira.
- Fragman-Sapir, O. 1999: *Alisma gramineum* (L.) Buchenau in: Greuter, W & Raus, T. (eds), *Med-Checklist Notulae*, 18. – *Willdenowia* **29**: 51-67.
- & Fritsch, F. M. 2011: New Species of *Allium* Sect. *Melanocrommyum* from the Eastern Mediterranean. – *Herbertia* **65**: 31-50.
- , Plitmann, A., Heller, D. and Shmida, A. 1999: Checklist and Ecological Database of the flora of Israel and its Surroundings. – Jerusalem.
- Ghazanfar, S. A. & Edmondson, J. R. (eds) 2013: *Flora of Iraq*, **5(2)**. – Baghdad.
- Golan, O. 2018: *Valerianella obtusiloba* Boiss. A new plant for Israel. – *Kalanit Pl. Mag.* **5**. [In Hebrew] https://www.kalanit.org.il/botanical_news/valerianella-obtusiloba-news/
- Golan, O. & Shmida, A. 2021: *Fumana scoparia* Pomel – A new species to the flora of Israel. – *Kalanit Pl. Mag.* **8**. [in Hebrew]. https://www.kalanit.org.il/botanical_news/fumana_scoparia_news/
- Holmgren, P. K., Holmgren, N. H. & Barnett, L. C. 1990: Index Herbariorum Standard. – IUBS Commission for Plant Taxonomic Databases (TDWG) <http://www.tdwg.org/standards/105>
- Lebel, M., Ron, M., Shemesh, B., Gil, H., & Ben-Natan, D. 2018: Endangered plants survey, 2018. – Tel-Aviv [in Hebrew].
- Lev-Ramati, D., Ben-Natan, D., Perelberg, A., Rotem, D., Shalev, O., Talmon, I., Gleitman, S., Tsafir, A. & Porat, Y. 2022: Tool and protocol development for mapping, surveying and tagging of protected natural assets in KKL forests designated for thinning or renewing, summary of a three-year pilot. – Tel-Aviv [in Hebrew].
- Mazar, S. 2016: New observations on rare plant species in the Dalton Height and the Northern Golan Heights: *Lythrum thymifolium* L., *Lythrum borysthenicum* (Schrank) Litv. and *Myosotis stricta* Link ex Roem. & Schult. *Bot. News Segment*. – *Kalanit – Pl. Mag.* **3**. [in Hebrew]. https://www.kalanit.org.il/botanical_news/lythrum-myosotis/
- Meikle, R. D. 1977, 1985: *Flora of Cyprus*. – Kew.
- Melamed, D. & Fragman-Sapir, O. 2015: *Valerianella pumila* (Willd.) DC. – A new species for the Israel flora from the Northern Negev. – *Kalanit Pl. Mag.* **2**. [in Hebrew]. <https://www.kalanit.org.il>
- Mendelson, A., Orgad, Y., Ben-Natan, D., Rinot, A., Pasternak, E., Yidov, S., Kesner, Z., Azulai, H., Winer, A., Barda, H., Zeidman, D., Oren, D., Grossbard, S. & Zilbershtein-Barzide, Y. 2020: Survey of Urban Nature Facilities in Hadera, summarizing document. – Tel-Aviv. [in Hebrew].
- Messerschmid, F. E. T., Klein, T. J., Kadereit, G., Kadereit, Y. W. 2020: Linnaeus's folly – phylogeny, evolution and classification of *Sedum* (*Crassulaceae*) and *Crassulaceae* subfamily *Sempervivoideae*. – *Taxon* **69(5)**: 892-926. <https://doi.org/10.1002/tax.12316>
- Mouterde, P. 1966: *Nouvelle flore du Liban et de la Syrie*, **1**. – Beyrouth.
- Peri, O. 2015: *Bulbs of the Eastern Mediterranean*. – Pershore.
- Poppenwimer, T., Mayrose, I., & DeMalach, N. 2023: Revising the global biogeography of plant life cycles. <https://doi.org/10.1101/2022.09.13.507878>
- Post, G. E. 1896: *Flora of Syria, Palestine and Sinai*, **1**. – Beirut.
- Rivner, D. & Shmida, A. 2017: A new species to the flora of Israel – *Cleome chrtysantha* was found in Eilat Mountains. – *Kalanit Pl. Mag.* **4**. [in Hebrew]. <https://www.kalanit.org.il/cleome-chrtysantha/>
- Shalev, O., Ben-Natan, D., Mendelson, A., Gil, H., Enmar, L., Talmon, I., Ron, M., Kagan, G., Perelberg, A. & Ramon, U. 2021: *Eshkol Region*. – Tel-Aviv.
- Shemesh, B., Ron, M. & Ben-Natan, D. 2021: Endangered plant survey, 2021. – Tel-Aviv [in Hebrew].
- , — & — 2022: Endangered plant survey, 2022. – Tel-Aviv [in Hebrew].

- , — & — 2023: Endangered plant survey, 2023. – Tel-Aviv [in Hebrew].
- , —, — & Gil, H., 2020: Endangered plant survey, 2020. – Tel-Aviv [in Hebrew].
- Shifman, A. 2020: *Himantoglossum comperianum* (Steven) P.Delforge – A new species for the Israel flora. – Kalanit Pl. Mag. **7**. [in Hebrew]. <https://www.kalanit.org.il/himantoglossum-comperianum-news/>
- Shmida, A. 1985: Richness and evolution of the annual flora of the Mediterranean maquis. – Rotem **18**: 116-117.
- 2015: *Fumaria officinalis* L. – A new species to the flora of Israel, oppressing the common *Fumaria* species? – Kalanit – Pl. Mag. **2**. [in Hebrew]. https://www.kalanit.org.il/botanical_news/fumaria-officinalis-new-species-in-israel/
- and Pollak, G. 2007: The Red Data Book – Endangered plant species in Israel, **1**. – Jerusalem. [in Hebrew].
- , — & Fragman-Sapir, O. 2011: The Red Data Book – Endangered plant species in Israel, **2**. – Jerusalem. [in Hebrew].
- Smith, G. J. 1895: A Revision of the North American Species of *Sagittaria* and *Lophotocarpus*. – Missouri Bot. Garden Ann. Report **1895**: 27-64.
- Stewart, A. V., Joachimiak, J. A. & Ellison, W. N. 2011: *Phleum* in Kole, C. (ed.), Wild Crop Relatives: Genomic and Breeding Resources, Millets and Grasses. – Berlin.
- Streeter, D. Hart-Davies, C. Hardcastle, A. Cole, F. & Harper 2009: Collins Flower Guide. – London.
- Taifur, H. & El-Oqlah, A. 2019: Annotated checklist of the vascular plants of Jordan. – Kew.
- Tutin, T. G., Heywood, V. H., Burges N. A., Moore, D. M., Valentine, D. H., Walters S. M. & Webb, D. A. (eds) 1972: Flora Europaea, **3**.– Cambridge.
- Van Ham, R. C. H. J. & 't Hart, H. 1998: Phylogenetic relationships in the *Crassulaceae* inferred from chloroplast DNA restriction-site variation. – Amer. J. Bot. **85(1)**: 123-134.
- Zohary, M. 1966: Flora Palaestina, **1**. – Jerusalem.
- 1972: Flora Palaestina, **2**. – Jerusalem.
- 1976: New Guide to the Vegetation of Israel. – Tel-Aviv [in Hebrew].
- & Heller, D. (eds) 1989: New Guide to the Vegetation of Israel, expanded 2nd edition. – Tel-Aviv [in Hebrew].
- , Heyn, C. C. & Heller, D. 1980-1984: Conspectus Florae Orientalis, **1-2**. – Jerusalem.

Addresses of the authors:

Dar Ben-Natan¹, Ori Fragman-Sapir² and Bar Shemesh¹,

¹Deshe Open Landscape Institute, Steinhardt Museum of Natural History, Tel-Aviv University, Klausner St. 12, Tel Aviv-Yafo. darbn@tauex.tau.ac.il, shemeshbar@tauex.tau.ac.il.

²The Jerusalem Botanical Gardens and the Israel National Herbarium, The Hebrew University of Jerusalem. fragman@botanic.co.il